WORLDMAKING IN MUSIC, SOUND ART, AND INSTRUMENT DESIGN

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ABSTRACT

The audio arts, and music in particular, have often been understood according to a narrative concept based on a dramatic arc of conflict and resolution. I propose that a body of work exists that is better understood as an act of worldmaking in which artworks exist as assemblages of continuous process. This thesis explores ways in which the idea of worldmaking has shaped artistic practices in the audio arts. It begins by proposing a theoretical framework based primarily on the work of Ursula K. Le Guin and Anna Tsing, then examines how these ideas have been applied in the work of several composers, sound artists, and instrument designers.

In music, Pauline Oliveros, Brian Eno, and Hildegard Westerkamp have each created bodies of work that have been influential on the practice of worldmaking in music. I examine the concepts underpinning their individual practices as well as the larger cultural movements that they have each contributed to before moving on to the distinct but related musical ideas of John Luther Adams and Anna Þorvaldsdóttir, focusing on their immersive instrumental works *Inuksuit* and *METAXIS.*

In addition to his work as a composer, Adams has also created sound installations that sonify natural systems. I explore how the indefinite nature of sound installations affects their ability to create a sense of place by comparing Adams' *The Place Where You Go To Listen* with Andrea Polli's *Atmospherics/Weather Works* and with other sound installations based on nature data.

Finally, I discuss the application of worldmaking concepts to instrument design. I begin with a broad discussion of the modular synthesizer as an assemblage instrument, then examine two instruments that demonstrate distinct approaches to worldmaking: Peter Blasser's *Plumbutter*, and Tyler Etters' *Arcologies*.

The portfolio section of this dissertation includes my composition *a body in a place*, my sound installation *Sound Fisher*, my electro-acoustic instrument *Resin*, and my software instrument *Flyway.* Together, these provide an illustrative overview of my creative work at Princeton.

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TABLE OF CONTENTS

1. A CARRIER BAG THEORY OF SOUND

1.1 A Theoretical Framework for Worldbuilding in the Audio Arts

There is a body of audio art that is best understood as an act of worldmaking: works comprised of continually unfolding processes that combine to create indefinite environments of sonic relationships. This dissertation proposes a theoretical framework for worldmaking in audio art, based primarily on the work of Ursula K. Le Guin and Anna Tsing. Using this framework, I examine how ideas of worldmaking have been applied in the work of composers, sound artists, and instrument designers. The eight artists discussed in this dissertation share a basis in the creations of assemblage-based environments rather than narrative arcs. I examine the concepts underpinning their individual practices as well as aesthetic developments that they are representative of, and the larger cultural movements that they have each contributed to.

Composers Brian Eno, Pauline Oliveros, and Hildegard Westerkamp have each developed unique practices that have contributed to the development of place-based music. I connect these practices to the distinct but related musical ideas of John Luther Adams and Anna Þorvaldsdóttir, focusing on their immersive instrumental works *Inuksuit* and *METAXIS.* In the world of sound art installations, I discuss Adams' approach to sonifying the geophysical data of Alaska and compare it to Andrea Polli's sonification of weather data from the Eastern Seaboard. Finally, I discuss worldmaking in modular synthesis and examine the contrasting approach to cartographic interfaces in instruments created by Peter Blasser and Tyler Etters.

The portfolio section of this dissertation includes my composition *a body in a place*, my sound installation *Sound Fisher*, my electro-acoustic instrument *Resin*, and my software instrument *Flyway.* Together, these provide an illustrative overview of my creative work at Princeton, and my own connection to the concepts discussed in this dissertation.

1.2 Beyond the Narrative Arc

> For centuries there's been one path through fiction we're most likely to travel – one we're actually told to follow – and that's the dramatic arc: a situation arises, grows tense, reaches a peak, subsides. Teachers bid young writers to follow the arc (or triangle or pyramid) … And it is an elegant shape, especially when I translate arc to its natural form, a wave. It's rise and fall traces a motion we know in heartbeats, breaking surf, the sun passing overhead. There's power in a wave, its sense of beginning, midpoint, and end; no wonder we fall into it in stories.[1]
>
> - Jane Alison, *Meander, Spiral, Explode: Design and Pattern in Narrative*

The dramatic narrative arc is a familiar shape that has informed the creation of many narrative-based art forms. These stories often center around a heroic figure in conflict with their opponent, nature, society, or self. Through an inciting incident, rising action, climax, and denouement we are introduced to a conflict or question which, through a series of increasingly dramatic events, is eventually resolved. There are variations on the specific terms and dividing points used to describe this structure, but the general arc remains consistent, as does its foundation of conflict

[1] Jane Alison, *Meander, Spiral, Explode: Design and Pattern in Narrative* (Catapult, 2019), 6.

or uncertainty. As Jane Alison says, "[this] single shape has governed our stories for years," and has inspired a wealth of art creation and analysis. This includes tonal harmony and the ubiquitous sonata form, where the structure can be stated more simply as consonance, tension, consonance.[2]

In *The Carrier Bag Theory of Fiction*, Ursula K. Le Guin suggests an alternative approach to storytelling that moves beyond conflict narratives to embrace a broader view of human experience.[3] Borrowing from Elizabeth Fisher's *Carrier Bag Theory of Human Evolution*, Le Guin describes an approach to storytelling where elements are gathered because they are "useful, edible, or beautiful," and are brought together to create narratives "full of beginnings without ends, of initiations, of losses, of transformations and translations, and far more tricks than conflicts."[4] Conflict may be a part of the collection of materials gathered to make the story, but in these stories it does not receive special treatment, and its resolution is no longer linked to the conclusion of the story. Such a story "cannot be characterized either as conflict or as harmony, since *its purpose is neither resolution nor stasis but continuing process*."[5]

1.3 Our Relationship to Nature: Landscapes, Ecosystems, and Assemblages

Worldmaking and the creation of place outside of a narrative arc is predicated on the comparatively recent development of ecology. Philosophers from the Enlightenment Period

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[2] Scalar and harmonic functions in tonal harmony imply hierarchical relationships between frequencies, sites of stasis as the ultimate destination of tension, and resolution through cadential figures. Alison, *Meander, Spiral, Explode*, 8.
[3] Ursula K. Le Guin, "The Carrier Bag Theory of Fiction," in *The Ecocriticism Reader: Landmarks in Literary Ecology*, ed. Cheryll Glotfelty and Harold Fromm (University of Georgia Press, 1996), 149-154.
[4] Le Guin, "The Carrier Bag Theory of Fiction," 151, 153.
[5] Le Guin, "The Carrier Bag Theory of Fiction," 153.

disseminated a vision of nature that portrayed it as powerful and sublime, but ultimately passive, mechanistic, and other—separated from human concerns.[6] Artists of the era created landscapes, depicting nature from removed, idealized viewpoints separated from the observer, and focused predominantly on "the record of surfaces."[7] (e.g. Beethoven's Symphony No. 6, Pastorale.[8]) Artists selected landscape views or soundscapes that matched the aesthetic goals of their era without engaging with the systems that created those scenes.

The development of ecology introduced an understanding of nature as an environment of systems and relationships inclusive of living and non-living processes. Rather than a *landscape* to be observed from afar, nature became an *ecosystem* to be immersed in; rather than a static backdrop, it became an *assemblage of processes* that we are inextricably involved in and surrounded by.[9] Worldmaking implies the creation of a collection of processes, actors, and potentialities that together form a coherent whole. As in literature, a given world contains many possibilities of stories, settings, and relationships that may occur within it.

I use the term, *assemblage,* to describe the non-progress and non-linear possibilities inherent in the "continuing process" of carrier bag approaches to art making.[10] Although many of the artists discussed in this dissertation describe their works as *ecosystems*, using a more colloquial understanding of the term to explain their process-based artistic worlds, when not referring to a

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[6] Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press, 2015), vii.
[7] Andrews, *Landscape and Western Art*, 180.
[8] Ludwig Van Beethoven, *Symphony No. 6 in F major, Op. 68*, 1808.
[9] Diana Agrest, *Architecture of Nature: Nature of Architecture* (ORO Applied Research + Design, 2019), 10.
[10] Le Guin, "The Carrier Bag Theory of Fiction," 153.

specific artist's terminology I use *assemblage* as a more flexible descriptor of such works. While *ecosystem* implies a community of related processes within a place, *assemblage* remains agnostic towards these relationships. By remaining neutral about the nature of relationships within an artistic environment, the term *assemblage* avoids any implication of progress, point of arrival or a place of resolution. It makes room for the constituent elements of an artwork to "live together without either harmony or conquest."[11] Anna Tsing describes them as "open-ended gatherings… [that] allow us to ask about communal effects without assuming them."[12] They allow for relationships between processes within an environment that are fluid and uncertain – the processes may be inextricably related, come into temporary contact, or simply exist within the same space.[13]

1.4 Curiosity and Ego: Artists' Relationships to their Work

All the sonic artworks discussed in this dissertation share an immersive quality and encourage an exploratory mindset. They create spaces where listeners can follow their immediate curiosity within the sonic state and are not drawn into a linear narrative. These works can create meaningful artistic experiences when experienced at any scale because of their constant processes and the absence of any expectation of resolution. In a sound world where the dramatic arc is not a given, audiences are left to experience the unpredictable unfolding and interactions of its processes. "Unencumbered by the simplifications of progress narratives, the knots and pulses

[11] Tsing, *The Mushroom at the End of the World*, 5.
[12] Tsing, *The Mushroom at the End of the World*, 23.
[13] The use of this term also serves to associate these practices with Gilles Deleuze and Félix Guittari, whose concepts of assemblages and of rhizomatic versus arborescent models of thought have been influential on recent artwork. For an in-depth discussion of Deleuze's influence on musical thought see Edward Campbell, *Music After Deleuze* (Bloomsbury Publishing, 2013).

of patchiness are there to explore."[14] In worlds without heroes to embody or conflicts to be won, the focus moves towards collective curiosity rather than individual triumph. As Le Guin writes, "Instead of heroes, [these stories] have people in them."[15] There is no lead singer or soloist whose narrative we can expect to resolve; this can deemphasize the egos of the creators, performers, and audience.

This is not to say that the artists who make these worlds do not work to build a public persona– all the artists discussed below have done so, each in their own way and to varying extents. I propose that the role they have cast themselves in is the same one Le Guin has in *The Carrier Bag Theory of Fiction*: that of the gatherer, collecting items from the world because they are useful or beautiful and bringing them home to put into the carrier bags of their art. Adams gathers from Alaska to create sonic geographies, Þorvaldsdóttir gathers the subjective experiences of her body in nature, and Westerkamp gathers the sounds of the world. But while each of them has created a singular public character that helps to shape the reception of their work, within the works themselves their presence is minimized. They create worlds for the listener to explore that deemphasize their role in shaping those worlds, evoking a sense of outwards looking curiosity.

[14] Tsing, *The Mushroom at the End of the World*, 6.
[15] Le Guin, "The Carrier Bag Theory of Fiction," 153.

2. MUSIC

2.1 Composer Overview

This chapter examines the works of five composers who exemplify the carrier bag approach to art making, and who gather the constituent processes of their art into a coherent assemblage that becomes a world for the audience to inhabit and explore for a time. It begins with the work of three distinct artists who have been influential on the creation of such art today: Brian Eno, Pauline Oliveros, and Hildegard Westerkamp. Pauline Oliveros' work has been mentioned as an influence by most of the artists discussed in this thesis, particularly because of her creation of Deep Listening as a practice; Brian Eno's contributions to the development of ambient music have aided in the development of music that exists as an environment; and Hildegard Westerkamp is a major figure in the development of soundscape composition, bringing the actual sounds of nature into this music. These artists' individual works are representative examples of the major artistic themes that have influenced the musical practices of more recently active artists Anna Þorvaldsdóttir and John Luther Adams.[16] Þorvaldsdóttir and Adams both create nature-related music that places the audience inside an environment built of intersecting processes through their distinct compositional practices. I will discuss their aesthetics and compositional approaches individually before comparing their music directly through two immersive, large-ensemble works.

[16] 'Þ' is a letter called thorn. It is pronounced and often written as 'th' in English and currently is only used in Iceland. Anna uses both Þorvaldsdottir and Thorvaldsdottir in different contexts.

2.2 Immersive Environments in Western Art

> "…nature [is] a congregation of forces of growth and decay, a site of constant energetic movement and change, [that undermines] the conception of landscape as a fixed, stable arrangement of natural forms ordered by the artist at a distance"[17]
>
> - Malcolm Andrews, Landscape and Western Art

Since the mid-1800s, nature-based art has included works whose perspective is from within an *environment* rather than from the detached still life view of the *landscape* and has sought to portray or emulate the constantly changing systems underlying these environments. J.M.W. Turner's 1842 painting *"Snow Storm"* is an early example of such works.

Fig. 1: J.M.W. Turner's Snow Storm[18]

The necessity of the painting's full title of the piece demonstrates the lack of visual definition: *Snow Storm—Steam Boat off a Harbour's Mouth making Signals in Shallow Water, and going by*

[17] Malcolm Andrews, *Landscape and Western Art* (Oxford University Press, 1999), 179.
[18] J. M. W. Turner, *Snow Storm – Steam-Boat off a Harbour's Mouth Making Signals in Shallow Water, and going by the Lead. The Author was in this Storm on the Night the "Ariel" left Harwich*, 1842, Oil on canvas, 1842, Tate Britain, United Kingdom.

the Lead. The Author was in this storm on the Night the "Ariel" left Harwich.[19] The painting forgoes clarity of subject to capture the feeling of being fully immersed in the storm, with the paint itself seeming to follow the flow of wind and waves, blurring the boundaries between the two.[20]

While Turner worked to capture the dynamism of his storm within the static frame of a single painting, Claude Monet painted the same stacks of harvested wheat over the course of a year from 1890-91. Claude Monet's *Haystacks* series (*Les Meules à Giverny*) depicts the effects of natural systems on a place even more explicitly, to show how the changing light, weather, and seasons altered his perception of a place.

[19] Turner claimed to have been tied to the mast to experience the storm in person, but there are reasons to doubt this claim. Andrews, *Landscape and Western Art*, 177.
[20] Andrews, *Landscape and Western Art*, 177.

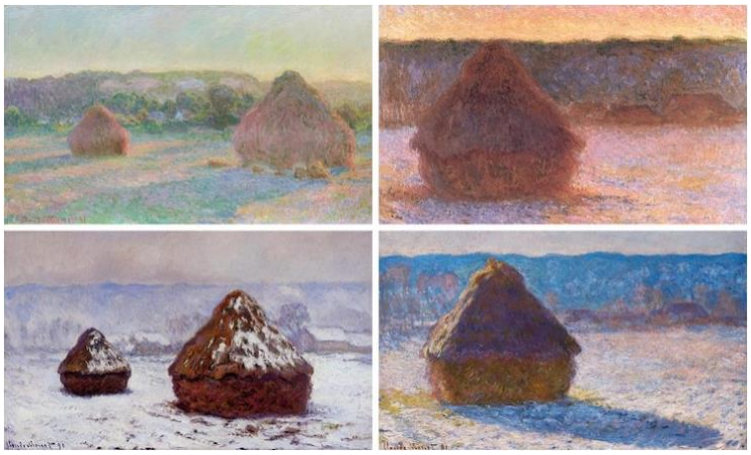

Fig. 2: Four of Monet's Haystack Paintings (1890-1891)
Clockwise from Top Left:"Stacks of Wheat (End of Summer)"[21] "Haystacks at Sunset, Frosty Weather"[22] "Haystacks (Morning Snow Effect)"[23] "Grainstack, White Frost Effect"[24]

In some respects, music has advantages over painting in creating immersive, assemblage-based art. Our perception of sound is inherently more immersive than our visual sense because our ears experience all directions roughly equally, and the temporal nature of sound is as well suited as the spatiality of visual art for supporting generative processes and assemblage systems. Despite this, the development of environmental conceptualization in music and other audio-based practices has been more recent.

Composers including Debussy, Webern, Varèse, Stravinsky, and Messiaen developed related techniques and drew from Japanese art aesthetics to create music that emphasizes objects and

[21] Claude Monet, *Stacks of Wheat (End of Summer)*, 1891, Oil on Canvas, 1891, Art Institute of Chicago, United States of America.
[22] Claude Monet, *Haystacks at Sunset, Frosty Weather*, 1891, Oil on Canvas, 1891, Private Collection.
[23] Claude Monet, *Haystack, Morning Snow Effect*, 1891, Oil on Canvas, 1891, Museum of Fine Arts, Boston, United States of America.
[24] Claude Monet, *Grainstack, White Frost Effect*, 1890–1891, Oil on Canvas, 1890–1891, Shelburne Museum, Vermont, United States of America.

moments rather than dramatic structures.[25] Stockhausen defined the "Moment Form" in reference to his 1960 piece *Kontakte*, writing that "These forms do not aim toward a climax, do not prepare the listener to expect a climax, and their structures do not contain the usual stages found in the development curve of the whole duration of a normal composition: the introductory, rising, transitional, and fading stages…*They are forms in a state of always having already commenced, which could go on as they are for an eternity."*[26] Stockhausen suggests an assemblage-like approach, stating that he "was trying to compose [static] states and processes in which every moment…is something that can exist on its own, which as something individual always can be related to its surroundings and to the entire work."[27]

Despite the conceptual similarities between Stockhausen's Moment Form and the worldmaking approaches discussed here, the sonic character of the music is dissimilar. Both practices avoid resolution, but Moment Form emphasizes the individualism of each moment rather than the relationships that connect them and seeks a sense of stasis within each moment. This contrasts one of the key similarities connecting the artists Oliveros, Eno, and Westerkamp, who all make works that create "neither stasis nor resolution but continuing process" and were among the first to embrace environmental conceptualization in the audio arts.[28]

[25] Jonathan D. Kramer, *The Time of Music* (Schirmer Books, 1988), 201.
[26] Seppo Heikinheimo, *The Electronic Music of Karlheinz Stockhausen*, trans. Brad Absetz (Suomen Musikkitieteellinen Seura, 1972) 120-121.
[27] Heikinheimo, *The Electronic Music of Karlheinz Stockhausen*, 122.
[28] Le Guin, "The Carrier Bag Theory of Fiction," 153.

2.3 Pauline Oliveros: Listening as Process

> Early this spring I met a musician, the composer Pauline Oliveros, a beautiful woman like a grey rock in a streambed; and to a group of us, women, who were beginning to quarrel over theories in abstract, objective language-- and I with my splendid Eastern-women's-college training in the father tongue was in the thick of the fight and going for the kill-- to us, Pauline, who is sparing with words, said after clearing her throat, 'Offer your experience as your truth.' There was a short silence. When we started talking again we didn't talk objectively, and we didn't fight. We went back to feeling our way into ideas, using the whole intellect not half of it, talking with one another, which involves listening. We tried to offer our experiences to one another. Not claiming something: offering something.[29]
>
> - Ursula K. Le Guin on Pauline Oliveros

2.3.1 Mythos I: The Descent

Once upon a time, in the ruins of a fort on the far northwestern shores of the country, a woman descended into the earth to be immersed in a reservoir of sound. Where once had been two million gallons of water was now a cistern where the sonic identities of visitors dissolved into the endless reverberation of the chamber. She emerged from the depths of the earth with a new music, and with a name for the practice of Deep Listening she had been cultivating for many years. Today that chamber is sealed, only to be heard in echoes and imitations.

[29] Ursula K. Le Guin, “Bryn Mawr Commencement Address.”

Pauline Oliveros' journey into the Fort Worden Cistern in Fort Townsend, Washington has become one of the founding myths of 20th century music, and has been the defining framing of Oliveros' career, having been retold in numerous profiles of her life's work.[30] Oliveros' storied descent into the cistern, a journey taken two years after the 1986 publication of *The Carrier Bag Theory of Fiction*, has become a creation story for a way of listening. Like John Cage going into the anechoic chamber to discover the impossibility of silence, Oliveros went into the carrier bag of the cistern to gather beautiful, interesting sounds, and brought them back to her community to share.

2.3.2 Text-based Sonic Meditation

> "Deep Listening is a process. I guess the best definition I could give is listening to everything all the time and reminding yourself when you're not listening."[31]
>
> - Pauline Oliveros

Although Oliveros' creation myth identifies the cistern as the start of Deep Listening, Oliveros herself considers much of the work that defined Deep Listening to have begun in 1970 at University of California San Diego. This was where she commenced her work on sonic meditations through collaborative workshops with her female-identified collective.[32] This

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[30] David Toop, "How Much World Do You Want? Ambient Listening and Its Questions," in *Music Beyond Airports*, ed. Monty Adkins and Simon Cummings (University of Huddersfield Press, 2019), 5.
[31] "An Interview With Pauline Oliveros," interview by Alan Baker, American Mavericks, January 2003, http://musicmavericks.publicradio.org/features/interview_oliveros.html.
[32] "About Deep Listening," The Center for Deep Listening, accessed September 3, 2024, https://www.deeplistening.rpi.edu/deep-listening.

development of her composition and meditation practices was a “continuing process,” as advocated for by Le Guin.[33] Oliveros’ lifelong practice of Deep Listening continues through dedicated practitioners and organizations like the Center for Deep Listening, founded in 2014, and through performances of her sonic meditation text scores.[34]

These text scores create musical and meditative experiences of astonishing complexity from simple instructions, acting as a form of generative art. “Tuning Meditation,” which emerges from the interactions of singers, is the most well-known, but Meditation VII, “Environmental Dialogue" is especially relevant to the themes of this thesis for its connection to the site of performance. This meditation is a listening-first piece of music: the performers are instructed to act as observers and to reinforce sounds when they are audibly capable of doing so.

> Each person finds a place to be, either near to or distant from the others, either indoors or out-of-doors. Begin the meditation by observing your own breathing. As you become aware of sounds from the environment, gradually begin to reinforce the pitch of the sound source. Reinforce either vocally, mentally or with an instrument. If you lose touch with the source, wait quietly for another. Reinforce means to strengthen or sustain. If the pitch of the sound source is out of your range, then reinforce it mentally.[35]
>
> - Pauline Oliveros

[33] Le Guin, “The Carrier Bag Theory of Fiction,” 153.
[34] Le Guin, “The Carrier Bag Theory of Fiction,” 153.
[35] Pauline Oliveros, “Environmental Dialogue,” in *Sonic Meditations* (Smith Publications, 1974).

In a 2008 revision of the piece, Oliveros notes that to reinforce "means to merge rather than imitate," suggesting the dissolution of any distinction between the performers and their environment. This goes beyond the equal footing created between The Deep Listening Band and the cistern, where performers and place were linked in amplitude, and casts the performers in a supportive role where they act as partial supports to environmental sound.

The "dialogue" of "Environmental Dialogue" emerges from the lack of distinction Oliveros draws between the human and non-human actors in the environment. Her revision clarifies that the performers are "a part of the environment and may also be reinforced."[36] This is consistent with her lifelong practice, which describes nature as all that "supports life forms of all kinds."[37] This piece, as well as sonic meditation more broadly, encourages an awareness of the environment while welcoming all human sound – internal and external – into that environment. This environment is understood as a non-hierarchical assemblage of relationships rather than as a conflict-based human/non-human dichotomy and is experienced from within rather than from the external viewpoint of the landscape artist.

Notably absent from either version of "Environmental Dialogue" is any indication of how the piece should end. In practice, this and other sonic meditations tend to come to an organic conclusion as the assembled processes of the work arrive at a point of silence. In a non-performance setting, silence may move back toward sounding, but the practicalities of performance usually mean that indefinite silence is usually replaced by the next portion of a

[36] Pauline Oliveros, *Anthology of Text Scores* (Deep Listening Publications, 2013), 120.
[37] Denise Von Glahn, *Music and the Skillful Listener: American Women Compose the Natural World* (Indiana University Press, 2013), 106.

program. Philosophically, the absence of an ending implies that the performers continue to listen to and reinforce the sounds of their environment, beginning (or continuing) their own practice of Deep Listening.

2.3.3 Alien Bog, Rattlesnake Mountain

Oliveros' creation of musical environment extends into her fixed electronic works. Her 'Bog' series blurs the framing of music and place by creating pieces of music conceived as environment that were themselves inspired by her experiences of listening to the sounds of the bog as music.

The best-known work of the series, Alien Bog (1967) was created fully electronically at Mills College using a Buchla Box 100 series synthesizer and Oliveros' own tape delay system, and is based on the sounds of wetland animals and insects in a nearby bog – sounds that had been important to Oliveros since childhood.[38] Speaking about the work, Oliveros stated that, "I was deeply impressed by the sounds from the frog pond outside the studio window at Mills. I loved the accompaniment as I worked on my pieces. Though I never recorded the frogs I was of course influenced by their music."[39]

Also notable for their connection to place are two pieces named *Rattlesnake Mountain*. The 1982 piece, one of the earliest solo accordion pieces recorded by Oliveros, evokes the experience of

[38] Tara Rodgers, *Pink Noises: Women on Electronic Music and Sound* (Duke University Press, 2010), 28.
[39] Pauline Oliveros, "Alien Bog," Alien Bog/Beautiful Soop, 1997, accessed July 5, 2024, https://oliveros.bandcamp.com/album/alien-bog-beautiful-soop.

the titular mountain as viewed from the Zen Mountain Center. Like Monet's haystacks, Oliveros follows the mountain through changes in the seasons and weather, and like the mountain itself, Oliveros listens "to hear the subtlety of a tone taking space and time to develop."[40] When performing the piece elsewhere, Oliveros imagined the mountain in her mind's eye, allowing her to follow "the feelings and sensations of my many experiences of the mountain – the changing colors of the season, the breezes and winds blowing through the grasses and trees."[41]

The second *Rattlesnake Mountain* was created in 1984 in collaboration with composer and performance artist Alvin Curran. Curran approached nine experimental composer-musicians to create *Maritime Rites,* an album of "environmental concerts" for radio that paired improvisations with field recordings and interviews from maritime sites along the Eastern Seaboard of the United States.[42] Curran considered improvisation and nature recordings to be a natural pairing, stating that "as nature is spontaneous and unpredictable, so is the music of man."[43] Oliveros recorded a version of *Rattlesnake Mountain* for Curran, which he remixed with sounds from whistle buoys, a three toned gong, foghorns from Maine, and an interview with Karen McLean, the only female lighthouse keeper in the United States at the time. As the accordion, foghorns, and McLean's speech emerge and retreat, the result is a work feels like slow, overlapping breaths of sound.[44] The piece fades in and out to create a form that arguably follows a traditional

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[40] Pauline Oliveros, "Rattlesnake Mountain," Accordion & Voice, February 4, 2021, accessed July 5, 2024, https://imprec.bandcamp.com/album/accordion-voice.
[41] Oliveros, "Rattlesnake Mountain."
[42] Alvin Curran, "Maritime Rites Liner Notes," Alvin Curran, 2004, accessed September 7, 2024, http://www.alvincurran.com/writings/MaritimeRiteslinernotes.html.
[43] Curran, "Maritime Rites Liner Notes."
[44] Note that the version available on BandCamp has the track mislabelled as "Coastline." Alvin Curran, "Rattlesnake Mountain," Maritime Rites, 2004, accessed July 10, 2024, https://newworldrecords.bandcamp.com/album/maritime-rites.

dramatic narrative arc; however, the overarching breath-like form implies that the music continues out of earshot after it fades away, much like the non-ending of "Environmental Dialogue." Curran brings together Oliveros' place by the mountain with places from his own travels to create a third place that the listener visits for a short time, resulting in "a tapestry with no beginning and no ending."[45] In describing the album and project as a whole, Curran stated that he "wanted 'space' to speak for itself, and rather than narrating a story, to let these monumental recorded environments speak for themselves."[46]

2.4 Brian Eno: Music as Environment

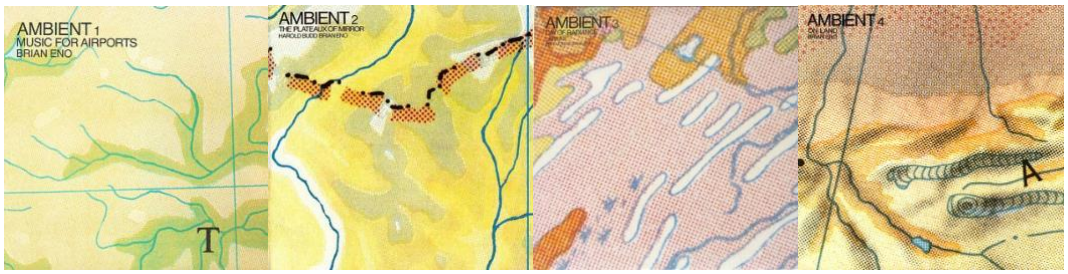

Fig. 3: The album covers of Brian Eno's Ambient *albums*[47] [48] [49] [50]

2.4.1 Mythos II: The Hospital Bed

> "It was raining hard outside, and I could hardly hear the music above the rain — just the loudest notes, like little crystals, sonic icebergs rising out of the storm. I

[45] Von Glahn, *Music and the Skillful Listener*, 121.
[46] Von Glahn, *Music and the Skillful Listener*, 117.
[47] Brian Eno, *Ambient 1: Music for Airports*, Album (E.G., Polydor, PVC, 1979).
[48] Brian Eno and Harold Budd, *Ambient 2: The Plateaux of Mirror*, Album (E.G., 1980).
[49] Brian Eno and Laraaji, *Ambient 3: Day of Radiance*, Album (Editions EG, 1980).
[50] Brian Eno, *Ambient 4: On Land*, Album (EG, 1982).

> couldn't get up and change it, so I just lay there waiting for my next visitor to come and sort it out, and gradually I was seduced by this listening experience. I realized that this was what I wanted music to be — a place, a feeling, an all-around tint to my sonic environment."[51]
>
> - Brian Eno

Brian Eno's origin myth of ambient music begins with a car crash. In 1975 he was confined to a hospital bed to recover from his injuries when a departing friend put on an album of seventeenth-century harp music at low volume on a broken stereo.[52] Most recorded music defines the sonic space that it is played in, masking the preexisting sounds of the venue with its own timbres, and the unintentional acoustics of the venue with its own reverberant space. Eno's quiet harp music was unable to define the space, and instead merged with the unstructured natural sounds of his environment. It colored the room and became part of the assemblage of sounds that formed the identity of the room through its interaction with the sounds of the rain. Devoid of context and structural signposts, the form of the music became indefinite, linked only to the present moment.

2.4.2 The Development of Ambient Music

The development of ambient music by artists including Brian Eno has been an important influence on how artists in recent decades have approached the creation of environment in music. Musician David Toop describes ambient music as "a musical form committed (implicitly or explicitly) to an engagement with interpretations and articulations of place, environment,

[51] Brian Eno, *A Year With Swollen Appendices* (Faber & Faber, 1996), 294-295.
[52] Eno, *A Year With Swollen Appendices,* 294-295.

listening, silence, and time."[53] The genre grew out of a desire to evoke deliberate atmospheres in spaces, a practice made newly possible by advances in audio recording and playback technology. Brain Eno's *Ambient 1: Music for Airports* is the most well-known example of this. The album is explicitly designed to improve the ambience of airports and the experience of travellers. Prior to the widespread adoption of audio playback technology, music for ambience would have required live musicians, limiting it to specific locations or wealthy individuals. Ambient music challenges the boundaries of music and installation by including practices from both fields, and draws from ideas in the visual arts to suggest new ways of structuring musical sound.

The process of Eno's development of ambient music is most explicitly documented in his four album *Ambient* series. Over the course of the series, there is a gradual dissolution of musical foreground and Eno's explicit presence as a composer, and an increasing interest in musical environment. *Ambient 1: Music for Airports* (1978) follows the initial goal of creating ambient music: it exists to improve the sonic ambience of airports and the experience of travelers in them. *Ambient 2: The Plateaux of Mirror* (1980) places improvised piano performances by Harold Budd within soundworlds created by Eno. *Ambient 3: Day of Radiance* (1980) is sonically distinct, with Eno processing and layering improvisations on acoustic stringed instruments by Laraaji. Finally, *Ambient 4: On Land* (1982) places the listener within musical environments lacking explicit human presence.

[53] Toop, "How Much World Do You Want? Ambient Listening and Its Questions," 1.

2.4.3 A New Type of Landscape Painting

> Does this relate to your obsession with depersonalizing art?
>
> Yes. If you leave your own personality out of the frame, you are inviting the listener to enter it instead. Take a landscape. As soon as there is a human subject, however tiny, it captures all the attention.[54]
>
> - Brian Eno interviewed by Franck Mallet

With the 1982 release of *Ambient 4: On Land*, Eno's ambient work shifted from music for modifying an existing place, to music that creates place itself. He wanted to make music that felt like figurative painting and that was rooted in the full history of listening, rather than specifically in music. The album uses recognizable musical instruments (in addition to field recordings, his own older material, and studio processing), but they are employed as paint on the canvas of the album timeline, rather than as elements of traditional structures. Eno treats the parts of the music as an assemblage, with each having their own agency. He wanted to "allow the sounds to live their lives separately from one another, clustering occasionally but not 'musically' bound together."[55]

Eno frequently describes his ambient music in terms of landscape painting.[56] Each place he creates has a specific character, palette, and atmosphere that determines that range of events that

[54] Franck Mallet, "Artpress: In the Enosphere," The Hyperreal Music Archive, September 2001, accessed June 15, 2024, http://music.hyperreal.org/artists/brian_eno/interviews/artpress01.html.
[55] Mallet, "Artpress: In the Enosphere."
[56] Eno has been active as a musician throughout his career, but his formal training was as an artist at the Ipswich School of Art.

can occur there.[57] The painting metaphor contextualizes his interest in aural surface and richness of texture rather than traditional sound objects, and his process of creating an internally consistent depiction of place, however real or imagined that place might be. Most importantly, it describes the unique sonic character of *On Land* and much of his other ambient music: Eno removes any sense of foreground or human subject because he believes that their presence would consume all the audience's attention.[58]

This process of removal began with his collaboration with Harold Budd on *The Plateaux of Mirror*. On that album, Budd's piano improvisations are often foregrounded, but the boundary between foreground and background is removed. Audio processing of the piano blurs its identity and the decays of its sounds blend seamlessly into the background soundworlds that Eno has constructed. As in the work of John Luther Adams discussed below, the lines defining the elements of Eno's work have gradually faded. Two years later, with *On Land*, the foreground and human subject has disappeared entirely. Despite an instrumentation that could imply more conventional musical roles, no element of the music emerges from the landscape to become foreground or subject. These landscapes may not be untouched, but they are certainly uninhabited.[59] Eno is careful to describe these works as figurative rather than abstract, but they are figurative in the sense of Turner's *Snow Storm* discussed above; they are blurred environments that immerse the audience as definition gives way to enveloping natural processes.

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[57] Ambrose Field, "Space in the Ambience: Is Ambient Music Socially Relevant?," in *Music Beyond Airports: Appraising Ambient Music*, ed. Monty Adkins and Simon Cummings (University of Huddersfield Press, 2019), 29.
[58] Mallet, "Artpress: In the Enosphere."
[59] This interpretation is supported by the album covers of the *Ambient* series. Each one depicts a map of a place. None of these maps include human habitation except for a possible indication of a path on *Ambient 2*.

2.4.4 Rhizomatic Frameworks

Eno's nonlinear, painterly approach to filling the sonic canvas is in keeping with Tsing's and Deleuze's rhizomatic frameworks.[60] Daniel Siepmann explicitly applies a Deleuzian model to ambient music to describe it as a dynamic system in a continuous state of transformation as it seeks an unattainable stability; he considers it to be music in which "there are no beginnings from which a linear sequence may emerge, but rather densifications, intensifications, reinforcements, injections, showerings, and other intercalary events."[61] The lack of linear directionality in ambient music removes any indication for the listener of their location within both large and small scale structures, encouraging them to remain in a constantly shifting present, unsure of which rhizomatic pathway the music might flow down next.[62] This unmoored atmosphere is aided by the typically slow processes of ambient music, whose non-anthropocentric pacing suggests an environment less focused on narrative or ego, and by the frequent use of fade-ins and fade-outs to obscure the boundaries of sonic events.[63] Like Oliveros' music (which itself is sometimes interpreted as ambient), Eno's work also demonstrates Le Guin's "continuing process" and avoidance of resolution.[64] The music is made up of cells whose

[60] Rhizomes are non-linear networks of relationships. Deleuze and Guittari contrast them with arborescent models which are more linear and hierarchical. Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Bloomsbury Publishing, 1988).
[61] Daniel Siepmann, "A Slight Delay: Agency and Improvisation in the Ambient Sound World," *Perspectives of New Music* 48, no. 1 (January 1, 2010): 191.
[62] Ulf Holbrook, "A Question of Background: Sites of Listening," in *Music Beyond Airports: Appraising Ambient Music*, ed. Monty Adkins and Simon Cummings (University of Huddersfield Press, 2019), 58.
[63] For a discussion of temporal approaches in fiction see Alison, *Meander, Spiral, Explode*, 43-58.
[64] For example, see Toop, "How Much World Do You Want?" 5.

fragmented character creates a sense of non-closure.[65] These cells often move at independent rates, implying an assemblage in that the cells may be interconnected, or may simply exist in the same environment. This environment typically has no implication of a resolution of its processes and could continue indefinitely without intervention from the creator or listener.

2.4.5 Eno Through the Years

Technological development has had an important role in Eno's career. His early work pushed the limits of developing studio techniques, and his more recent work has included apps for smartphones such as *Bloom* – an instrument and generative music player created in collaboration with Peter Chilvers and released only a year after the original iPhone. To create the *Ambient* quartet of albums, Eno embraced the emerging role of the studio as a space to create music disconnected from live performance.[66] This allows the studio to create its own psychoacoustic space. To aid in the creation of this space and to increase the sense of immersion in the musical environments of *On Land*, the album booklet includes a circuit diagram for a suggested audio setup adding a third speaker through an unusual use of the positive terminals of a typical stereo speaker configuration. This approach is indicative of Eno's creative use of technology, the importance of maximizing the immersive nature of the album, and his commitment to making the music accessible to a wide audience.[67]

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[65] Monty Adkins, "Fragility, Noise, and Atmosphere in Ambient Music," in *Music Beyond Airports: Appraising Ambient Music*, ed. Monty Adkins and Simon Cummings (University of Huddersfield Press, 2019), 121.
[66] Eno, *Ambient 4: On Land*.
[67] Eno considered releasing the album in a quadrophonic format, but realized that very few people, including himself, owned a quadrophonic setup. Eno, *Ambient 4: On Land*.

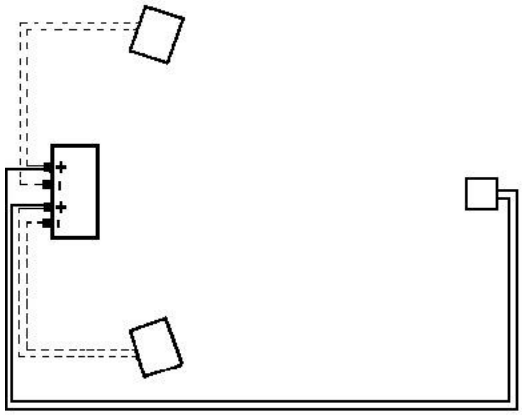

Fig. 4: The suggested speaker placement for On Land. *The third speaker will play the sounds that are not panned to the center of the stereo field.*[68]

If a painting is hanging on a wall, we don't feel that we're missing something by moving our attention away from it. Yet with music and video, we still have the expectation of some kind of drama, some kind of narrative. My music and videos do change, but they change slowly. And they change in such a way that it doesn't matter if you miss a bit … By the mid 1970s I was starting to develop a kind of music that I called Ambient music, which was really an attempt to make music that was more like painting. So, it was a kind of music that pretty much stayed in one place and didn't tell you a story: it was a kind of atmosphere or condition that you could enter and leave when you wanted.[69]

- Brian Eno

[68] Eno, *Ambient 4: On Land*.
[69] Brian Eno, "'Reflected'. Brian Eno at the National Gallery of Umbria," National Gallery of Umbria, 2021, https://gallerianazionaledellumbria.it/2017-2022/en/exhibition/brian-eno-reflected/.

Eno's environmental framing extends to all listening experiences and describes how "listening to something is an act of surrender. 'Okay, I accept the world that you are offering me. I am happy to live there for a moment.' This is the nature of any cultural undertaking. You agree to momentarily break off your activities, to enter another world."[70]

2.5 Hildegard Westerkamp: Soundscape as Language

2.5.1 Mythos III: Soundwalking

> "It's a calm morning. I'm on Kits Beach in Vancouver. It's slightly overcast, and very mild for January. It's absolutely wind-still. The ocean is flat, just a bit rippled in places. Ducks are quietly floating on the water. I'm standing among some large rocks full of barnacles and seaweed. The water moves calmly through crevices…[71]"
>
> - Hildegard Westerkamp

> "… I suddenly noticed all sounds around me. I never forgot that moment. A few years later I phoned Murray [Schafer] and he invited me to come up and talk with him. A few weeks later he hired me to work with the World Soundscape Project (WSP). This was in the summer of 1973. At last, I had landed

[70] Franck Mallet, "Artpress: In the Enosphere," The Hyperreal Music Archive, September 2001, accessed June 15, 2024, http://music.hyperreal.org/artists/brian_eno/interviews/artpress01.html.
[71] Hildegard Westerkamp, "Kits Beach Soundwalk," Album, in *Transformations* (Empreintes Digitales, 1989).

in a place where my listening ear felt truly engaged: I was allowed to listen to the *whole* world.[72]"

- Hildegard Westerkamp

2.5.2 A Framework for Listening

In the late seventies, Hildegard Westerkamp hosted a show on Vancouver Co-operative Radio called *Soundwalking*.[73] On the show, she took listeners around the city to listen to the sounds of its many environments. As the show developed, she began narrating her journeys, telling audiences about the parts of the environment that they were unable to perceive audibly. On these walks, she acted at first as a listener, silently bringing her audience through the many soundscapes of her adopted city, and then as a mediator, adding her voice to the soundscape to share what the listener could not know about the place she had brought them.[74] The text above is from the opening narration of *Kits Beach Soundwalk* (1989), a piece that developed out of the *Soundwalking* show and that has become one of Westerkamp's best-known works. The piece demonstrates the exploratory nature of her practice, through which she shares a sense of curiosity and playfulness with the sonic possibilities of the world around her.[75]

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[72] Heather Frise and Mike Hoolboom, "Listening: An Interview With Hildegard Westerkamp," Hildegard Westerkamp, 2020, accessed August 2, 2024, https://hildegardwesterkamp.ca/resources/PDFs/Interview_Westerkamp_Frise-and-Hoolboom.pdf.

[73] "Kits Beach Soundwalk (1989)," Hildegard Westerkamp, accessed June 15, 2024, https://www.hildegardwesterkamp.ca/sound/comp/3/kitsbeach/.

[74] Hildegard Westerkamp, interview by author, Vancouver, August 8, 2024.

[75] Later in the piece, she focuses on the sounds of barnacles, filtering out the sounds of traffic and playfully narrating that "luckily, we have bandpass filters and equalizers. We can just go into the studio and get rid of the city. Pretend it's not there." Westerkamp, "Kits Beach Soundwalk."

Westerkamp does not view her work as a creation of place, but as a method of building "a framework for listening to a place."[76] She uses the sounds she has recorded as a poetic language to speak about the place she has visited. Her framework enables audiences to focus on their own listening and on their deepening relationship to the composition, to the place it comes from, and to the familiarity of the sounds themselves.

The larger forms of Westerkamp's work often align with the classical ideas of structure that she internalized as a child. She views the shape of each piece as a journey that often creates either a through-composed form arriving at a destination, or an ABA form that returns to its origin point, though sometimes only through subtle sonic hints. However, within these structures she views her work as a slow-motion improvisation in the studio, working with the integral structure and meaning of the sounds themselves. She often transforms these sounds, for example by slowing them down to reveal the details of a sound's structure. In this way, her music reveals an assemblage of unfolding natural processes at a small scale that exist within more traditional large-scale structures.

Westerkamp first developed her work as a part of the World Soundscape Project led by R. Murray Schafer alongside several other composers and artists.[77] This research led to the development of acoustic ecology and soundscape studies and has been a significant factor in the increased focus on environmental sound and place in the sonic arts over the last fifty years.

[76] Hildegard Westerkamp in discussion with the author, August 2024.
[77] Barry Truax et al., "World Soundscape Project," The Canadian Encyclopedia, February 7, 2006, accessed June 15, 2024, https://www.thecanadianencyclopedia.ca/en/article/world-soundscape-project.

Westerkamp's technique of *soundwalking* grew out of this research, and the practice has become widespread. When leading these walks, Westerkamp guides participants on a one-hour journey during which they focus primarily on observing the soundscape rather than the landscape. Following the walk, she leads a guided discussion of what has just been heard. These walks offer an alternate perspective that encourages the public to engage more deeply with their environment, whether through listening only, or by experimenting more directly with the environment – treating all objects as potential sound making instruments.

> If you listen deeply enough
> You become part of something,
> And then it's harder to destroy.[78]
>
> - Westerkamp quoting her daughter Sonja

Time is as important as place in Westerkamp's work, and she states that, "when you listen, you are in the presence of time passing, and it means that you are able to slow down to the pace of time."[79] Her music encourages listeners to inhabit time as much as the locations she shares. Westerkamp considers this slower sense of time to be vitally important for environmental protection in the face of both the climate crisis and capitalist ideas of growth and distraction. Her work is similar to meditation practices in that it encourages a mindful inhabitation of the present time and place.

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[78] Westerkamp quoting her daughter Sonja during a commencement speech. Hildegard Westerkamp, "Speech by Honorary Doctorate Recipient Hildegard Westerkamp, Convocation SFU 2024," Hildegard Westerkamp, June 29, 2024, accessed August 12, 2024, https://hildegardwesterkamp.ca/writings/.

[79] Hildegard Westerkamp in discussion with the author, August 2024.

2.6 Anna Þorvaldsdóttir: Orchestra As Site

2.6.1 The Performer As Caretaker

> When you see a long sustained pitch, think of it as a fragile flower that you have to carry in your hands and walk the distance on a thin rope without dropping it or falling. It is a way of measuring time and noticing the tiny changes that happen as you walk further along the same thin rope. Absolute tranquility with the necessary amount of concentration needed to perform the task.[80]
>
> - Anna Þorvaldsdóttir

This passage is included in the performance notes of many of Þorvaldsdóttir's scores, including in *STREAMING ARHYTHMIA* (2007), her oldest extant work, and in ARCHORA (2022), her most recent publicly available work.[81] As such, it represents a conceptual through line of her compositional practice. The text places the performer in the role of a focused observer of the music, in addition to their role as a carrier of the musical line. The music is framed as a place to be continually traversed. There are no discontinuities in locale, and the location has a coherence that allows small details to emerge. More pragmatically, the instruction encourages performers to invest focus and energy into the details of sustained sounds that could otherwise risk being thought of as simple, easy to play, and unchanging.

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[80] Anna Þorvaldsdóttir, *In The Light of Air* (Iceland Music Information Centre, 2014).
[81] Since 2011, Þorvaldsdóttir has used all capital letters in the titles of her orchestral and operatic works, and standard capitalization in the titles of her other works. Anna Þorvaldsdóttir, *STREAMING ARHYTHMIA* (Chester Music, 2007) and Anna Þorvaldsdóttir, *ARCHORA* (Chester Music, 2022).

Þorvaldsdóttir creates sonic environments in which the music *is itself a place*, but is not *in a place*. Her music is not about nature or a specific location, instead, she draws inspiration from nature's "proportions, flow, and natural phenomena."[82] The spaces she creates are traversed by the audience and performers together as they move within a vast environment. Her music recalls the ritualistic walking of artists like Richard Long, where an action is carried out and a place experienced, but no specific story is told.[83] Like Eno and Turner, Þorvaldsdóttir invites the listener into the middle of a musical assemblage, avoiding the romantic and pastoral traditions of a removed observer.[84] She orients the listener then takes them on a journey within her musical world. Change is created through the subtle shifts in perspective created by this journey, zooming in and out on the details of the environment's structure.

2.6.2 There's Something in the Water: Borealism and Icelandic Stereotypes[85]

Reception of Þorvaldsdóttir's work is colored by the strong associations of Icelandic cultural output, with journalists often implying that music emerges organically and inevitably from Iceland's unique landscape.[86] While nature is a common theme in Icelandic artwork, such

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[82] John Rogers, "An Ocean of Sound: Anna Þorvaldsdóttir Evokes the Vastness of Nature," The Reykjavik Grapevine, June 20, 2019, accessed June 20, 2024, https://grapevine.is/music/2019/06/20/anna-thorvaldsdottirs-work-evokes-nature/.
[83] Tristan McKay, "5 Questions to Anna Thorvaldsdottir," I Care if You Listen, May 31, 2023, accessed June 20, 2024, https://icareifyoulisten.com/2023/05/5-questions-to-anna-thorvaldsdottir-composer/.
[84] Størvold, *Dissonant Landscapes*, 97.
[85] Tony Clayton-Lea, "Something in the Water: What Makes Icelandic Music so Creative?," *The Irish Times*, October 20, 2018, https://www.irishtimes.com/culture/music/something-in-the-water-what-makes-icelandic-music-so-creative-1.3663185.
[86] An indicative example of this trend is a description of Sigur Rós's music as "My Bloody Valentine played by mountain elves." Størvold, *Dissonant Landscapes*, 2 and 66.

framing can reduce the agency and unique voice of artists and ignores the highly international character of the Icelandic artistic community. Þorvaldsdóttir's work must negotiate the complex web of borealistic typecasting that shapes the reception of all Icelandic musicians, particularly those that explore nature themes in their work.[87]

At a personal level, Þorvaldsdóttir is deeply influenced by the Icelandic landscape, particularly that of her hometown of Borgarnes. She identifies elements of nature including the open space and long sightlines, surrounding mountains, presence of the ocean, distinct sound of the wind, and the dramatic changes in light over the course of the year as being a part of her, and therefore a part of her music. Describing the landscape of Borgarnes, she concludes that "this is all a part of nature here and a part of me because I am a part of this nature."[88] This demonstrates the lack of separation she sees between herself, her music, and her environment. Speaking more broadly of the relationship between humans and their environment, Þorvaldsdóttir states that, "You're a part of it. You're an insignificant part of it, but you're a part of it nonetheless."[89]

At the same time, Þorvaldsdóttir is clear that she does not attempt, and does not want to portray nature in her music.[90] Her music exists purely as music, and has very deliberate musical

[87] Borealism is analogous to Orientalism and describes the stereotypes of simultaneously inhospitable and pure landscapes and cultures of the north. For an in-depth discussion description see Philip V. Bohlman, "Musical Borealism: Nordic Music and European History," in *The Oxford Handbook of Popular Music in the Nordic Countries*, ed. Fabian Holt and Antti-Ville Kärjä (Oxford Academic, 2017).
[88] Anne Leilehua Lanzilotti, "Anna Thorvaldsdottir: A Part of Nature," Music & Literature, May 18, 2017, accessed June 20, 2024, https://www.musicandliterature.org/features/2017/5/18/anna-thorvaldsdottir-a-part-of-nature.
[89] Størvold, *Dissonant Landscapes*, 110.
[90] Størvold, *Dissonant Landscapes*, 104.

intention, even as it exists outside of traditional story or progress forms.[91]

2.6.3 Invisible Ecosystems

Rather than portraying nature, Þorvaldsdóttir draws on sites of interacting systems. She works with the causes and bodily experience of place more than with its observed specificities. In her performance notes she often includes the following indication:

> My music is written as an ecosystem of materials that are carried from one performer – or group of performers – to the next throughout the process of the work. As you play a phrase, harmony, texture, or a lyrical line it is being delivered to you, passed on from another performer – performers – for you to carry on until it is delivered to another. All materials continuously grow in and out of each other, growing and transforming throughout the process.[92]
>
> - Anna Þorvaldsdóttir

With this performance note, Þorvaldsdóttir makes the ecosystem-based nature of her work explicit. She asks the performer to eliminate any sense of ego or ownership in their role, instead, they are asked to act as temporary caretakers of each musical element that is handed to them. Each performer is a part of the musical ecosystem, but like the musical elements themselves,

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[91] Tom Huizenga, "Structural Integrity: Anna Thorvaldsdottir's Rigorous, Regenerative Music," *NPR*, May 15, 2023, https://www.npr.org/2023/05/15/1175550706/anna-thorvaldsdottir-iceland-composer-interview.

[92] This passage is also included in the performance notes of many of Þorvaldsdóttir's works, most recently Þorvaldsdóttir, *ARCHORA*.

they may only have brief interactions with each other and the elements before continuing their own path. If there are human figures in Þorvaldsdóttir's environments, they are figures lacking the centrality typically given in the visual and audio arts through defined figures and melodic lines.

Also made clear in the quoted passage is the importance of continuing process in Þorvaldsdóttir's work. She explores the area between motion and stasis as processes unfold and are passed between performers. Like Turner's *Snow Storm*, she abandons the lines between foreground and background, human and nature, witness and actor. In doing so, she creates "a landscape that is conceived not of objects but of relations," and encourages a new form of environmental thinking.[93] This dissolution of subject and foreground parallels an important facet of ambient music, which similarly avoids a central focus. Eno drew an explicit connection to landscape, stating that "as soon as there is a human subject, however tiny, it captures all the attention."[94]

2.7 John Luther Adams: Geography, Place, and Prayer

> "I especially like that middle section," [my friend] said. "You know – the part where nothing happens. That's what you really want to do, isn't it?"
> I've been trying to find the courage to do this ever since.[95]
>
> - John Luther Adams

[93] Størvold, *Dissonant Landscapes*, 104.
[94] Holbrook, "A Question of Background: Sites of Listening," 76.
[95] Leif Thompson commenting on the 1988 premiere of *The Far Country of Sleep*, a piece dedicated to Morton Feldman. Adams, *Winter Music: Composing the North*, 76.

2.7.1 Sonic Geography

John Luther Adams has created work that demonstrates an evolving relationship to music and place throughout his career. This evolution can be summarized as beginning with *sonic geography*, a gradual development of *music as place*, and recently a developing practice of *place as faith*. Most of this work is through acoustic concert music, but he has also created installation works that sonify nature data. His musical work and aesthetic approach are discussed here, and his installation work is discussed in Chapter 3.

After moving to Alaska in 1978 to work in environmental advocacy and protection, Adams began to develop a compositional approach that he calls sonic geography.[96] With this practice he worked to become deeply engaged with the Alaskan environment, seeking to develop a new indigenous music rooted in this specific landscape.[97] Like the artists discussed above, Adams relates this directly to the contrast between traditional landscape painting and more immersive artworks, stating that "over the years my music has led me beyond landscape painting with tones into the territory of "sonic geography" – a region that lies somewhere between place and culture, between human imagination and the world around us" and, "landscape alone is no substitute for the authentic personal experience of fully being in a place. As with any true intimacy, this takes time."[98] Philosophically, this practice has some ideas in common with the acoustic ecology and

[96] Adams' theory of sonic geography is applicable anywhere that an artist can deeply engage with their environment, but his particular realization of this practice is tied to Alaska.
[97] Indigenous in the sense that the music originates in that place. Adams has occasionally worked with music from Yupik and other peoples from the Alaska area, typically at the request of people from those cultures. He uses words from local languages more frequently, especially in his earlier music.
[98] Adams, *Winter Music: Composing the North*, 23.

soundscape work of artists including Hildegard Westerkamp, but Adams never works with field recordings and his only use of natural sound is the occasional transcription of bird song. These early works more often include elements of human culture, such as regional place names, but from the beginning Adams has avoided human figures and any form of storytelling. Sonic geography has more in common with mapmaking, with the music embodying the composer's understanding of the "unique resonances" of a place and acting as an "open and seemingly empty to allow space for you, the listener, to find your own way through."[99]

2.7.2 Music As Place

Fig. 5: Rothko Number 5, 1950[100]

[99] Adams, *Winter Music: Composing the North*, 8 and "John Luther Adams in Conversation With Alex Ross," February 3, 2023, https://www.youtube.com/watch?v=vb0WFe3sn8c.
[100] This is the last painting by Rothko to feature lines, distinct edges, or any implication of foreground and background. Mark Rothko, *No.5/No. 22*, 1950, MoMA.

After this, the lines disappear completely.[101]

- Brian O'Doherty describing Rothko's *Number 5, 1950*.

While many of the elements of Adams' music have retained a northern feel, he has gradually moved away from the idea of sonic geography, towards music that functions independently as place.[102] Adams was influenced by painters including Turner, James Turrell, and Mark Rothko as he transitioned away from the waypoints of sonic geography, towards a music in which background had overwhelmed foreground to create fields of pure color without distinct edges.[103] He sought to create in music the visual phenomena of *ganzfeld* in which fields of pure color disorient the viewer.[104] Tod Tarantino considers most of Adams' work since 1999 to be color field composition. The distinct musical practices Tarantino identifies in these works are a consistent sonority, a lack of narrative in the phrases and harmonies, and a saturated pitch gamut within which movement replaces any harmonic function. The resulting works "present a slowly shifting singularity enlivened by surface disturbances."[105] Unlike the maps of sonic geography, this music encourages the listener to become lost within the indifferent wilderness of its color fields.[106] Vertically, the fields are dense pitch collections, often with all pitches within the scale of a given piece sounding consistently. Horizontally, there are no distinct boundaries; an entire piece is a single, complex sonority. Within this consistent color field, there is constant motion

[101] Adams, *Winter Music*, 148.
[102] Adams, *Winter Music*, 116.
[103] John Luther Adams, *Dark Waves* (Wise Music Classical, 2007).
[104] Adams, *Winter Music*, 166.
[105] Todd Tarantino, "The Color Field Music of John Luther Adams," in *The Fartheset Place: The Music of John Luther Adams*, ed. Bernd Herzogenrath (Northeastern University Press, 2012), 157.
[106] Adams, *Winter Music*, 164.

and continuous process – something is always changing, but it is difficult to hear exactly what. Like shifting light on a landscape, changes in harmonic color are eventually noticed but there is no clear moment of arrival.

> Narrative is too limiting, not truthful enough: "instead of the arc of a story," he writes, "I want the music to have the more objective presence of a place"[107]
>
> - Kyle Gann on John Luther Adams

This color field approach led to music that existed *as place*. In this music, Adams rarely refers to a specific location or element of nature, but instead creates an environment consisting only of musical material. In creating this material, he follows John Cage's aspiration "to imitate Nature in her manner of operation."[108] Though the substance of their music is very different, this approach shares a strong affinity with Þorvaldsdóttir's approach to composition, where a specific landscape has been internalized but the music itself exists as an independent place. Much as the color fields collapse distinctions between foreground and background, Adams seeks to unify the listener and the landscape and eliminate any implication of an objective landscape or subjective, expressive listener.[109] Melodies and their associated subjective presence are similarly excised, leaving only "slowly changing light and color on a timeless white field."[110]

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[107] Adams, *Winter Music*, xviii.
[108] Adams, *Winter Music*, 92.
[109] Adams, *Winter Music*, 63.
[110] In this quote from 1999 he is discussing the work in progress of *Dream in White on White* (2001). Adams, *Winter Music*, 63.

Adams sees himself as a part of the American experimentalist tradition that includes composers like Charles Ives, Harry Partch, John Cage, Conlon Nancarrow, Lou Harrison, Morton Feldman, Pauline Oliveros, and James Tenney, several of whom were friends and mentors of his. Like many of these artists, Adams claims to avoid personal expression and composes using multiple coexisting algorithmic processes whose pattern is typically broken only because of the physical limits of the instruments, following a practice Feldman termed "crippled symmetry."[111] These algorithms typically exist as multiple simultaneous tempo layers existing in ratios like 2:3:4:5:6:7, creating a dense texture that is heard as processes moving at different rates rather than as a single complex rhythm.[112] Such textures are the most consistent characteristic of Adams' music, though he has increasingly preferred to make these processes less audible in order to avoid the linear narrative that an anticipated process implies.[113] This results in music that is unpredictable, yet also has a feeling of inevitability as glacial processes unfold at rates too slow to be foreseen from within the musical place, and as rapid processes flicker in and out of the complex texture making it difficult to follow any sound for long. With these textures, Adams moves away from individualistic gesture in favor of creating assemblages and relationships. He avoids personal expression in his composition and discourages it in his performers but sees no contradiction in creating beautiful musical place using impersonal means stating that he is "most deeply moved when the music has little or nothing to do with personal expression."[114]

[111] Tarantino, "The Color Field Music of John Luther Adams," 158.
[112] This approach is based on an idea from Henry Cowell, *New Musical Resources* (Alfred A Knopf, 1930).
[113] Adams, *Winter Music*, 122.
[114] Adams, *Winter Music*, 134.

2.7.3 Composition As Prayer

Fig. 6: The full score of Become Desert *on display in the Lincoln Center lobby. The gradual large-scale gestures of the 40-minute piece are visible.*[115]

A demonstrative example of the duality of formalism and natural beauty in Adams' music is his most famous piece, *Become Ocean*. The piece is formally constructed of three large waves of sound and the entire piece is a palindrome, with the 2nd half being the exact reverse of the first half. At the same time, these massive, slow waves are evocative of the power of ocean waves and the scale of the open ocean. The title is drawn from an acrostic poem – a form which itself blends formalism and beauty – on Lou Harrison's name by John Cage which ends with:

LiStening to it

we becOme

oceaN.[116]

[115] John Luther Adams and Sam Birmaher, "Become Desert Score," *News from JLA*, September 12, 2023.
[116] John Luther Adams, *Become Ocean* (Tiaga Press, 2013).

Become Ocean is in some ways a culmination of the compositional practices discussed above, but it also represents the beginning of subtle changes in Adams' practice that have been present in his work since he stopped living full time in Alaska around the time of its composition. The piece was composed in Mexico on the Pacific coast but, though the natural connection is explicit in the title, the sonic geography that defined his early work has now fully faded in favor of the more generalized archetype of *ocean*.[117] This idea carries through into the other pieces in the *become* trilogy: *Become Desert* (2013) and *Become River* (2010).[118] He has expanded the thematic reach of his work temporally with works like *Vespers of the Blessed Earth* and *An Atlas of Deep Time* that address the current Holocene Extinction and the full geological history of earth.[119] These works answer in part a question Adams asked when creating *Inuksuit* in 2009: "how do we understand the brevity of our human presence in the immensity of geologic time."[120] At the other extreme of timescale, some of these works have included the return of the birdsong that defined his earliest music. Adams has always considered his music and relationship to nature to be a practice of ritual, prayer, and faith, and in these recent works the role of this faith in grieving for both personal and global loss has been foregrounded.[121] His relationship to place is now more strongly colored by these considerations, and his music now engages with global losses and global processes.

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[117] The trends I have identified in Adams' work are not strongly bounded. These are throughlines to his practice and related ideas that have been more or less prominent at different points in his career.
[118] Adams, *Become Ocean* and John Luther Adams, *Become River* (Tiaga Press, 2010).
[119] John Luther Adams, *An Atlas of Deep Time* (Tiaga Press, 2021) and John Luther Adams, *Vespers of the Blessed Earth* (Tiaga Press, 2021).
[120] John Luther Adams, *Inuksuit* (Tiaga Press, 2009).
[121] Adams has written of his friendship with the writer Barry Lopez, who died as a climate refugee in John Luther Adams, "The Story He Will Never Write," Harper's Magazine, January 11, 2021, https://harpers.org/2021/01/the-story-he-will-never-write-barry-lopez/.

2.8 Transitions: Inuksuit and METAXIS

2.8.1 Immersive Music

Anna Þorvaldsdóttir and John Luther Adams have developed similar conceptual bases in their practices that have nevertheless led to distinct sonic results. Both of them have learned from the natural patterns and processes of nature and create assemblage works without narrative structure; over the course of their careers, both composers have moved from creating music about place, to creating music as place; and both have worked to create art that is immersive rather than observational. This last goal has led both Þorvaldsdóttir and Adams to create works in which the musicians surround an audience which itself is free to explore the sounding environment, and that blur the boundary between music and installation.

Despite these conceptual similarities, the resulting musical material is distinct. Adam's work typically consists of several lines moving at related tempi to create music with a sense of clarity and momentum evoking the physical systems of nature. Þorvaldsdóttir's music often avoids the clear implication of tempo and consists of tenuous gestures and textures that suggest the complex messiness of nature and the physical experience of the body in an environment.

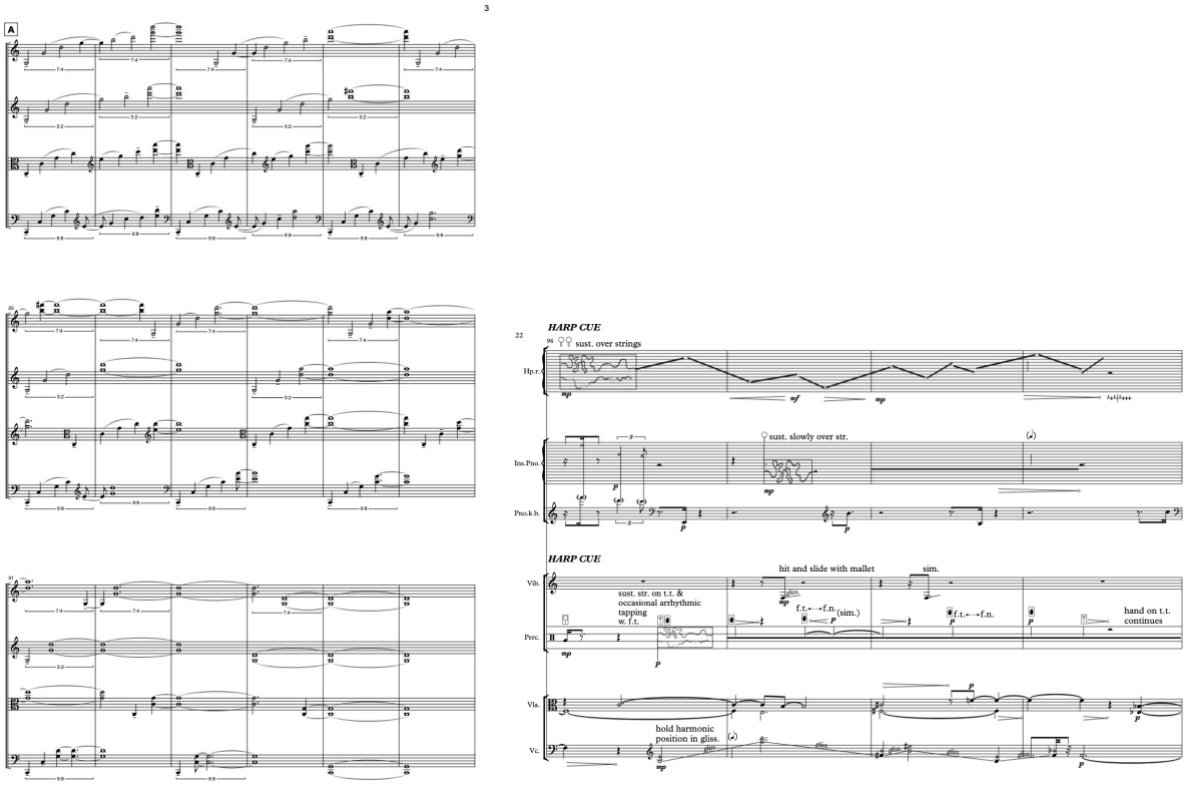

Fig. 7: Excerpts from Adams' Untouched *(2015) and Þorvaldsdóttir's* In the Light of Air *(2013/2014) showing the contrasting textures typical of each of their music.*[122]

2.8.2 Taking It Outside

Inuksuit (2009) grew out of Adams and percussionist Steve Schick's experiences performing Adam's earlier large-scale percussion piece *Strange and Sacred Noise* outdoors.[123] That piece, which was designed to create overwhelming amounts of sound inside a concert hall, dissipated quickly in less reflective, noisier outdoor performance environments. Adams and Schick wanted to create music that was specifically designed for outdoor performance, and that could embrace

[122] These works were chosen as strong examples of these textures, for the clarity of smaller ensembles, and for the similar dates of composition. Þorvaldsdóttir tends to use fewer extended techniques in her orchestral work, but the emergent gestures are similar. John Luther Adams, *Untouched* (Tiaga Press, 2015) and Þorvaldsdóttir, *In The Light of Air*.
[123] For a recording of one of these performances, see John Luther Adams, *Inuksuit (Film)*, 2013.

the varied acoustic properties of outdoor locations. Reflecting on their experience with *Strange and Sacred Noise*, they developed five lessons that could shape the creation of this new outdoor piece.

1. that the focus and perceptual acuity needed to listen to a piece of music was transposable to environmental sounds. Listening intently outdoors meant that the ambient sounds we heard during performances of *Strange and Sacred Noise* took on the vividness of musical events.
2. that space mattered. Performing complex music in open spaces meant that individual elements could be tracked with greater clarity…
3. that percussion instruments, many of which had been designed explicitly for use outdoors, worked well in our outdoor performances. This was especially true of triangles, snare drums, noisy metallic instruments, and sirens.
4. that there was an intangible aspect to outdoor performance that was widely appealing for both players and listeners. People liked making and listening to music outside of a concert hall.
5. and, that performing outdoors reconfigured our sense of scale in a way that leveled a healthy critique on the machismo of percussion playing.[124]

[124] I have quoted them in full here in part because of their potential utility to other artists developing outdoor performance pieces. Steven Schick, "Strange Noise, Sacred Places," in *The Farthest Place: The Music of John Luther Adams*, ed. Bernd Herzogenrath (Northeastern University Press, 2012), 96.

The resulting piece exists on the boundaries of human and environmental agency. The title, *Inuksuit*, is the plural of *inuksuk*, the stone landmarks built by people from the North American Arctic whose name means "to act in the capacity of the human."[125] The work is far more indeterminate than Adams' indoor music.[126] It is a work for 9-99 percussionists whose location is determined by the practicalities of the landscape. There is no score and no conductor; instead, Adams provides a large folio of possible parts for performers to choose from. Over its 70+ minute duration, the piece gradually moves through five types of sound material (breathing/wind, calls/clangs, inuksuit, waves, and birdsongs), a structure that contains the humanoid inuksuit within more organic sounds. In contrast to the uninhabited musical places Adams typically creates, in *Inuksuit*, the performers arrive, setup their instruments, exist for a time as inuksuit-like figures within the landscape creating sounds, dismantle their setup, and depart leaving no trace.[127] Like Oliveros' sonic meditations discussed above, *Inuksuit* transitions smoothly out of and back into the local soundscape. The beginning and ending include large portions of silence, and the final composed sounds heard are the (optional) songs of local birds being played on piccolo. As these birdsongs end, the performers transition into the role of audience members, free to wander through the space to listen to the continuing natural music of the site.[128]

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[125] Adams, *Inuksuit*.
[126] Despite Adams' avoidance of self-expression, his indoor concert works are as tightly controlled as any notated music. He completely avoids improvisation in order to also remove self-expression from the performers. Instead, the individual performers are subsumed into the collective emergent sound of the piece.
[127] Adams' instruction to leave no trace follows best practices for visiting protected outdoor locations while also supporting the conceptual structure of the piece.
[128] Adams, *Inuksuit*.

Adams describes *Inuksuit* as a *site-determined* piece, describing the folio as "the musical materials and guidelines for discovering the work within each site.[129] The term *site-determined* contrasts *site-specific*, with the distinction being that a site-specific work is influenced by the site, but the relationship to the site is determined by the creator of the artwork.[130] With *Inuksuit*, Adams has created a set of possibilities, but the creative agency of each performance is primarily with the environment itself, and secondarily with the performers' collective creative responses to the site in their choice of folio, instrumentation, and location. These performers create solitary points of sound within the landscape, while most of the area continues to create its natural soundscape. The performers exist as an assemblage, playing parts that are unaffected by the other players, each of whom may be inaudible to the others.

Inuksuit follows the notation, context, and performance practice of music, but the experience of listening is more like visiting an installation.[131] Given the physical scale of the performance space, listeners cannot hope to experience all musical events spatially, and the music is similarly meaningful whether or not listeners experience the full piece temporally because of its modular, through-composed nature, dissolution into the natural music of the site, and its assemblage nature that encourages listening in the present rather than reaching for longer-term connections.

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[129] Adams, *Inuksuit*.
[130] Steve Schick considers music intended for concert halls to be site-specific because of the relative similarity between halls around the world. He also argues that the commercial exclusivity of concert halls drives an excessive focus in music education on concert hall performance, to the detriment of learning performance skills for more publicly accessible and varied sites. Schick, "Strange Noise, Sacred Places," 95.
[131] Schick, "Strange Noise, Sacred Places," 102.

> Making music outdoors invites a different mode of awareness. You might call it "ecological listening." Indoors, we seal ourselves off from the world and concentrate on listening to an array of carefully produced sounds. Outdoors, rather than focusing our attention inward, we're challenged to expand our awareness to encompass a multiplicity of sounds, to listen outward…Hearing music outdoors, it's sometimes difficult to say exactly where the music ends and the world takes over. There is no single point of interest; rather, every point around the aural horizon is a potential point of interest, a call to listen.[132]
>
> - John Luther Adams

While most of Adams' music continues to be creates for the concert hall, *Inuksuit* has led to other works for outdoor performance. Like *Inuksuit's* sets of nine percussionists, *Across the Distance* (2015) is for horns in multiples of eight, and similarly follows a structure through which performers gradually spread out from a central location[133]. The piece explores the harmonics of the natural horn, which gradually merge as the increasingly distant sounds are diffused through the features of the site. *Ten Thousand Birds* (2014) follows the more expansive approach of Adams' recent work in that it is built around a generalized day/night cycle and is named for the approximate number of global bird species.[134] The piece is a folio of small pieces – which Adams describes as "places" – which can be freely combines according to the performance situation and instrumentation available. The piece is open-ended and will continue to expand as Adams creates the "places" of additional species. In all of these works, he has

[132] Adams, *Silences so Deep*, 121.
[133] John Luther Adams, *Across the Distance* (Tiaga Press, 2015).
[134] John Luther Adams, *Ten Thousand Birds* (Tiaga Press, 2014).

reduced the control he exerts on the performers at the same time as he moves into a less controlled acoustic space while connecting more clearly with the ideas of indeterminacy, acoustic ecology, and sonic meditation.

Adams' indoor works have remained fully composed, but in these pieces he has increasingly moved the musicians to surround the audience or to allow for other appropriate physical motion of sounds through space. For example, in his *Become* trilogy each piece rearranges the ensemble to enhance the conceptual basis of the piece. *Become River* (2010) places the higher instruments at the back and the lower instruments at the front to create a gradual flow of the music downwards to the audience.[135] In *Become Ocean* (2013) the orchestra is arranged in three ensembles, emphasizing the large-scale wave structures of the piece as the ensembles move in and out of phase.[136] Finally, in *Become Desert* (2017) the orchestra is divided into five loose groups that fully immerse the audience horizontally and vertically in sound that follows Octavio Paz's description of the desert as "that which is not stone is light."[137]

[135] Adams, *Become River*.
[136] Adams, *Become Ocean*.
[137] John Luther Adams, "Becoming Desert," *Slate Magazine*, March 1, 2018, https://slate.com/culture/2018/03/john-luther-adams-on-his-new-piece-become-desert.html.

2.8.3 Inside the Orchestra

Fig. 8: Þorvaldsdóttir's sketch for METAXIS[138]

In contrast to *Inuksuit*'s ceding of sonic space to natural sound and emergent assemblages, Þorvaldsdóttir's *METAXIS* (2024) treats the orchestra itself as a site. The piece is similarly immersive, with the orchestra placed around a large space and the audience free to explore that space independently.[139] As in all of Þorvaldsdóttir's music, the performers exist as an assemblage, with gestures emerging organically from around the space. The title is drawn from Plato's concept of the *metaxy*, which refers to the inherent in-betweenness of human nature, and to the multidimensional character of the piece itself as being both an installation and a piece of

[138] "Sketch for METAXIS," *Instagram*, September 15, 2015, https://www.instagram.com/annathorvalds/.
[139] Anna Thorvaldsdottir, "METAXIS," Anna Thorvaldsdottir, accessed July 5, 2024, https://www.annathorvalds.com/metaxis.

music to inhabit.[140] Þorvaldsdóttir describes the piece as an "orchestral music-installation piece for deconstructed symphony orchestra," and refers to the piece as a "musical landscape" that she encourages listeners to explore in order to discover how the various layers flow around the space.[141] The physical flow of musical ideas strengthens the immersive character of Þorvaldsdóttir's music, and in *METAXIS* is more viscerally felt because of the larger, surround nature of the staging. The movement of sounds in space places emphasis on the spatial character of music, and aids the perception of music as a site, rather than as a purely temporal art.

While Adams requires an(y) outdoor location for *Inuksuit*, Þorvaldsdóttir suggests the foyer of a concert hall as an ideal location. She considers the piece to be an opportunity to welcome audiences into the internal workings of the orchestra in a way that is not accessible in a traditional concert situation, through the musical environments that she is uniquely capable of creating. Þorvaldsdóttir has a deep love of orchestra as a medium and uses this piece as an opportunity to share that appreciation with an audience who may otherwise not have experienced orchestral music from the inside. Having developed a practice in which music exists as place, Þorvaldsdóttir has moved her subject indoors to one of the places she is most familiar with. Schick, Adams, and Þorvaldsdóttir all recognized the site-specificity of the concert hall experience. In *Inuksuit*, Schick and Adams rejected this specificity in favor of a site-determinist approach, while Þorvaldsdóttir embraced that specificity to create a music-installation where the orchestra itself becomes the explicit subject of the piece. *METAXIS* and *Inuksuit* move beyond

[140] Jóhannes Bjarkason, "Between Two Worlds: Anna Þorvaldsdóttir Premieres Metaxis at the Reykjavík Art Festival," The Reykjavik Grapevine, May 31, 2024, accessed July 5, 2024, https://grapevine.is/music/2024/05/31/between-two-worlds/.
[141] Thorvaldsdottir, "METAXIS."

the traditional structures of live concert music by immersing the audience and by encouraging them to explore spatially, but both works are presented and received primarily as music.

3. SOUND ART

3.1 Finite and Indefinite

The medium of sound art is broad and can be considered to encompass most audio-focused art that resists definition as music, instrument building, or spoken word art. In general, it does not include live performers – sound is instead created through electronic or mechanical means – and does not include the related trappings of a spatially static audience and a dedicated concert hall. For the purposes of this dissertation, the most important distinction between music and sound art is the latter's relationship to time. The frequent use of narrative understandings of music occurs in part because listeners can be expected to experience a beginning, middle, and end to a piece of music. While this can be interrupted, for the vast majority of musical experiences, the creator intends that the entire duration be listened to. In sound art, the audience is generally free to experience as much or as little of the work as they desire and can expect to have a meaningful experience of the artwork regardless of when they enter and leave.[142] Sound art may be *finite* in that it has a fixed duration and can be repeated, or *indefinite* in that it has no fixed duration and is not repeatable. Finite works could in theory be experienced in full, but this would not be expected to be a typical experience.[143] Indefinite works cannot be experienced in full even by their creator and have no concept of an end point. They are a form of generative art in that the creator must give over some agency to the system that creates the indefinite sounds.

[142] Sound art is usually exhibited in a context more akin to that of visual art, such as in a gallery or public space.
[143] For example, in a looped installation in a gallery, it would be difficult for a visitor to enter and leave the space right at the beginning and end of the piece. Works intended to be experienced this way are more likely to be framed as fixed electronic pieces or as a form of narrative.

Because of the undefined visitor experience, both finite and indefinite sound art typically avoid any expectation of resolution and support an experience of "continuing process."[144] Visitors arrive to a process that is already unfolding and depart while that process continues. The site of a sound art installation is a place shaped by that art, rather than a location where narrative occurs. Its creation is an act of worldmaking, and the visitor experience has much more in common with the act of visiting a special location than with the experience of hearing a story. It is more like going to a national park, where we are comfortable with the idea that the ecosystem will continue without us, than like going to a play, which we would be unlikely to depart from right before the climactic moment.

3.1.1 Sonification

The "continuing process" within a piece of sound art can have many sources, from those akin to music making, to those emergent from the physical construction of the art. In this chapter, I address sound art in which process is rooted in the sonification of nature data. Sonification is the practice of representing non-audio data as sound. It can be used practically and scientifically through devices like Geiger counters or can be used as material for artistic creation. Artistic sonification is most frequently encountered through the direct sonification of devices like wind chimes, which transform local wind characteristics into musical sound through the striking of tuned pipes.[145] Such devices deemphasize the quantitative communication of data in favor of immediacy and aesthetic considerations.

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[144] Le Guin, "The Carrier Bag Theory of Fiction."

[145] Alan Dorin considers wind chimes to "deserve a special place in the history of generative music. Other direct sonifications include aeolian harps and solar sounders. Aeolian harps use

Sonification works are created using quantitative data about the world as a sound parameter in music or sound art. According to Alexandra Supper, "Compositions like these are not intended to enable scientific insights or communicate facts, but rather to open up a compositional approach. They can be understood as part of a shift in the course of the twentieth century from conceptions of music that stress its individuality, subjectivity, and expression toward a more materialist and objective one, emphasizing artistic restraint and preaching "the absolute elimination of the artist's ego or personality from the artistic product."[146] In this way, artistic sonification can be understood in part as an extension of the experimentalist tradition in music, as well as a result of an increased tendency to frame the environment as system rather than as subject as discussed in the previous chapter.

The two sound art installations I discuss here offer distinct approaches to sonification and worldmaking. John Luther Adams' *The Place Where You Go to Listen* is a real-time sonification of geophysical data in Alaska, and Andrea Polli's *Atmospherics/Weather Works* is a fixed sonification of a historic storm covering the U.S. eastern Seaboard.

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wind to vibrate strings. Solar sounders use the variable output of solar panels to power circuits. For examples of solar sounders see Daniel Fishkin, "Solar Sounders," D. Fiction, accessed August 13, 2024, https://dfiction.com/solar-sounders/. Alan Dorin, "Generative Processes and the Electronic Arts," *Organised Sound* 6, no. 1 (April 1, 2001): 57.

[146] Supper has written extensively on the history and practice of artistic sonification. Alexandra Supper, "Singing Data: Sonification and the Relation Between Science and Art," in *Sound Art: Sound as a Medium of Art*, ed. Peter Weibel (MIT Press, 2019), 491.

3.2 The Place Where You Go to Listen

> *The Place Where You Go to Listen* undermines the usual expectations we bring to music. In *The Place*, events don't occur in easily recognizable, repeating patterns. There is no narrative, no discourse, no development from beginning to middle to end. The music never ends. We're always hearing the sounds of here and now, unfolding in their own time.[147]
>
> - John Luther Adams

The Place Where You Go to Listen has been sonifying the geophysical data of Alaska at the Museum of the North in Fairbanks for eighteen years. The installation takes in data about the sun, moon, clouds, geomagnetic activity, and seismic activity, and transforms that data into an immersive sound and light space that is intended to create "a virtual world that resonates sympathetically with the real world."[148] Because of the indefinite nature of the installation, many typical considerations of temporal structuring are altered. The starting point of the sound was on the day it was ready to be made public, and the end point will occur for a yet unknown external reason related to museum priorities, finances, data availability, or equipment breakdown. There will be no resolution or outcome to the process of *The Place*, only a continuous, open-ended unfolding. Between these points, the moment-to-moment sound of the installation is controlled by the far more complex (and largely unpredictable) systems of the Alaskan environment. There are coarsely repeating patterns that emerge from the daily and annual sunlight cycles and from the phases and location of the moon, more tenuous patterns linked to long term geomagnetic

[147] Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 108.
[148] Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 113.

cycles and seasonal weather tendencies, and uncorrelated events from seismic activity. These cycles all have inherent variation and do not share a least common multiple, so no moment of *The Place* will repeat exactly over its full existence.

3.2.1 Tending a Garden

Adams likens the creative process of building *The Place Where You Go to Listen* to that of tending a garden rather than writing a novel, and more like design than composition.[149] He cannot anticipate, control, or pre-screen the specific path of the installation over the years, but instead had to create by setting up systems of mapping or translation for the data streams such that sounds consistent with his artistic vision would emerge from the weather of any specific moment. This challenge highlights a consistent tension in Adams work between a desire to objectively follow the systems he sets in motion, and a desire to subjectively create beautiful sonic color. He works to minimize the "evidence of [his] hand" in order to give the music a stronger feeling of emergent place, but his hand is strongly involved in creating that result.[150]

In the case of *The Place*, this process was expressed through the design of the mapping between data and sound. Adams and lead programmer Jim Altieri iterated through a wide range of sonification options while simulating the data inputs of potential geophysical conditions, choosing mappings that support the sense of organicism Adams seeks in his work. Some of these choices were led by practical considerations, such as their decision to blend equal tempered and just tunings to avoid buzzing when partials were played simultaneously, while others were more

[149] Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 7.
[150] Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 8.

orchestrational, such as the choice of drum-like sounds for seismic activity and bell tones for geomagnetic activity.[151] *The Place* represents a peak of both expressive control and reduced agency in Adams work. He designed the "instruments" that are played, the architecture and lighting of the space, the data that would be input, and the exact mapping of that input, but has no control over the specific experience of any moment. Adams creates sounds that prioritize beauty over the communication of data in their character and tailors those sounds for human preferences, but is uncompromising in his decision to maintain the temporal and directional accuracy of the data streams. Individual parameters change over durations of up to a year, and some sounds only occur at times of day that the museum is inaccessible. As with many other parts of his work, Adams compares the experience with visual art, quoting James Turrell's description of his own light works as the making of "a space that responds to a space outside with a logic or consciousness formed by its look into that space."[152] Like Turrell's skyspaces, the momentary experience of the artwork is tailored for human attention, but its glacial shifts emphasize the slower cycles of nature.

[151] These sounds are all derived from the filtering of pink noise. Pink noise feels balanced across the frequency spectrum and is close to many natural sounds. It also provides a source of micro-variation in the randomness of its values. These sounds are dispersed through several speakers and a subwoofer within the curved rectangle space of the room. Adams first worked with pink noise in his 2004-5 work *Veils*, which is a six-hour soundscape composition. Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 3, 65, and 122.

[152] Turrell was also a major influence on the design of the lighting in the space, where panels create colour fields of light that also correspond to the data streams. Adams, *The Place Where You Go to Listen: In Search of an Ecology of Music*, 59.

3.3 Atmospherics/Weather Works

Andrea Polli's *Atmospherics/Weather Works* offers a contrasting approach to the sonification of geophysical data. It was first exhibited at Engine 27 in New York City in 2003 and has been arranged for other venues since then.[153] The installation models two major storms, compressed to a physical and temporal scale that can be more readily understood by visitors. Polli's work emphasizes the "emotional connection and impact with her audience as a way of increasing awareness of climate issue" and she believes that bringing large-scale data to a human scale helps audiences to "relate to the sonification in an embodied way."[154]

The installation sonifies two major storms that had a significant effect on the New York area: Hurricane Bob from August 1991, and the President's Day snowstorm of 1979.[155] Glenn Van Knowe, an atmospheric and geophysical model researcher, built simulations of the storms extrapolated from their historical data. The modelled storm was mapped to the fifteen-speaker array at Engine 27, with the speakers' elevation and location in the space being mapped to the entire Eastern Seaboard of the United States and to the atmosphere from sea level to 60000 feet.

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[153] Including in an elevator at the Tang Museum. Andrea Polli, "Elevator Music 10 Atmospherics/Weather Works: Andrea Polli," Tang Teaching Museum, 2007, accessed September 22, 2024, https://tang.skidmore.edu/exhibitions/126-elevator-music-10-atmospherics-weather-works-andrea-polli and Andrea Polli, "Atmospherics/Weather Works: A Spatialized Meteorological Data Sonification Project," *Leonardo* 38, no. 1 (February 1, 2005): 31–36.

[154] Andrea Polli, "Sonifications of Global Environmental Data," in *Environmental Sound Artists in Their Own Words*, ed. Frederick Bianchi and V. J. Manzo (Oxford University Press, 2016), 2 and Andrea Polli, "Soundwalking, Sonification, and Activism," in *The Routledge Companion to Sounding Art*, ed. Marcel Cobussen, Vincent Meelberg, and Barry Truax, 2020, 88.

[155] This was in part so that some visitors would have memories of the storms from having lived in New York at the time. Polli, "Atmospherics/Weather Works: A Spatialized Meteorological Data Sonification Project," 33 and Polli, "Elevator Music 10 Atmospherics/Weather Works: Andrea Polli."

The storm was modelled at a resolution of five elevations, ten-kilometer squares, and three-minute intervals, before data was gathered from the fifteen sampling points that would match the speakers.

Polli's work is focused on environmental issues and often incorporates scientific data. The material of her work is flexible and includes a wide range of media, often focused on light or sound.[156] She likens data sets to photographs, in that they are a simplified representation of the world, but with data sets she is able to explore, transform, and replay them in various conditions and from multiple points of view.[157] This process can potentially offer new perspectives on data sets to researchers, while offering audiences a new perspective on the world around them.

3.3.1 Geosonification

Atmospherics/Weather Works grew out of Polli's prior experience with sonification of improvisation and complex systems, and from ideas originating with Hildegard Westerkamp and the World Soundscape Project.[158] She had been a part of the New York Society for Acoustic Ecology and had created sound mapping projects including Soundseeker and the New York Soundmap. She considers *Atmospherics/Weather Works* to be her first *geosonification* project, a term she created to describe art that makes use of nature data sonification approaches shaped by soundscape studies.[159]

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[156] For example Particle Falls (2015) visualizes particulate pollution in Zagreb. "Andrea Polli: Particle Falls," 2016, accessed May 27, 2024, https://vimeo.com/159202543.
[157] Cathy Lane and Angus Carlyle, *In the Field: The Art of Field Recording* (Uniformbooks, 2013), 3.
[158] Polli considers Westerkamp to be a major influence. Lane and Carlyle, *In the Field*, 18.
[159] Polli, "Soundwalking, Sonification, and Activism," 90.

From this point, Polli began work to sonify six variables from the model: atmospheric pressure, water vapor, relative humidity, dew point, temperature, and total wind speed. Similarly to Adams, she worked to build an "orchestra" of sounds that would effectively sonify the data, using long tones for temperature and pressure, and more percussive tones for water. She also mapped pressure to low frequencies so that the pressure would be physically felt by the bodies of listeners. Polli mapped correlated variables to the same sound, for example by altering the pitch of a sample with one and its filter frequency with another. This reduced the data load on listeners by combining correlated systems into singular sonic gestures, and emphasizes the assemblage-nature of these systems by showing the imperfect links between parameters. Rather than the nature-like sound of pink noise heard in *The Place Where You Go to Listen*, Polli chose to work with noisy recordings from nature, using sounds that were made by wind or that were influenced by the natural environment.[160]

3.3.2 A Question of Scale

Having developed the sonic palette of *Atmospherics/Weather Works*, the scaling and presentation of the data became a major curatorial choice. The 40000:1 physical scaling from approximately 1600x400km to Engine 27's 40x10m was determined by the ratio between the size of the storm and the size of the venue, while the temporal scaling was a more arbitrary 288:1 ratio where the twenty-four hours of the storm model were reduced to five minutes. For each storm, the five elevation layers of the model were each made into a five-minute piece, and a 6th piece sonified

[160] For example, insects that change frequency depending on the temperature. Polli, "Atmospherics/Weather Works: A Spatialized Meteorological Data Sonification Project," 34.

all levels in accordance with the physical height of the speakers, trading horizontal fidelity for vertical simultaneity. The data variables were scaled for dramatic effect with some scaled per-level to give more clarity to the data, and others scaled globally to create more variety over the cumulative playback of the pieces.[161] Each storm played for about thirty minutes in total, six times per day.

3.3.3 Different Viewpoints

In keeping with the contrasting artistic and communicative goals of the two works, the immersive experience created by *Atmospherics/Weather Works* is distinct from *The Place Where You Go to Listen*. Polli's work allows listeners to experience the storms at a scale that matches the human experience and encourages them to explore their full volume by moving around the space. Conversely, Adams' work is more akin to a fixed viewpoint that offers a heightened experience of the comparably large space of Alaska. His data is placed around the edges of the space, allowing viewers to hear over the horizon, but their place within that horizon is fixed. Polli's audience can hear back to two particularly exciting periods in the past, while Adams' audience remains at the viewpoint of the present, unable to change their place in time and instead encouraged to hear the environment as it is now. Both works create sound worlds that offer their audience's new ways of experiencing the world around them and explore the challenges inherent in synthesizing artistic agency with natural systems.

[161] Polli, "Atmospherics/Weather Works: A Spatialized Meteorological Data Sonification Project," 35.

Both works are also indicative of the porous boundary between music and sound art. Adams' background is in music and composition, and he used the tools of those fields in orchestrating the sounds of *The Place* and the systems of its tuning. At the same time, the indefinite nature of *The Place* allowed him to move beyond the installation-like nature of immersive musical works like *Inuksuit*, and to apply the systematic approach of his composition to a work that sheds many of music's limitations in creating "continuing process." Conversely, *Atmospherics/Weather Works* could have been framed as a series of five-minute multi-channel electronic soundscape compositions, but their contextualization as a geosonification installation helps to deemphasize compositional agency and encourage the listener to focus on the unique perspective on the environment that the installation offers. Polli draws from her experience with soundscape studies to shape the reception of her work, stating that "the meaning of Western classical music historically has leaned towards the celebration of human shaping and manipulation of the environment through sound, while if one would assign meaning to listening to a soundscape, this meaning might be closer to celebrating human connection and subordination to the complexity of the environment."[162]

[162] Polli, "Soundwalking, Sonification, and Activism," 85.

4. INSTRUMENTS

4.1 Instruments at Assemblages

All instruments exist as assemblages. Their physical construction brings together components, each with their own resonant properties. The relationships between these components create a system linking an input of energy to a resultant acoustic emanation. This emanation joins the instrument to the larger physical and cultural environment that it exists within.

Previous research by Paul Théberge has examined the ways that instruments exist within multiple external assemblages made up of their "technical characteristics" as well as the "musical practices, genres, institutional settings, social ideologies, and discourses" that they exist in and in relation to.[163] Georgina Born, and Kyle Devine have discussed the techno-social assemblages that have emerged in music technology communities and the problematically gendered dynamics that have resulted from the inequalities in these communities.[164]

This chapter is focused on the more intimate assemblages that exist between a player and an instrument, between an electronic luthier and the instruments they design, and internally within modular and semi-modular instruments.[165] I broadly discuss assemblage and site characteristics

[163] Paul Théberge, "Musical Instruments as Assemblage," in *Musical Instruments in the 21st Century: Identities, Configurations, Practices*, ed. Till Bovermann et al. (Springer Nature, 2017), 60.
[164] see Georgina Born and Kyle Devine, "Gender, Creativity and Education in Digital Musics and Sound Art," *Contemporary Music Review* 35, no. 1 (2016) and Georgina Born, "On Musical Mediation: Ontology, Technology and Creativity," *Twentieth-Century Music* 2, no. 1 (2005).
[165] "Electronic luthier" is an expansion of Sergi Jordà's term "digital lutherie" to include analog electronic instruments as well as digital. Jordà coined the term in Sergi Jordà, "Instruments and Players: Some Thoughts on Digital Lutherie," *Journal of New Music Research* 33, no. 3 (2004).

of modular synthesis and then explore how those concepts are applied in two instruments that embody a cartographic approach to worldmaking as instrument design: Peter Blasser's *Plumbutter*, and Tyler Etter's *Arcologies*.

4.1.1 Modular Synthesizers As Worldmaking

More than any other instrument, modular and semi-modular synthesizers embody the idea of assemblage. Each modular synthesizer is built out of multiple modules whose relationship and interaction determine the sound of the instrument. The constituent modules are self-contained circuits designed to create or modify sound. In a modular synthesizer, these modules are fully isolated from each other until patched together by players using cables. In a semi-modular synthesizer, there is a pre-wired audio pathway that enables the synthesizer to make sound without any patch cables, but the player can add-to or alter this pathway using patch cables.

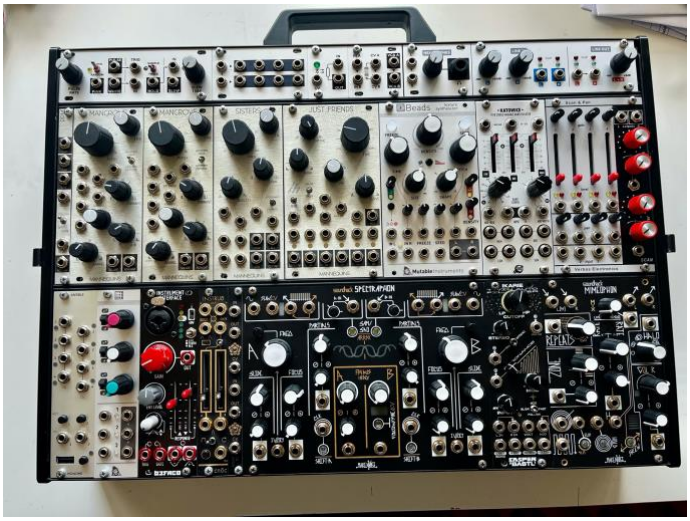

Fig. 9: My modular synthesizer. Cables are inserted into the 1/8" jacks to create connections.

Players assemble their synthesizers according to their artistic interests, with most modular synthesizers including modules from several different makers. These makers design modules with the intention that their modules will shape and be shaped by the electrical relationships between modules. Almost all modules have inputs and outputs, implying an openness to flexible and/or non-hierarchical relationships as well as non-linear feedback pathways. The functions of these modules are also flexible. While designers suggest typical use cases, fluid identities are encouraged through wide modulation/parameter ranges and by a patching system that in most formats does not discriminate between audio signals and control signals. This allows for filters intended for removing sound to become sine-wave oscillators through high resonance, or sequencers to become sound sources through tempi that reach audio rate.

The personalized assembly of a modular synthesizer is an act of worldmaking by the builder. They assemble a carrier bag of possibilities that, laid out before them, becomes a territory to explore through patching and manipulation. Sequencer modules might suggest characterful agency as patterns are deliberately chosen, while LFOs might act as environmental forces washing up and down eternally, but all are open to redefinition and reappropriation as the player explores and interacts with the world they've designed.[166] Over time, they gradually transform this world to better suit their needs by rearranging or replacing modules.

[166] Similar metaphors often used in the naming of modules. For example, one of the most popular LFO modules is Mutable Instruments' *Tides*. Émilie Gillet, "Mutable Instruments Tides Documentation," 2018, accessed August 23, 2024, https://pichenettes.github.io/mutable-instruments-documentation/modules/tides_2018/manual/.

4.1.2 Curators of Voltage

Playing on a modular synthesizer abandons the proportional relationship of energy input and sound output found in most other instruments in favor of an exploratory, non-linear approach where sound is produced by building a set of relationships between voltage systems. Each module is constantly operating, producing characteristic voltages whether or not it is connected to any other module.[167] Players act as curators of these voltages, often working in collaboration with the voltages themselves as they both act to alter the parameters of various modules.[168] The interactions between modules can be difficult to predict even for an experienced player, and so the building of relationships can be part of an exploratory approach to the modular environment. The boundaries of modular instruments are fluid, as patch connections between instruments are no different than patch connections within an instrument.

Most other electronic instruments also complicate the relationship between energy input and energy output. Hybrid instruments like electric guitars, as well as electronic instruments like keyboard synthesizers that maintain the metaphor of acoustic instruments often preserve some amount of proportionality in energy, while non-keyboard synthesizers such as computers typically have no relationship. In these instruments, sound output is again determined by the interaction of voltages rather than through mechanical energy.

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[167] This characteristic firmly defines modular synthesizers as assemblages because, though they are a network of relationships, the specific nature and existence of any relationship is not assumed.

[168] Most modules have control knobs in addition to inputs that are often linked to the same parameter as the control knobs. Modulation using voltage is an important part of modular synthesizer technique, where the voltage acts to move a parameter according to its own pattern. Often this modulation takes the form of an oscillator, a source of randomness, or a programmed sequence of voltages.

4.1.3 Hello World! Computers As Assemblages

In the most widely used synthesizer – the computer – these interactions are also organized as assemblages, albeit ones that tend to be more hierarchical and more deterministic than those found in modular synthesizers; computer signal chains are less likely to make use of feedback pathways, functional blocks tend to be more defined in purpose, and the combination of memory, save states, and digital precision make precise recreation of sounds the norm. Computers can be understood as assemblage instruments on multiple levels. At the supra-computer scale, networks of multiple computers sharing data exist in temporary assemblages at a global scale through the internet, and at a local scale through laptop orchestras or electronic performance setups using multiple computers. At the sub-computer scale, programs coexist and create transient relationships by sharing sound and data.

Assemblages are also formed within programs. The most common creative sound environment is the DAW (digital audio workstation). These programs, though comparatively linear in their typical signal flow, still allow for a high degree of interconnectedness between the various systems affecting the output.[169] Where computers become most assemblage-like is in programming, where constructing networks of relationships becomes the primary practice. Some audio specific programming languages like Max/MSP and PureData work similarly to modular synthesizers (in that function is defined by connecting objects using virtual cables and by adjusting audio and data values) and share many of the environmental characteristics of hardware synthesizers. However, most audio languages retain the text-based approach common

[169] For example, through sidechains and sends.

to general purpose languages; they have a similar syntax, with additional structures added to facilitate work with the temporally-bound nature of sound.[170] These text-based languages support functional programming. This is a practice in which functions are created to do specific tasks, and in which functions are linked by their mutual interactions with shared data. Some artists have worked to develop complex relationships with their computers, at times choosing to give creative agency to the computer, situating themselves as one of multiple actors within their built environment. For example, composer, improvisor, and researcher George Lewis has created the Voyager software as a live performance program, which he describes as "a non-hierarchical, interactive musical environment that privileges improvisation."[171]

4.1.4 Digital Luthiers and Creative (Mis)use of Instruments

Performers develop relationships to their electronic instruments in many individualistic ways. The instruments are comparatively new, and the role of the performing electronic musician is a subject of ongoing discussion and development. This thesis is focused on the role of instrument designers, but performers are an important part of instrument development through their creative (mis)use of instruments. Electronic performers are also typically active in a degree of meta-instrument design as most performance setups are multi-instrumental and idiosyncratic, with performers frequently redesigning the components of their setup and the relationships between

[170] Most software is designed to run as quickly as possible, but because musical parameters like pitch and rhythm depend on specific timing, additional tools are needed to schedule code execution.

[171] George E. Lewis, "Too Many Notes: Computers, Complexity and Culture in Voyager," *Leonardo Music Journal* 10 (December 1, 2000): 33.

its constituent parts.[172] The art created on these instrumental assemblages is widely varied and can include more traditional narrative approaches; like Le Guin's carrier bag stories, there is room for both conflict and narrative in the art created in these worlds. Users of electronic instruments can find many types of worlds and stories within the assemblages they and the digital luthiers create.

The ways in which digital luthiers contextualize their work has important influence on the ways their instruments exist within the art world. The remainder of this chapter examines two instruments – one hardware and one software – both of which embody ideas of assemblage and worldmaking in their construction and in the metaphors that their creators use to contextualize their existence.

4.2 My Name is Plumbutter

Fig. 10: Map of the regions and circuits of Plumbutter[173]

[172] In acoustic music, only percussionists regularly demonstrate a similar level of malleability in their performance setup.
[173] Josh Singer, *Plumbutter & Rolzer Dance Party Guide*, 2024, accessed October 4, 2024, https://indd.adobe.com/view/d20ba1c8-fa97-4389-ab4b-b71f0b0a9fe0, 2.

> My name is Plumbutter. My face is a psycho-geographical map of the cities of Baltimore and Cleveland. I am a drum-machine, but let me tell you I am more than that, for I also am a "drama machine". Thus there exists in me, a dialectic between drum and drama, like cops and gangsters, male versus female, or rural versus urban. You can see my wild spaces are represented by a deer-horn, and my downtown by a factory, and in between, a vast swath of suburban developments. It is a gradient of these three areas—urban, suburban, and rural—that informs my electronic synthesis.[174]
>
> - Plumbutter

4.2.1 Stores at the Mall

The worldmaking of Peter Blasser extends beyond specific instruments and their lineage to include his personal history as a musician, and the way he frames his instruments through a multiplicity of manifestos.[175] Blasser's master's thesis *Stores at the Mall* describes the overall framing that has defined his career as an instrument builder in terms of a shopping mall containing several shops specializing in different types of instruments and bearing cryptic names like Tocante, Shbobo, Fabaray, and Ieaskul F. Mobenthey. Ciat-Lonbarde is the best-known shop, and its products include Plumbutter, and other instruments focused on analog synthesis.[176]

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[174] Peter Blasser, "An Essay on Worldmaking in Plumbutter," Ciat-Lonbarde, accessed October 3, 2024, https://www.ciat-lonbarde.net/ciat-lonbarde/plumbutter/index.html.
[175] For example, The Man With the Red Steam originated as a character in Blasser's band The Gongs who was frequently assigned the rhythmic tasks. Blasser, "Schematic of Roolz-Gewei With Man With the Red Steam," 6.
[176] Blasser, "Stores at the Mall," 40.

About half of the stores have not yet had any products released, leaving Blasser free to create new conceptual frameworks for instrument development over the course of his artistic career.

The names of Blasser's shops, instruments, and circuits are a distinctive part of his world, and often are the result of an intuitive blending of descriptive words about the named party. *Sandrodes* is the result of combining the words "androgynous" and "nodes," while *Plumbutter* grew out of Peanut Butter (a childhood teasing nickname for Peter Blasser), and from *plumbum* as the Latin word for lead (a material used in solder and circuits). Combined, they help to define the linguistic character of the affected, mythic, Baroque world that Blasser has made through his instruments, performances, and writing.

4.2.2 Drum and Drama

> Where my father dealt with water and the lungs and surgery cuts bloody red,
> I work in veins of copper laced together with arteries of tin and lead.
> My skin is wood, that is good. My father is dead, I eat lead.
> He was deputy assistant secretary of defense for health affairs, and a doctor.
> I am creator of schematics for frequency modulated triangle oscillators.
>
> -Petroleum Bottle[177]

[177] Peter Blasser, "An Essay on Worldmaking in Plumbutter," Ciat-Lonbarde, accessed October 3, 2024, https://www.ciat-lonbarde.net/ciat-lonbarde/plumbutter/index.html.

Plumbutter is a "drum and drama machine" created by Peter Blasser.[178] As Blasser says, "Drum is the machinery that forms building materials for buildings, utilities and roads; drama is the breath of the forest and the organic swell of foliage over the seasons.[179]" It is a semi-modular instrument that brings together several circuits designed by Blasser into an instrument that is intended to create "rhythmic pulsing plus more gestural, soft, or emotional sounds."[180] Blasser frames *Plumbutter* as a map that encompasses a city center, suburbs, and countryside, with the center tending towards mechanistic ideas, and the countryside towards wild, organic gestures. The instrument originated as smaller villages named *Rollz-5* and *Roolz-Gewei* that contained earlier versions of the same circuits/locations, and which eventually grew to become the "republic," then the "empire" of *Plumbutter*.[181]

As the quotes above makes clear, Blasser conceptualizes the instrument as a place where binary dialectics are in a productive tension. The emphasis on binary opposition is somewhat ironic given the importance of Le Guin's *Carrier Bag Theory of Fiction* to this thesis, but Le Guin is clear in her paper that conflict and opposition can comfortably exist as equal members in the carrier bag of materials gathered for the creation of fiction. The world of *Plumbutter* contains opposites and opposition, but also includes buildings, characters, and wildlife that coexist within its assemblage.

[178] Blasser, "Stores at the Mall," (MA Thesis, Wesleyan University, 2015), 83.
[179] Peter Blasser, "Stores at the Mall" 83.
[180] Blasser, "Stores at the Mall," 83.
[181] Blasser, "Stores at the Mall," 80 and 85.

4.2.3 Into the Woods

Plumbutter consists of three main regions: the urban factory, the suburbs, and the woods, each containing one or more circuits. The urban factory is the most rhythmic and mechanical region of the city. It is centered on The Man with the Red Steam, a factory that includes a steam engine noise generator, and an eight-stage smokestack that pulse sequences can rise through.[182] It also contains four Rollz – pulse circuits that can create regular and chaotic pulses to trigger other parts of the synthesizer. Conceptually, this region pulls human gestures into the pulse rhythms of machines in a factory.

Moving outwards from the industrial city center, we reach the suburbs. Here, life follows more human rhythms in the three constituent pairs of Gongues (x2), AVDogs (x2), and Ultrasound (x2). In contrast to the constant noise of the steam engine, in the suburbs, the residents sound when asked to through patch cords, using circuitry based on filters. The Gongues are portrayed as "hunched gamelanists" ringing their gongs in response to input.[183] The AVDogs (audio-visual dogs) blend the pulsing of the factory with the organic motion of the countryside; they bark and move around the stereo field.[184] Finally, the Ultrasounds are heterodyne filters that bring ultrasonic sounds into an audible range. In the map of *Plumbutter*, they are representative of old radios and of the bats that should be present in a healthy suburban environment.

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[182] The "steam" noise circuit is appropriately based on "Sound Simulator for Model Steam Engine" US Patent 3913097. Peter Blasser, "Schematic of Roolz-Gewei With Man With the Red Steam," Ciat-Lonbarde, n.d., https://www.ciat-lonbarde.net/ciat-lonbarde/plumbutter/labrolzpapersz.pdf., 6.
[183] Singer, *Plumbutter & Rolzer Dance Party Guide*, 25.
[184] The AVDogs use a similar circuitry to the resonant filters of the Gongues, but rather than a sound source, the filter resonance serves as a decaying LFO on the pan of the AVDogs' resonators.

The outermost section of the map is the woods, populated by the Deerhorn. Deerhorn marks the outer boundary of the *Plumbutter* city map. Here at the boundary, the dialectics that make up the instrument are emphasized as the urban drum gives way to the countryside drama. Deerhorn is a theremin-like circuit that creates pitched sound based on gestures from the performer in the space over its antenna. It is difficult to influence the Deerhorn with the automated mechanical rhythms of the city, and so it depends on its sensitivity to the player's body and to the other materials surrounding the instrument. The name Deerhorn comes from the habitat of deer at the edge of human settlements and wild forest, and from the electrical sensitivity deer have in their horns.[185]

4.2.4 Sandrodes

One of the most unique characteristics of Blasser's synthesizers is his inclusion of *sandrodes* – patch points that are "androgynous nodes" and can act as inputs, outputs, or neither, as they link parts of the circuit. In other modular and semi-modular systems, modules may influence, or be influenced by each other, but the patch points are protected such that circuit behavior will not propagate upstream from an input to an output. In contrast, Blasser's *sandrodes* link parts of a circuit such that influence can occur in either or both directions. This idea was directly influenced by Deleuze and Guattari's concept of rhizomatic structures outlined in *A Thousand Plateaus*.[186] Blasser considers the more common input/output-based synthesizers to be examples of hierarchical or arborescent structures, and designed *sandrodes* to create non-hierarchical, rhizomatic assemblages in his instruments. As discussed above, I consider input/output-based

[185] Singer, *Plumbutter & Rolzer Dance Party Guide*, 48-49.
[186] Blasser, "Stores at the Mall," 66-67.

synthesizers to also be rhizomatic assemblages because of the fluid hierarchies, redefinitions, and feedback possibilities they support, but Blasser's approach demonstrates a stronger version of this model wherein nodes can exist in constant flux following the unpredictable washes of electrical current.

4.3 Tyler Etters' Arcologies

Fig. 11: Artwork for Arcologies

4.3.1 Assembling Arcologies

> Is there a way to tell stories that are satisfying, but more closely resemble life? What would happen if we took a break from the monomyth? What would it mean to tell stories based around community instead of heroism? Threads instead of arcs? Harmony instead of conflict? I've started exploring this in my practices. After all,

> what is the traditional pop song structure but another manifestation of the monomyth? And what is the expository blog post but the same?[187]
>
> - Tyler Etters

Arcologies is a software instrument made by Tyler Etters in which players create musical sound through an interactive environment by building structures on a grid map.[188] These structures each relate to the world around them in distinct ways in keeping with the character of the world Etters has developed. Structures interact using photons (similar to bangs in Max/MSP and Pd) that travel over the grid at a steady rate along the cardinal directions. Sound emerges from these collisions between photons and structures, and the player acts as a curator of these interactions by building, demolishing, and modifying these structures to alter the assemblage relationships. The player's actions do not directly trigger sound, but instead set up relationships within the arcology that may lead to emergent sound.[189]

[187] Quoted from a blog post by the creator of *Arcologies* less than a year before *Arcologies* was made. Tyler Etters, "We Are Drawn to the Monomyth," *Northern Information* (blog), November 10, 2019, accessed October 17, 2024, https://nor.the-rn.info/2019/11/10/we-are-drawn-to-the-monomyth.
[188] Etters, "Arcologies."
[189] A given map of structures created in Arcologies is called an arcology. An arcology is a large, self-sufficient habitation designed to support a large population of people while maintaining a healthy relationship to nature.

4.3.2 Instruments for Making Instruments

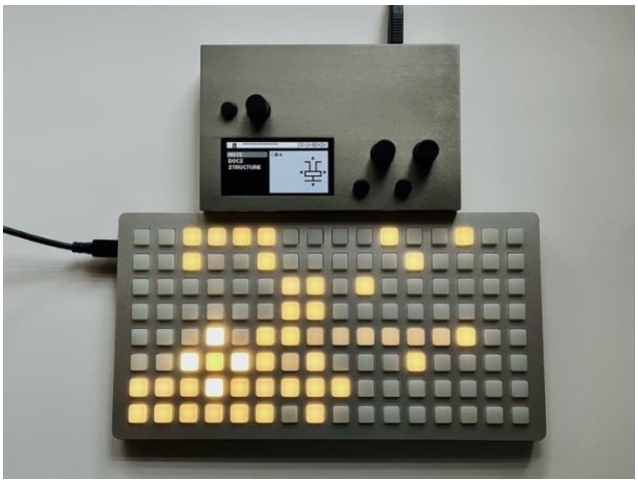

Fig. 12: My Norns (top) and grid (bottom) running Arcologies.

The instrument is open-source and is written in the Lua and SuperCollider languages for the monome norns platform and the monome grid controller.[190] These devices share much of their philosophical basis with Arcologies. Norns is a sound computer designed to "become what the player imagines: instrument, composition, score, tool, game, art," transforming the computer into an "art-facilitating playground-ecosystem."[191] The grid is similarly designed to be redefined. Unlike many of the electronic music grid-style controllers that have spawned from it, monome's grid does not include any built-in functions or traditional musical tools like MIDI or CV; it simply communicates button presses and outputs decoupled light information. All further interactions are left to the digital luthier to design.[192] In this way, norns and grid exist as

[190] monome uses lower case letters in all of their naming. Brian Crabtree, Kelli Cain, and Dani Derks, "monome," accessed October 17, 2024, https://monome.org/.
[191] Brian Crabtree, "Interview: The Mycelia of Does-Nothing Objects," in *Modular Synthesis: Patching Machines and People*, ed. Ezra J. Teboul, Andreas Kitzmann, and Einar Engström (Taylor Francis, 2024), 457.
[192] monome describes their instruments as "sound machines for the exploration of time and space." Crabtree, Cain, and Derks, "Monome."

facilitators and concrete environments for instrument creation. In a recent interview Brian Crabtree, one of monome's founders, stated that "nature is foundational to our way of being. Words like "ecosystem" and "community" and "emergent" appear frequently when describing the musical systems we've designed, and I do believe that language and stories shape the energy surrounding any project."[193]

4.3.3 The Mushroom at the End of the World

The similar importance of language, framing, and worldmaking in Etters' work is evident in the design of Arcologies. It is not the first instrument to make use of interactive objects on a grid, but the evocative world Arcologies is based on have given it a distinct identity that shapes the music that emerges from it.[194] The development of Arcologies was directly inspired by *The Mushroom at the End of the World*, particularly Tsing's description of supply chains.[195] Other influences related to this dissertation include Brian Eno and Peter Chilvers' generative music applications, Conway's Game of Life, and worldbuilding simulators like SimCity.[196] The world Etters implies through watercolor painting and through the names and descriptions of buildings is one whose inhabitants are constructing new relationships between a ruined civilization and encroaching nature, using the mid-twentieth century concepts of people like Paolo Soleri and Buckminster

[193] Crabtree, "Interview: The Mycelia of Does-Nothing Objects," 456.
[194] For example, the esoteric programming language Orca developed by Hundred Rabbits was an influence on Arcologies and uses a similar grid and photon approach with each letter assigned a distinct function. Devine Lu Linvega and Rek Bell, "Orca," Hundred Rabbits, accessed October 11, 2024, https://100r.co/site/orca.html.
[195] Tyler Etters, "The Software Blues - Agonies and Ecstasies of Creating Ambitious Artwork," September 20, 2020, accessed October 11, 2024, https://www.youtube.com/watch?v=mzo5rovx9nE&list=PLe1BFUbUceS2N5GLgORKQrw1bsz2ZLwJ3&index=3.
[196] Etters, "Arcologies."

Fuller alongside the ideas expressed in contemporary writings from The Dark Mountain Project, the Eco Futurism Corp, and Anna Tsing.[197]

Much of the detail of the world emerges from the structures themselves. They have names like solarium, apiary, kudzu, shrine, and crypt. Each one has a fragment of text suggesting their history and use (sometimes including tongue in cheek references to the actual code). For example, the Dome structure references "geodesics reverberating with chlorophyll psalms," the Kudzu describes "wrist-thick kudzu vines that wrap the Sears Tower…when you look down, you see tiny figures pounding corn, laying stripes of venison on the empty car pool lane of some abandoned superhighways," and Shrine is "A holy site to the SuperCollider pantheon," referencing the coding language that creates the actual sounds of Arcologies.[198] The resulting music tends to support this world through sounds and framings that suggest a nostalgia for early futurism, and through musical structures that gradually evolve and that deemphasize performer input, suggesting mutual worldmaking between player and environment and continuing process rather than individualism.

4.3.4 Making a Personal Polymyth

Arcologies is one of Etters' many projects included within his Northern Information framework.[199] These projects include instruments, music, photography, and writing, all of which

[197] The documentation includes links to descriptions of these people and projects. Etters, "Arcologies."
[198] Tyler Etters, "Arcologies," GitHub, July 21, 2024, accessed October 7, 2024, https://northern-information.github.io/arcologies-docs/.
[199] "Northern Information" (Tyler Etters, November 8, 2009), accessed October 7, 2024, https://nor.the-rn.info/.

he views as part of the making of a personal polymyth. The themes present in Arcologies carry through into some of these other works. For instance, the landing page of the Northern Information website includes a quote from Ellen Ullman: “We build our computer systems the way we build our cities: over time, without a plan, on top of ruins.” Regular topics discussed on the website include climate change, the ethics of software development, hauntology, the COVID-19 pandemic, and the challenges of digital culture. Etters also emphasizes the importance of creating art, and the importance of supporting others in creating art. To Etters, “Arcologies is another extension of that. I’m creating a world of the code and the code creates worlds and that lets other people create worlds. I love that I get to create these worlds that are beautiful and cohesive and that make sense to me, and then they are tools that other people get to take to create worlds that are beautiful and cohesive and that make sense to them.”[200]

Like Peter Blasser, Tyler Etters has created a larger world and mythology to create instruments and other artworks within. These worlds help to drive creative instrument design as they provide an environment to create in relationship to. Similarly, the resulting instruments support a relationship to players in which the player’s decisions are shaped by the mythology and geography of that world. These instruments do not act as communicators of player agency, but instead encourage them to explore through connections between themselves and the instruments, and between elements of the instruments themselves.

[200] Tyler Etters, Ryan Laws, and Zack Scholl, “Tyler Etters, Ryan Laws, Zack Scholl,” interview by Dani Derks, December 26, 2022, accessed June 19, 2024.

5. CONCLUSION

5.1. My Carrier Bag

I begin composing a new piece of music by asking myself what sort of place I would like the audience, musicians, and myself to inhabit together for the duration of the piece. Then I listen, trying to hear the special moments that will emerge from the coincidence of processes, and to imagine what paths might connect those moments.

Some of my earliest work was with field recordings and transcriptions of the sounds of nature. Soon after, I began to create music that evokes the feeling of specific places and times, and that encompasses the beauty and messiness of the natural world. Recently I have been interested in creating more embodied and unpredictable sound worlds. In contrast to the deserted environments of my earlier music, my more recent compositions evoke more of the bodily experience of place. In all this work, I encourage curiosity rather than virtuosity—exploration rather than narrative.

In my own work and that of others, I am interested in further exploring the possibilities inherent in deeper interactions between the members of sonic assemblages. The "open-ended gatherings" of assemblages encourage fluid relationships, and so these relationships are themselves an opportunity for artistic creation. By more closely "[imitating] Nature in her manner of operation" we can build continually evolving sound worlds more focused on the underlying mechanisms of

nature's assemblages than on surface-level imitations of nature.[201]

5.2 "Still There are Seeds to Be Gathered"[202]

The concepts discussed in this dissertation provide a new framework for understanding the work of artists who create sound worlds of continuous process, and offer an alternative to the narrative, resolving approaches common in the audio arts. It demonstrates the creative potential and diversity of music, sound art, and instrument design predicated on the creation of assemblage-based worldmaking. Each of the artists discussed in this thesis has found a unique way of creating worlds in the audio arts and have demonstrated the potential of works that blur the line between music and sound art by abandoning traditional ideas of narrative progress and closure. These approaches are as fruitful as the idea of narrative storytelling and these artists are far from an exhaustive list of those who are exploring them.

Looking to the future, Le Guin reminds us that the bag is also "full of beginnings without ends, of initiations, of losses, of transformations and translations."[203] There is potential to be explored in works that explore the boundary between sound art and instrument through objects whose continuing process is shaped by the presence and interactions of visitors who join their assemblage. There is also opportunity for performers to have more agency in assemblage-based music. While Adams and Þorvaldsdottir have rigorously notated their music to avoid undesired dramatic expression, Oliveros has demonstrated through her sonic meditations the emergent

[201] Adams, *Winter Music*, 92.
[202] Le Guin, "The Carrier Bag Theory of Fiction," 154.
[203] Le Guin, "The Carrier Bag Theory of Fiction," 153.

possibilities of performances in which musicians are encouraged to listen with an exploratory, carrier bag approach to the world around them. Adams and Polli have shown the creative potential of empowering natural systems with creative agency. Blasser's and Etters' instruments demonstrate the creative possibilities of designs where the players' interactions are based more on the exploratory building of relationships between continuous processes than on the development of expressivity within the static system of traditional instruments. I am interested in the possibilities inherent in other instrument relationships, whether through bilateral relationships like those seen in Blasser's instruments, or through the resonance of physical acoustic systems.

> "The curiosity I advocate follows such multiple temporalities, revitalizing description and imagination. This is not a simple empiricism, in which the world invents its own categories. Instead, agnostic about where we are going, we might look for what has been ignored because it never fit the time line of progress."[204]
>
> - Anna Tsing

By moving beyond ideas of progress and resolution, we can create sound structures that encourage exploratory creation and listening within continually evolving processes that mirror our immersive experience of the natural world. Understanding audio art as an act of worldmaking invites a focus on the relationships between the processes within a work and a new way of approaching artistic creation.

[204] Tsing, *The Mushroom at the End of the World*, 21.

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PORTFOLIO

I have selected the four creative works included in this portfolio to be representative of my creative practice during my time at Princeton University. The linked videos as well as code for the software-based works are available here.

A Body in a Place

This piece was premiered by Alarm Will Sound on March 21, 2023 in Richardson Auditorium in Princeton, New Jersey.[205] A video of the performance is available here, and the score is included below. The music consists of two elements: a body, and a place. The body is made up of simple shifting harmonies and was created in Banff, Canada in January 2023. The place is a loose transcription of field recordings that I made in Banff, Canada in January 2017. In my music I often create landscapes for the musicians and audience to be in together for the duration of the piece. In the past, these landscapes have usually been empty places. In this piece there is an observer present, and an environment that is itself full of life. The two begin distinct, but the boundary between them becomes increasingly blurred.

Flyway

This is an improvisation-oriented sequencer that I developed and coded for the monome norns music computer. Players create melodic shapes using MIDI knobs or sliders and control rhythm using a monome grid. The shape of the melody can be quickly altered, and players can

[205] Liam Elliot, "a body in a place." *Vimeo*. August 23, 2024, video, https://vimeo.com/1002046073/daa67038bf.

manipulate a given shape by altering the loop length, and by scaling the shape over any size of pitch range. A virtual birds flies the shape of the melody. The Lua code is included below, and a demonstration video is available here.[206] I first performed using this instrument at Unruly Sounds Festival in Princeton, New Jersey on October 30, 2023.

Sound Fisher

This is a sound sculpture that was presented as a part of the online 48h Neukölln Festival in June 2020. It consists of a ceramic bowl, a contact microphone, a speaker, and a Bela microcontroller. The sound of the river is passed through resonant filters that change pitch when a larger splash hits the bowl. All sounds heard are from the river, with some frequencies being emphasized while others are attenuated. The sculpture is named after one of Pauline Oliveros' sonic meditations. Video documentation is available here.[207]

Resin

This is a string feedback resonator instrument that I have designed and constructed. It grew out of a desire to add sympathetic resonance to any other instrument and has developed into a hybrid acoustic-electronic feedback instrument that can be played alone or in series with other instruments. Further details including pictures and schematics are below, and a video of my first

[206] Liam Elliot, "Flyway Performance Sequencer," *Vimeo*, October 1, 2024, video, https://vimeo.com/1014639183.
[207] Liam Elliot, "Sound Fisher," *Vimeo*. August 23, 2024, video, https://vimeo.com/432656708/339a3d0a4d.

public performance in Taplin Auditorium at Princeton University on October 22, 2024 is available here.[208]

Resin is an instrument designed to sympathetically resonate with other instruments or with its own feedback pathways. It is unusual in that it is primarily designed to be played in collaboration with other instruments, and because the playing style is more sculptural than additive: the player uses their fingers on the strings and potentiometers to remove sound from the otherwise loud feedback.

The instrument consists of a walnut body, ten electric guitar strings, an individual pickup per string, an analog amplification and effects circuit, a transducer, and jacks to interface with external instruments and effects. Sounds are input to the transducer, which transmits vibration into the bridge and strings. The string vibration is received by the pickups, passed through the circuitry, and returned to the transducer. The sound is dependent on the character of the external input, the tuning of the strings, the settings of the effects, the amount of amplification, and the manipulation of the strings and bridge by the player.

I designed the circuitry for Resin based on experimentation using a prototype version interfaced with modular effects. The circuit diagram is below. It includes amplification on the input and output, a diode-based distortion to add harmonic material, a -6dB/octave highpass filter, a -12dB/octave lowpass filter, and a delay made using two PT2399 chips that can function as two

[208] Liam Elliot, "Winter Music," *Vimeo*, October 29, 2024, video, https://vimeo.com/1024555973.

short delays in parallel, or a longer delay in series. The short parallel delays are particularly helpful for altering feedback pitches by acting as a quasi-comb filter, while the longer series delay functions more traditionally. Both can help to slow the mercurial changes inherent in feedback, and the noisy character of longer delays can help to provide raw sound material to instigate feedback sounds.

Since completing the instrument in May 2024, I have been exploring its sonic possibilities through collaborative recording sessions with musicians in the USA, the UK, and Canada. While Resin is primarily designed as a collaborative instrument, I presented the first solo performance on the instrument in Taplin Auditorium at Princeton University on October 22, 2024. That performance is linked above in the introduction to my portfolio. Below are several pictures illustrating the design and construction of Resin.

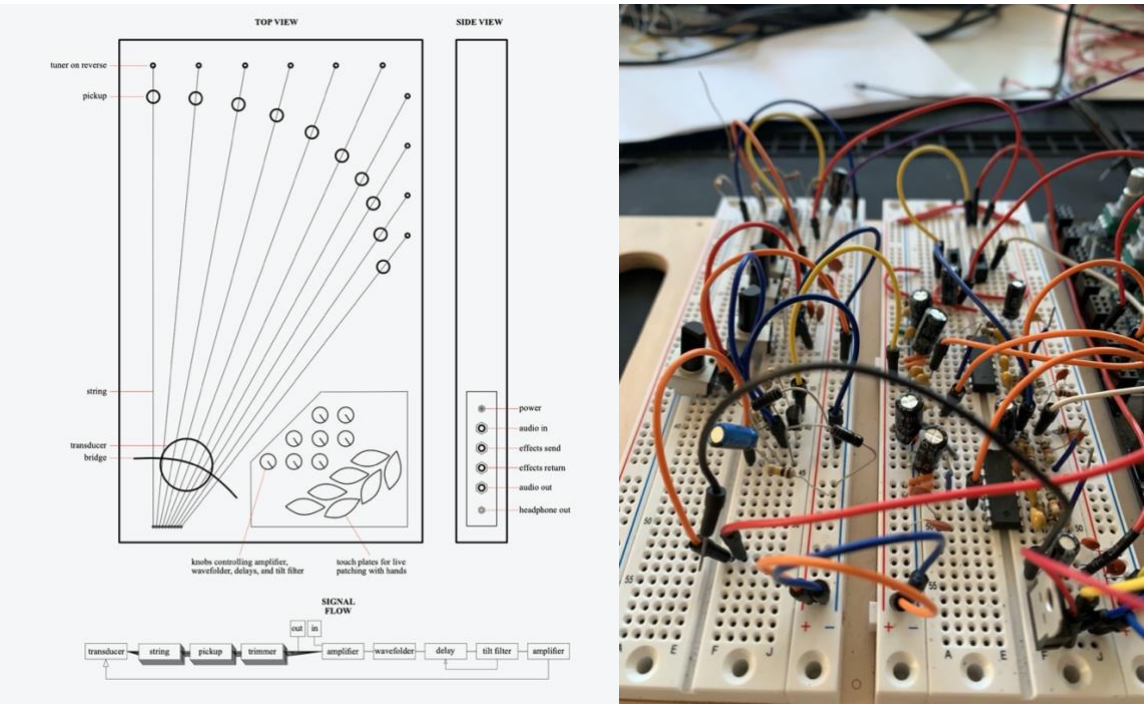


Fig. 13: Designing the layout and signal flow (left) and breadboarding the circuitry (right).

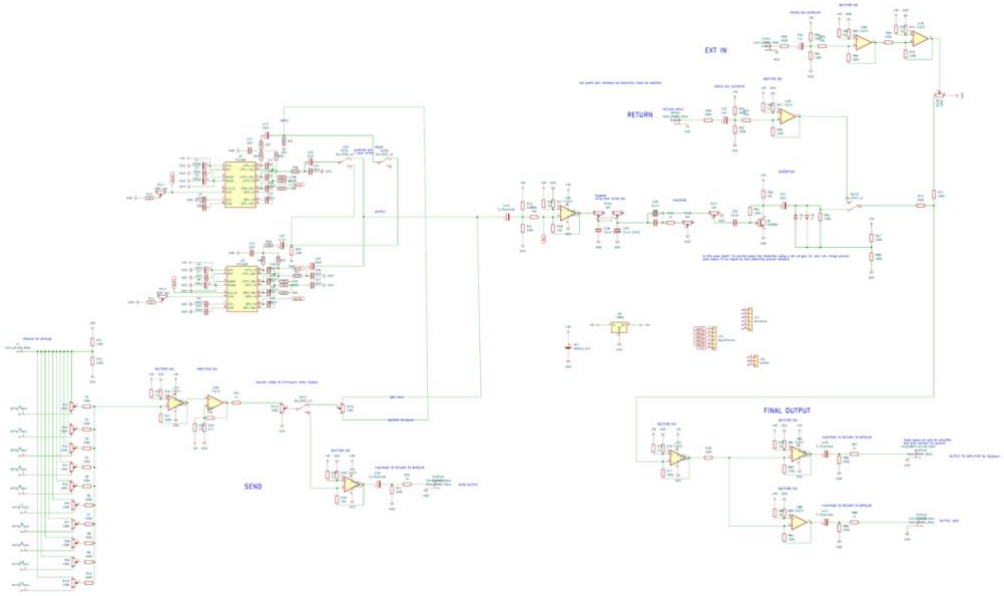


Fig. 14: The final circuit.

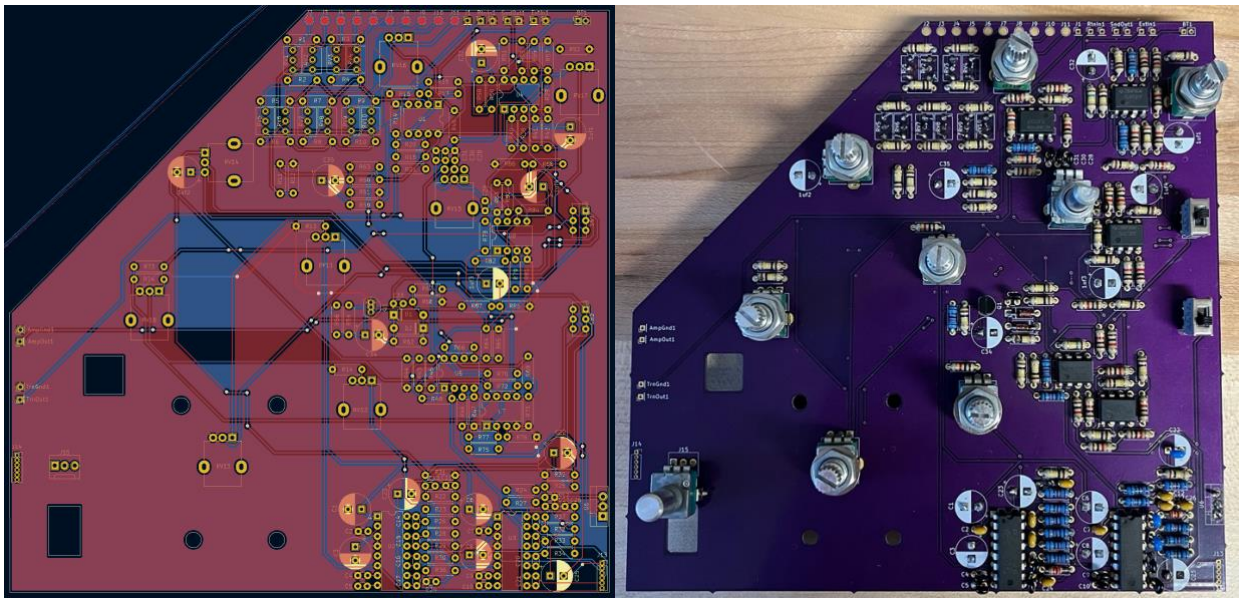


Fig. 15: The PCB layout of the above circuit (left) and the populated board (right).

Fig. 16: The CNC cut walnut body from above (left) and below (right). The cuts underneath allow for wiring, tuning pegs, and jacks to be installed.

Fig. 17: The completed instrument.

a body in a place

Liam Elliot
for Alarm Will Sound

INSTRUMENTATION

Alto Flute
English Horn
Clarinet in B♭
Bass Clarinet
Bassoon

Horn in F
Trumpet in B♭
Trombone

Percussion 1
  Vibraphone
  Kick Drum
Percussion 2
  Snare
  Bass Drum

Piano

Violin I
Violin II
Viola
Cello
Double Bass

Duration: 7:20

This music consists of two elements: a body, and a place. The body consists of simple shifting harmonies and was created in Banff, Canada in January 2023. The place is a loose transcription of field recordings that I made in Banff, Canada in January 2017.

In my music I often create landscapes for the musicians and audience to be in together for the duration of the piece. In the past, these landscapes have usually been empty places. In this piece there is an observer present, and an environment that is itself full of life. The two begin distinct, but the boundary between them becomes increasingly blurred.

PERFORMANCE NOTES

The body is not the foreground
Neither is the place
There is no hierarchy, only sounds that emerge from the collective sound and dissipate

Dynamics are generally quiet
Noise and pitched sounds should be equally loud on average. Because many of the noises are inherently quiet, the pitched sounds should reduce volume to match them
Dynamics should continuously vary. The hand-drawn appearance of the dynamic lines suggests continuous, independent variation
These constantly shifting dynamics create an unstable, undulating, organic, tenuous texture
Do not match the exact dynamic shape or rhythm of another player unless indicated
In general, notes or gestures begin and end as quietly as possible

INTERPRETING THE SCORE

Each page/line lasts very approximately 20 seconds
The start of each page should be indicated by the conductor
Each line of each part is numbered and matches the page number

Entries that should be synchronized/cued are indicated by circled numbers. These entries should be simultaneous, but the players should only continue synchronizing if indicated
All other entries are proportional to the duration of the page (e.g. an entry halfway through a page should occur about 10 seconds after the page starts) but are not synchronized between players

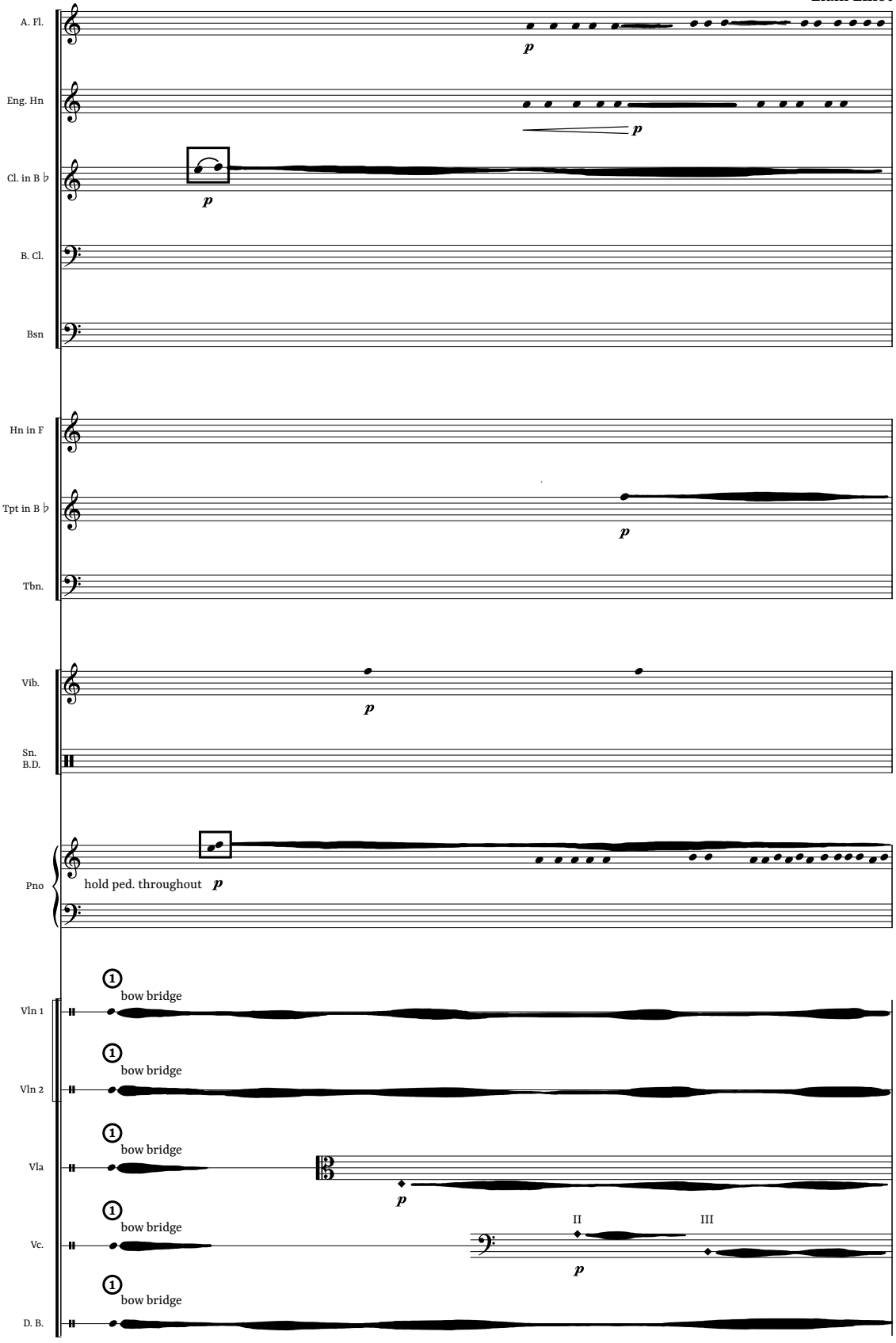
Line thickness indicates dynamic. A very thin line is a barely heard resonance while a thick line is among the loudest sounds in that moment

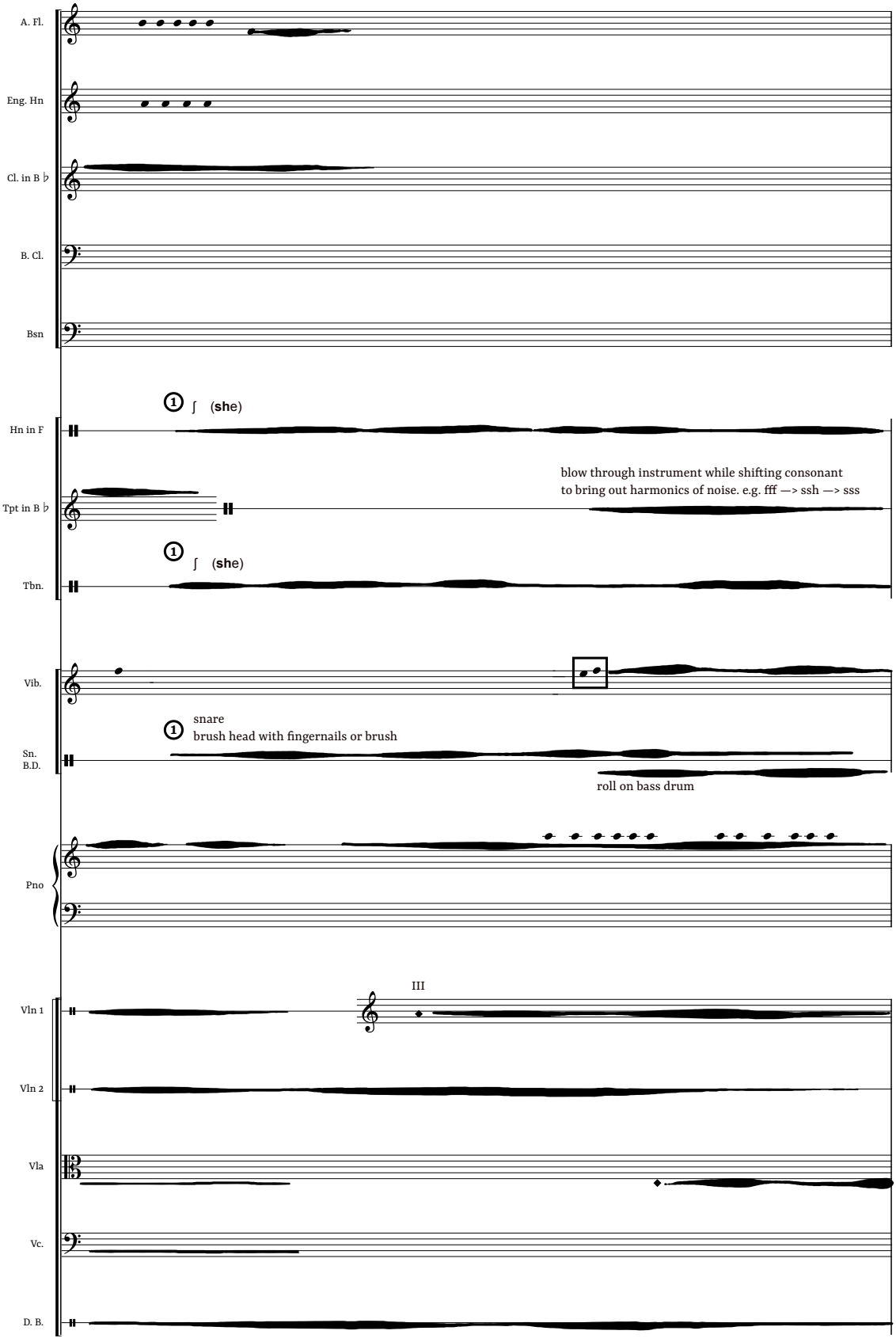
Accidentals and playing techniques (e.g. bow bridge, sul tasto) apply to repeating notes or gestures immediately following

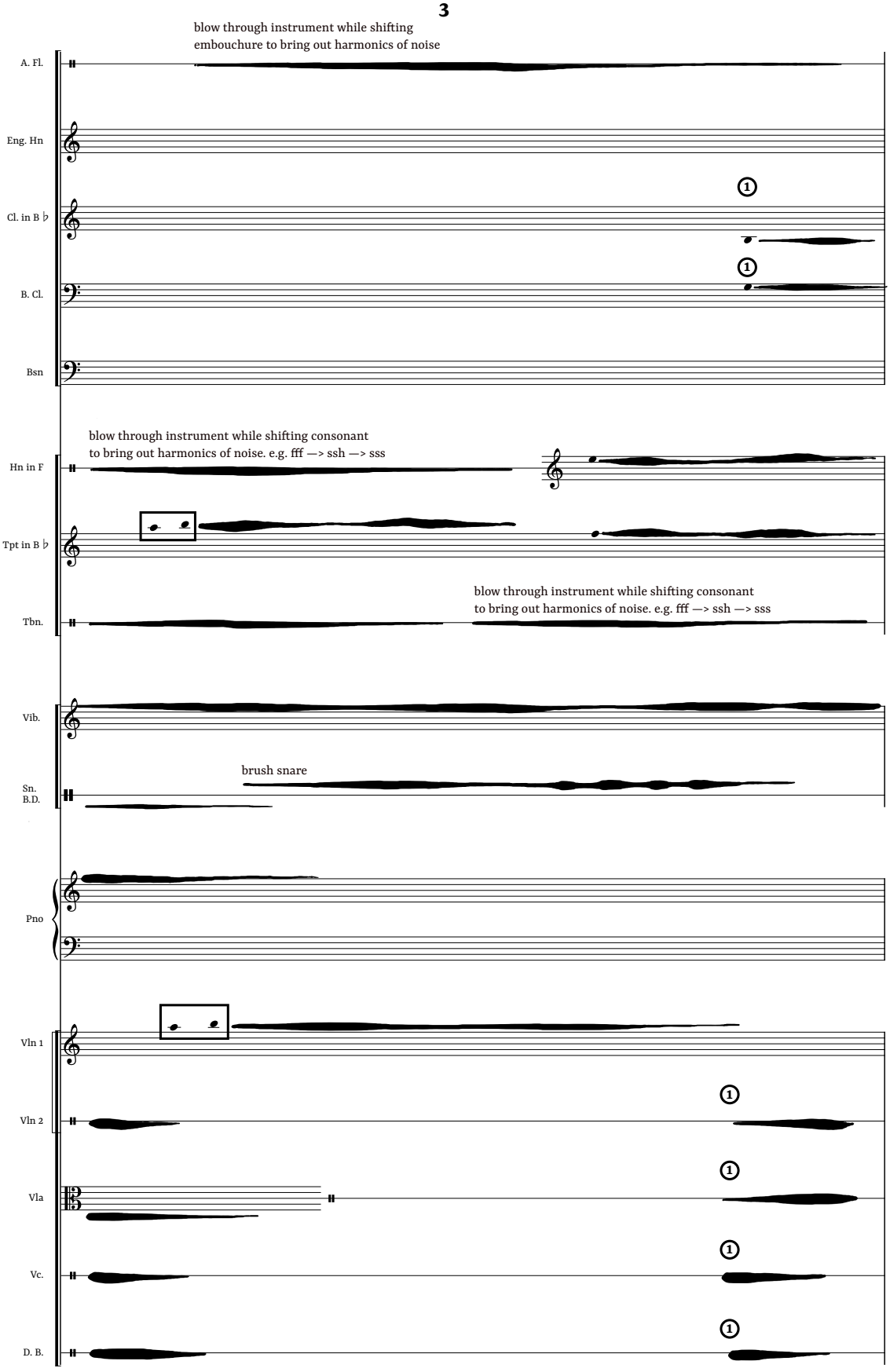
Boxed events repeat legato
Repeat speed is at the player's discretion
Non-boxed events are continuously held
The spacing of notes in boxed events is proportional – closer noteheads are faster
Bow and breathe as needed

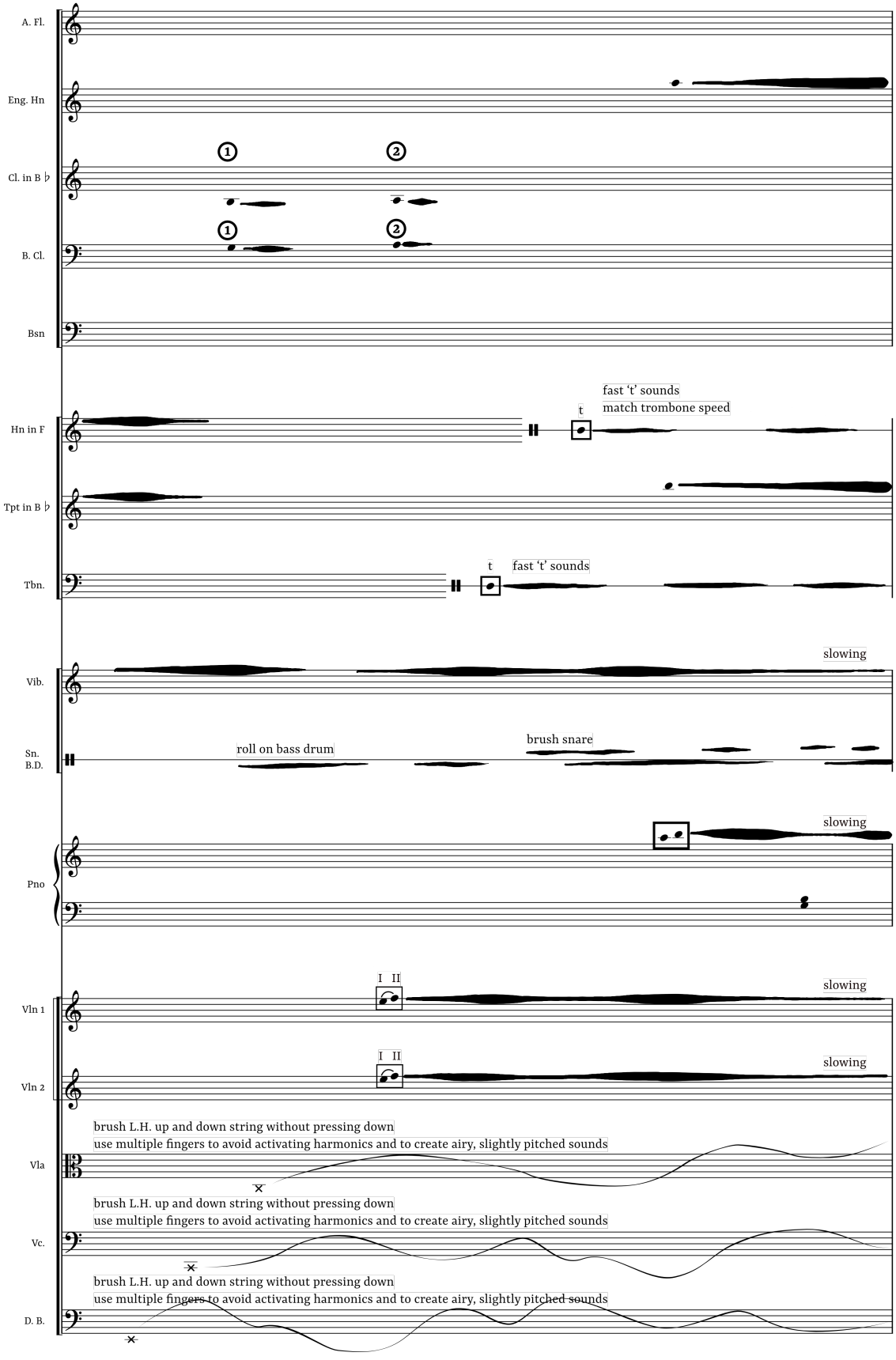
a body in a place

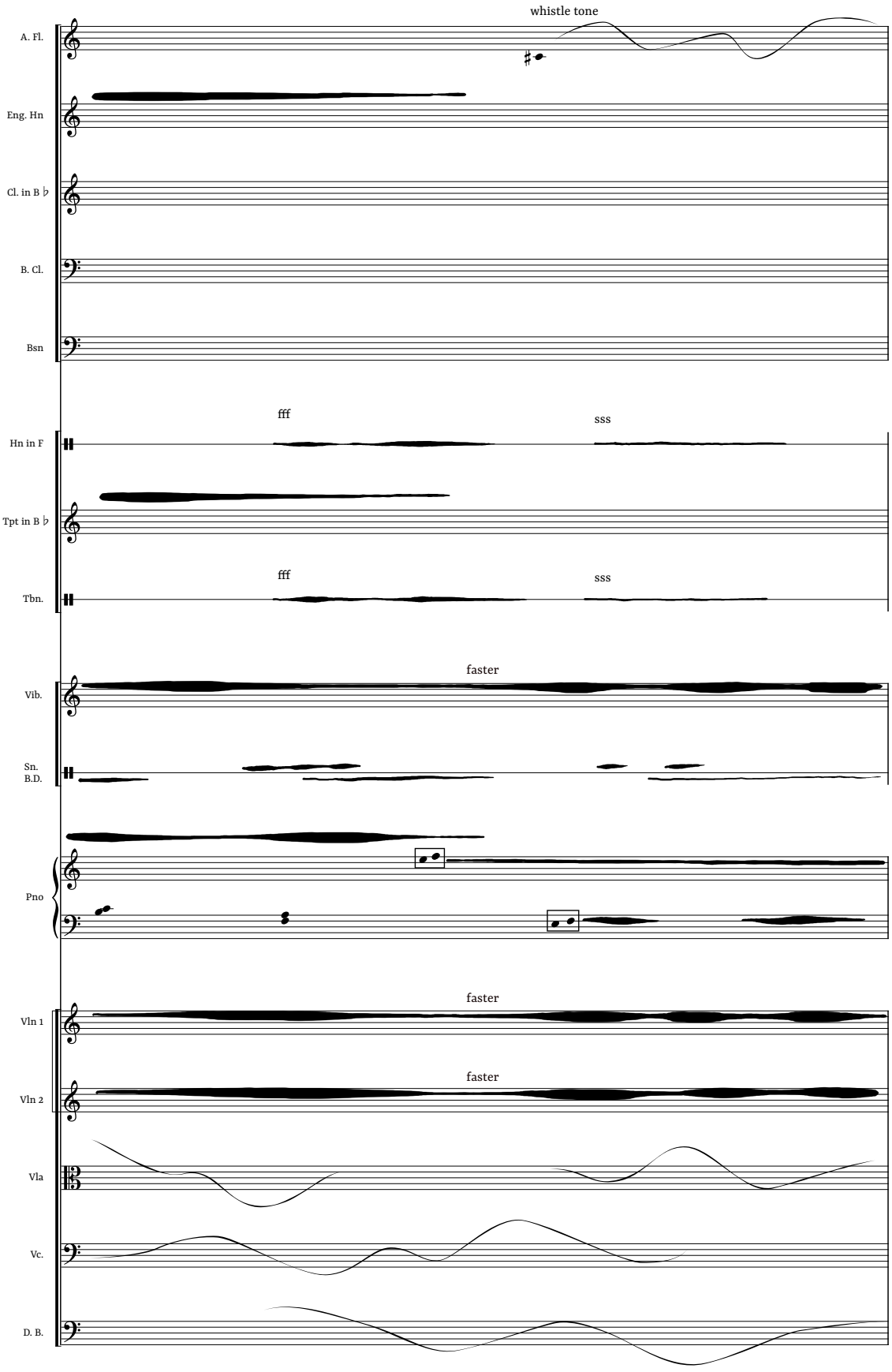
Liam Elliot

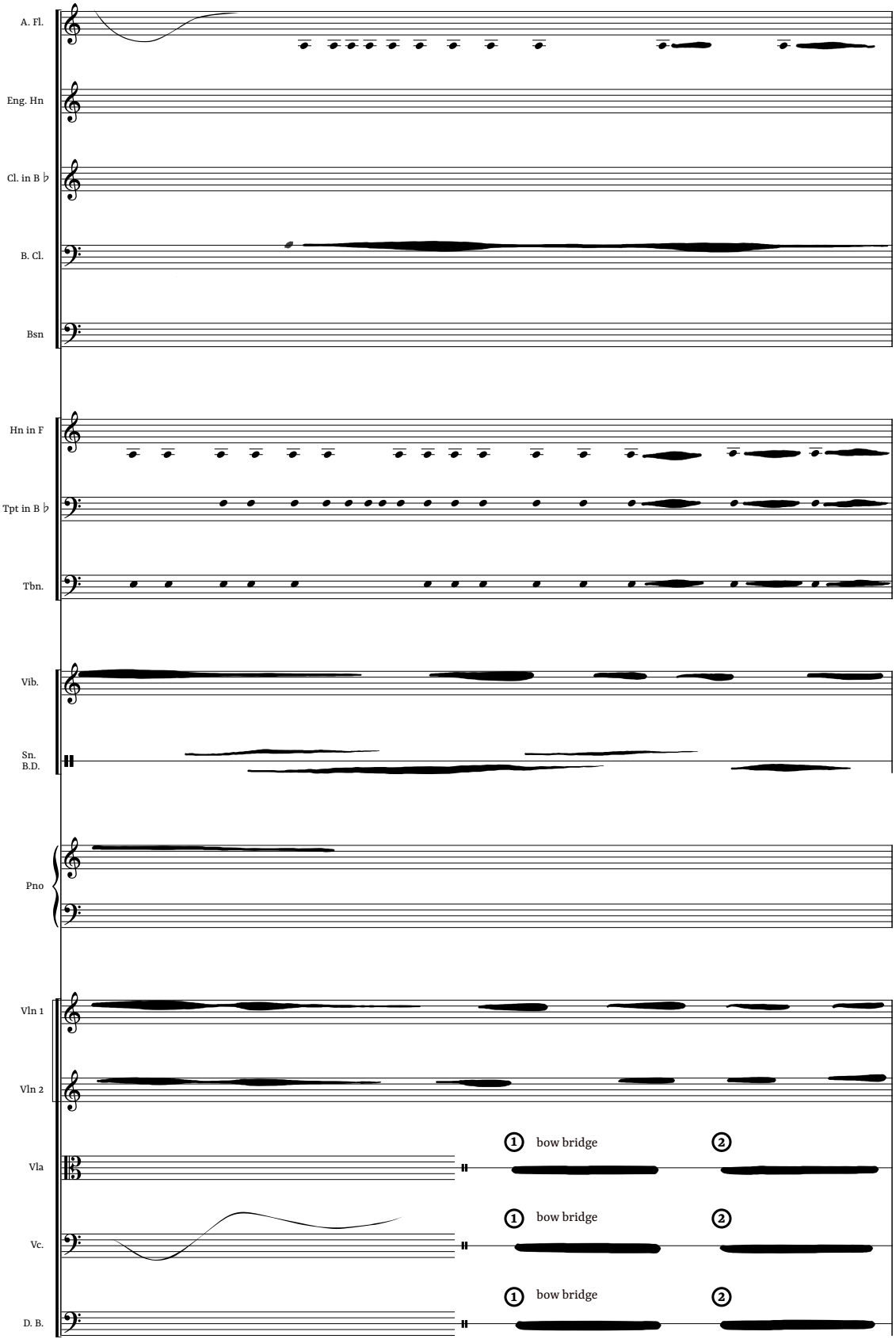


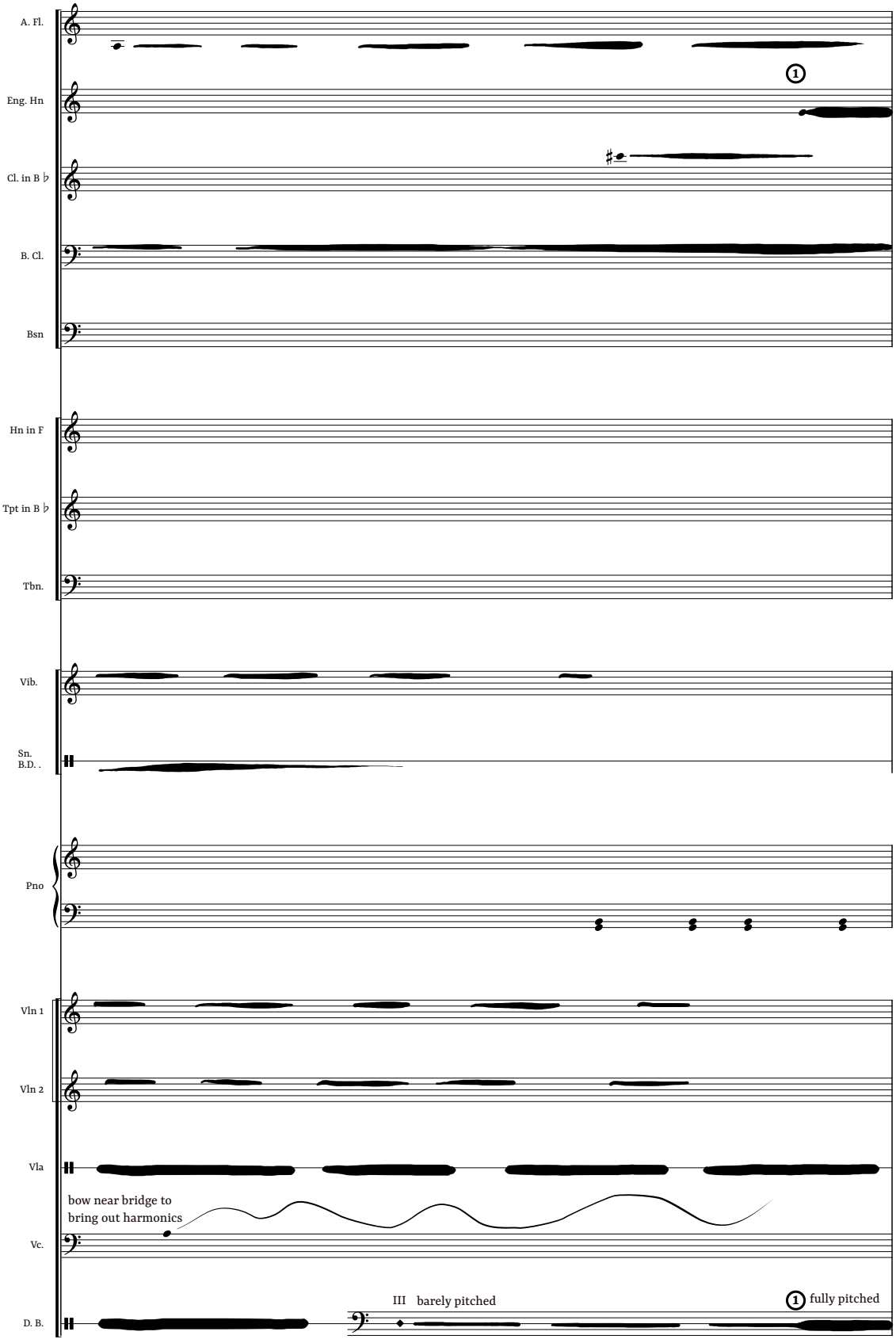

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
1 ∫ (she)
blow through instrument while shifting consonant
to bring out harmonics of noise. e.g. fff —> ssh —> sss
1 ∫ (she)
1 snare
brush head with fingernails or brush
roll on bass drum
III

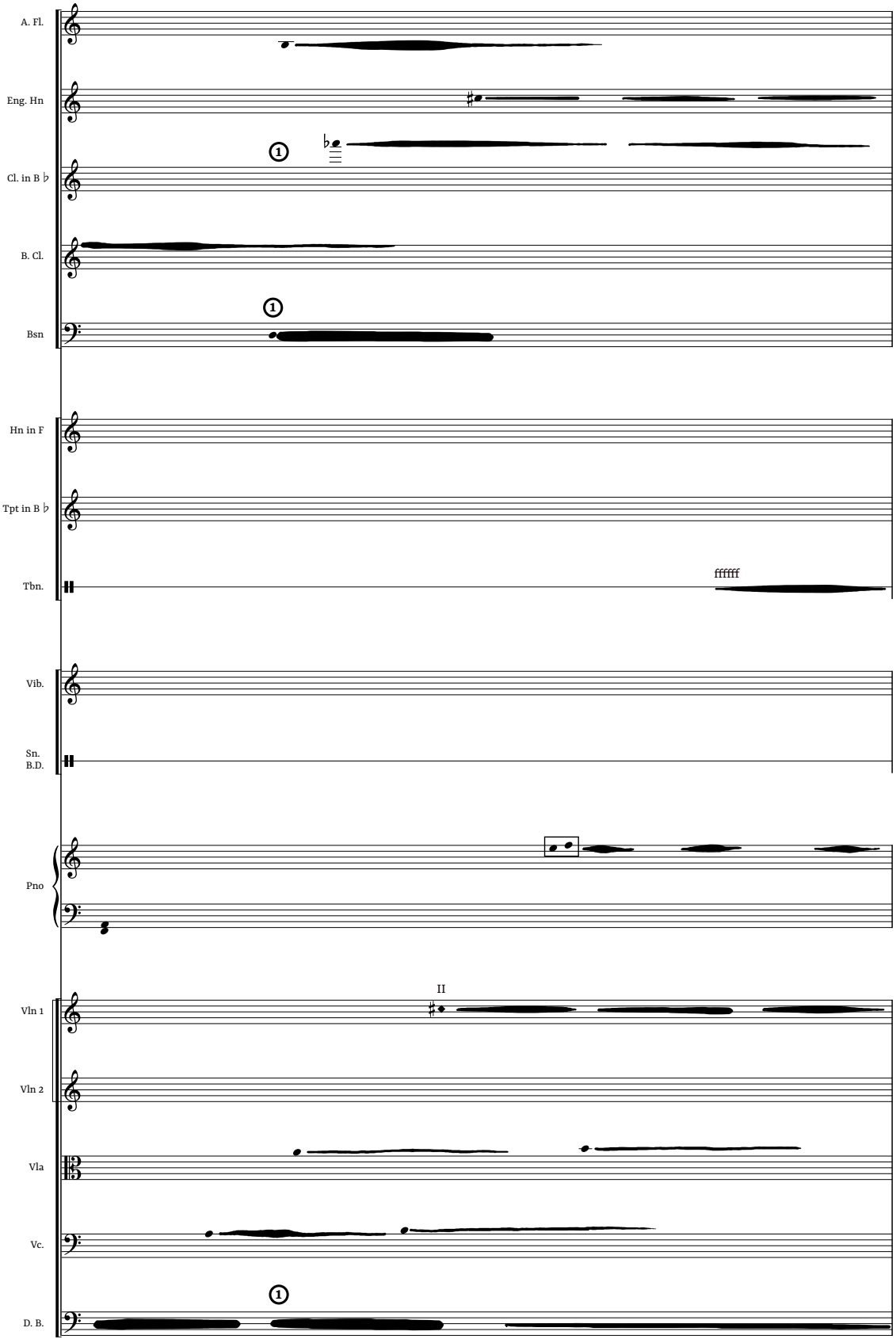

blow through instrument while shifting
embouchure to bring out harmonics of noise
A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
blow through instrument while shifting consonant
to bring out harmonics of noise. e.g. fff —> ssh —> sss
Hn in F
Tpt in B ♭
Tbn.
blow through instrument while shifting consonant
to bring out harmonics of noise. e.g. fff —> ssh —> sss
Vib.
brush snare
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.

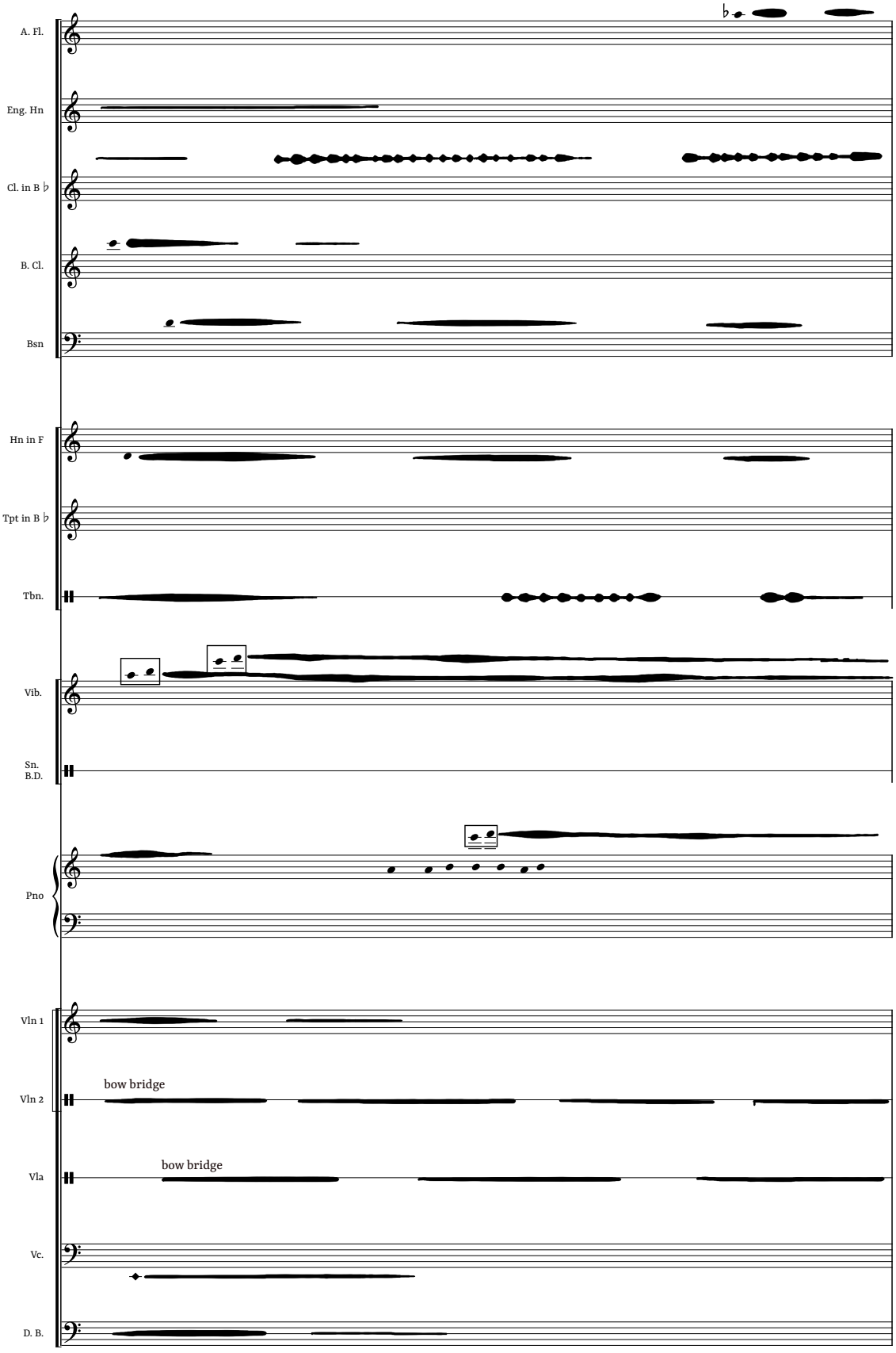

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
1
2
t
fast ‘t’ sounds
match trombone speed
slowing
roll on bass drum
brush snare
I II
brush L.H. up and down string without pressing down
use multiple fingers to avoid activating harmonics and to create airy, slightly pitched sounds

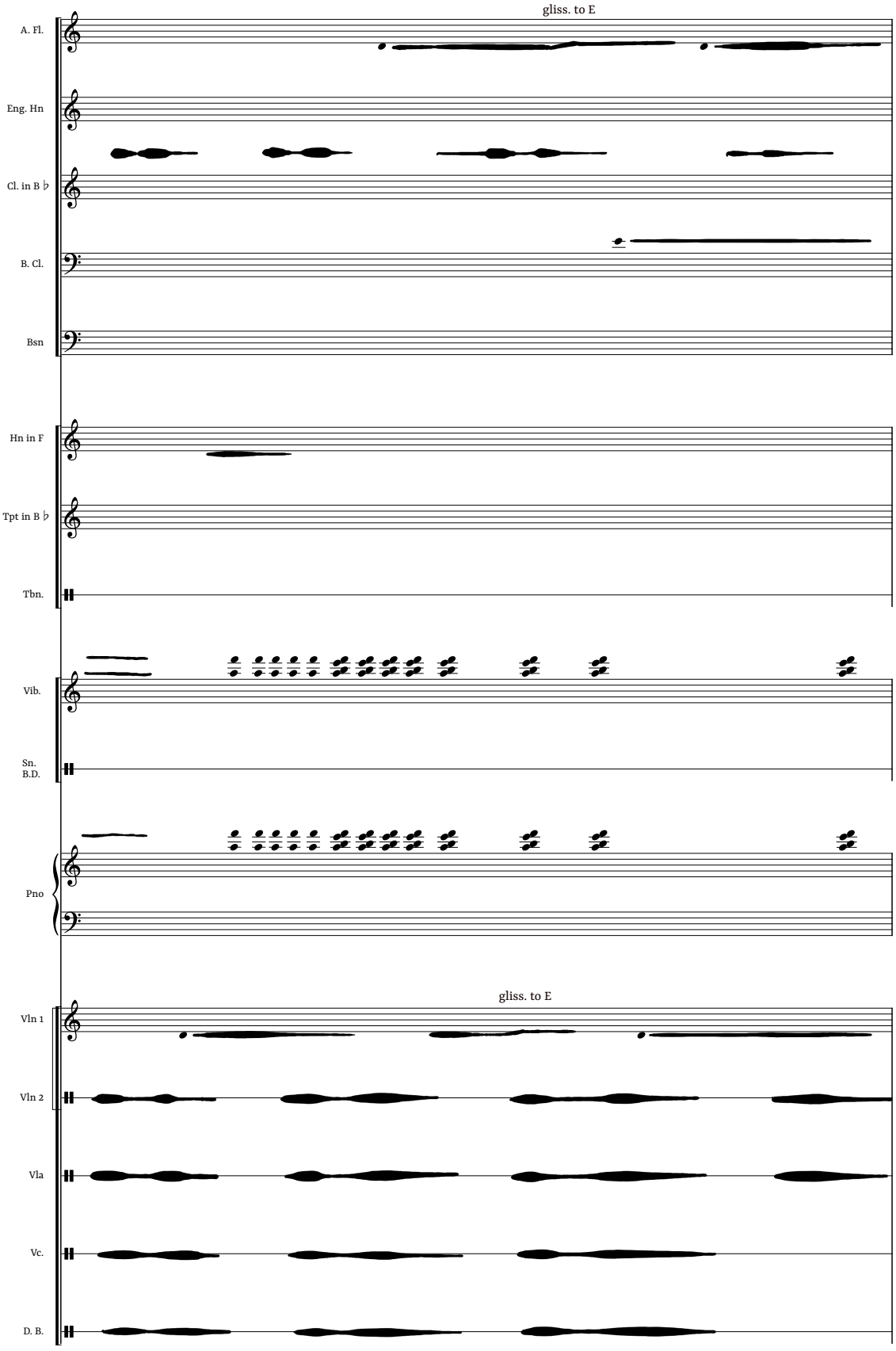

whistle tone
A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
fff
sss
Hn in F
Tpt in B ♭
fff
sss
Tbn.
faster
Vib.
Sn.
B.D.
Pno
faster
Vln 1
faster
Vln 2
Vla
Vc.
D. B.

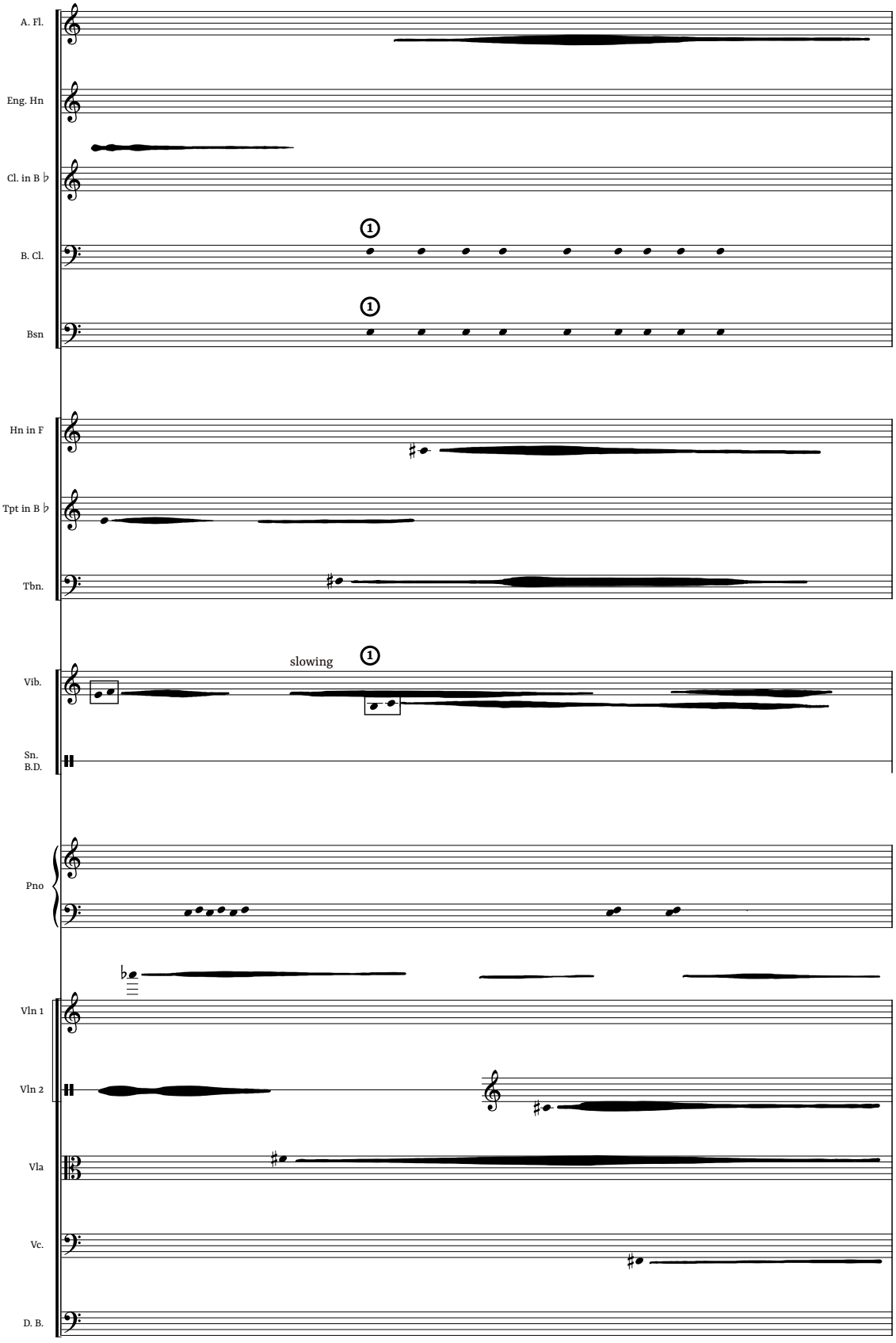

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
1 bow bridge 2
1 bow bridge 2
1 bow bridge 2

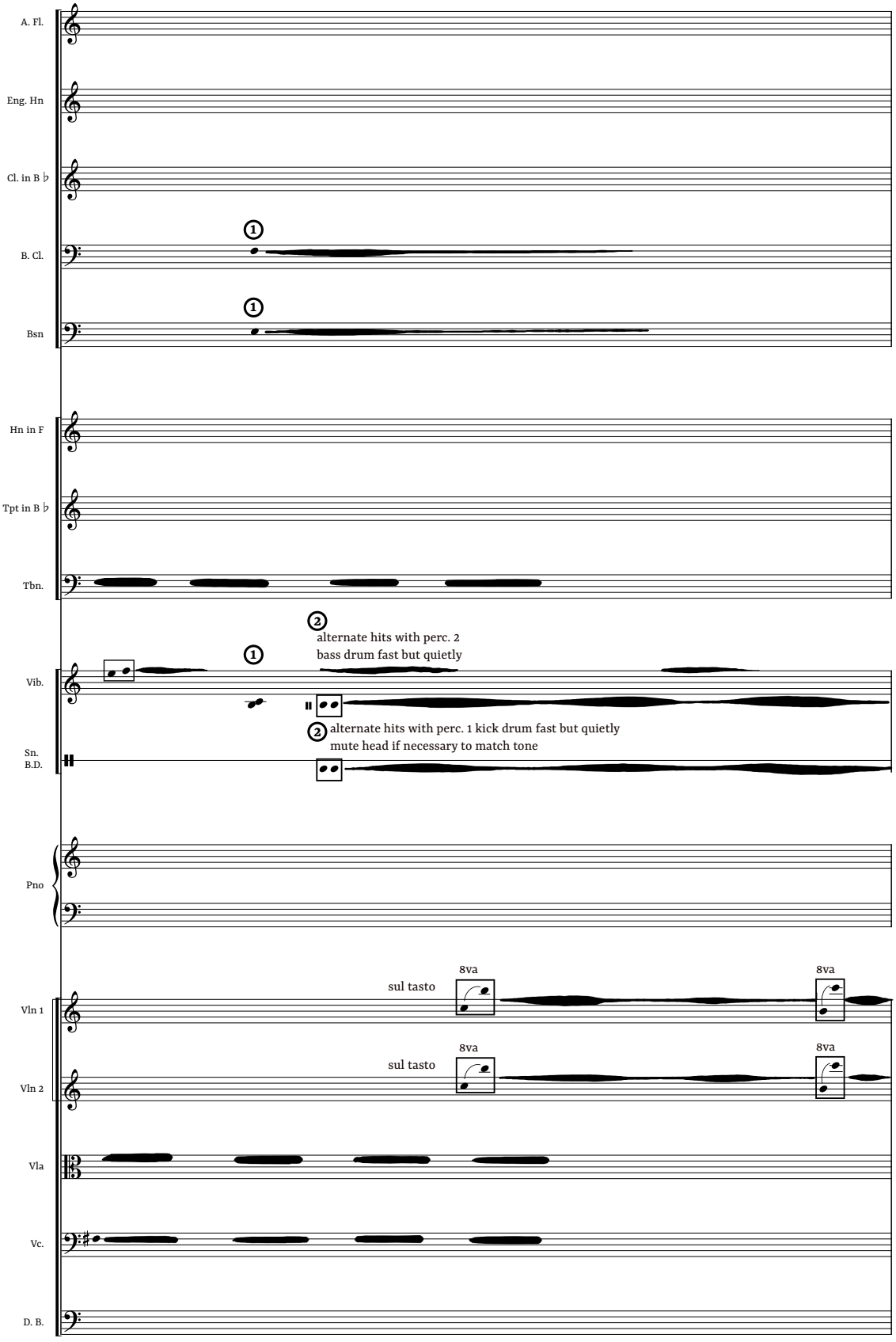

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D. .
Pno
Vln 1
Vln 2
Vla
bow near bridge to
bring out harmonics
Vc.
D. B.
III barely pitched
1 fully pitched

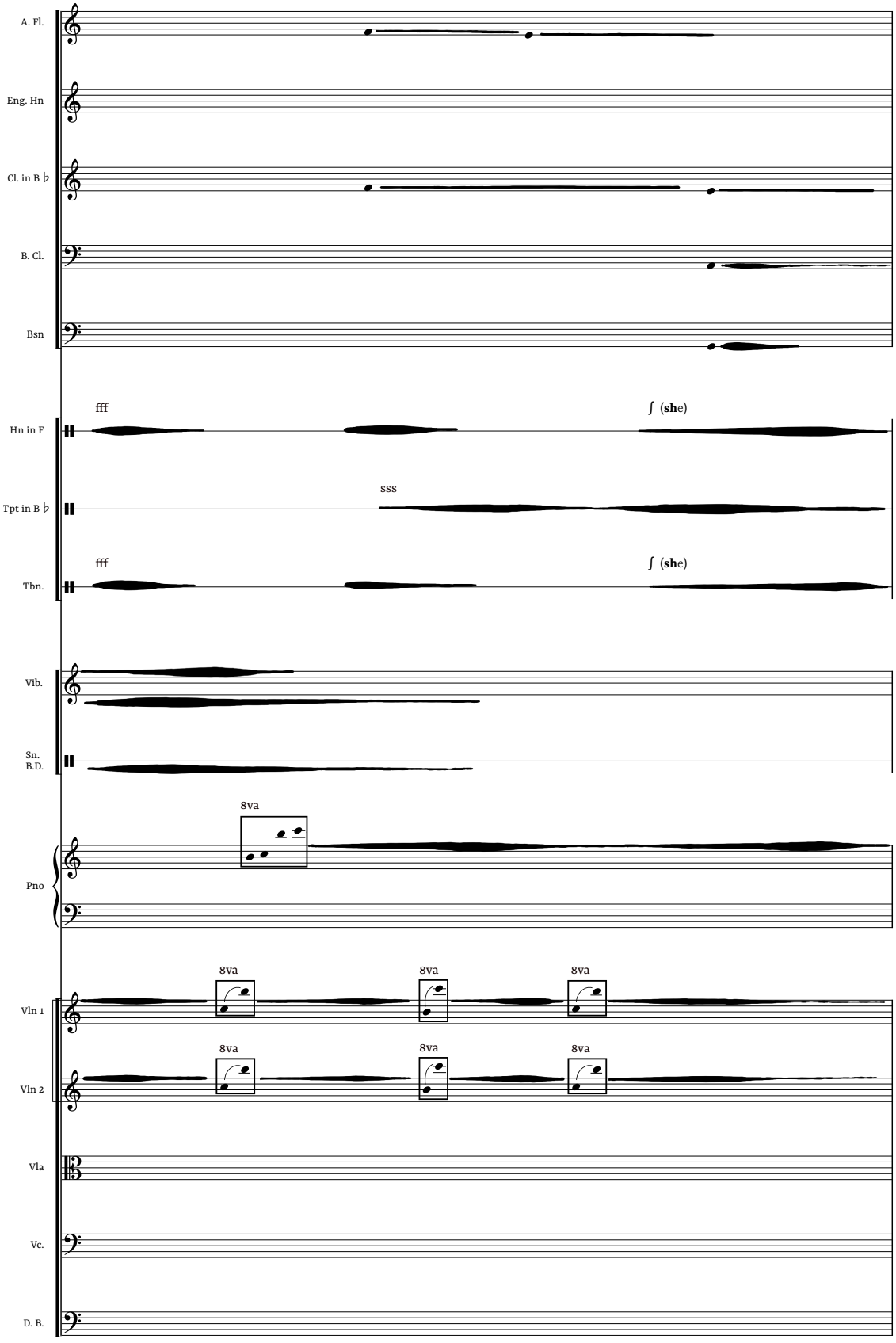

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
ffffff
Vib.
Sn.
B.D.
Pno
II
Vln 1
Vln 2
Vla
Vc.
D. B.

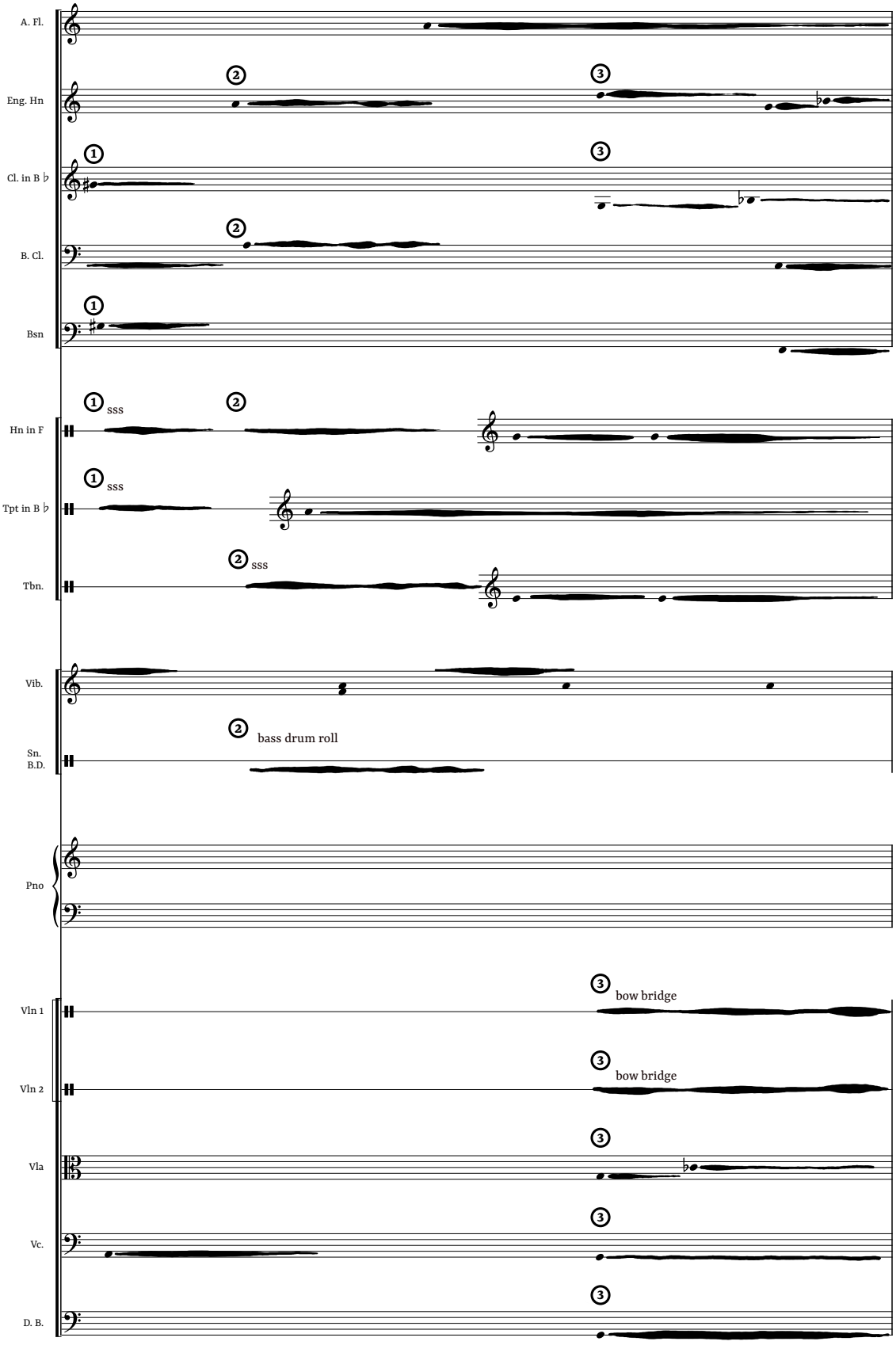

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
bow bridge
Vla
bow bridge
Vc.
D. B.

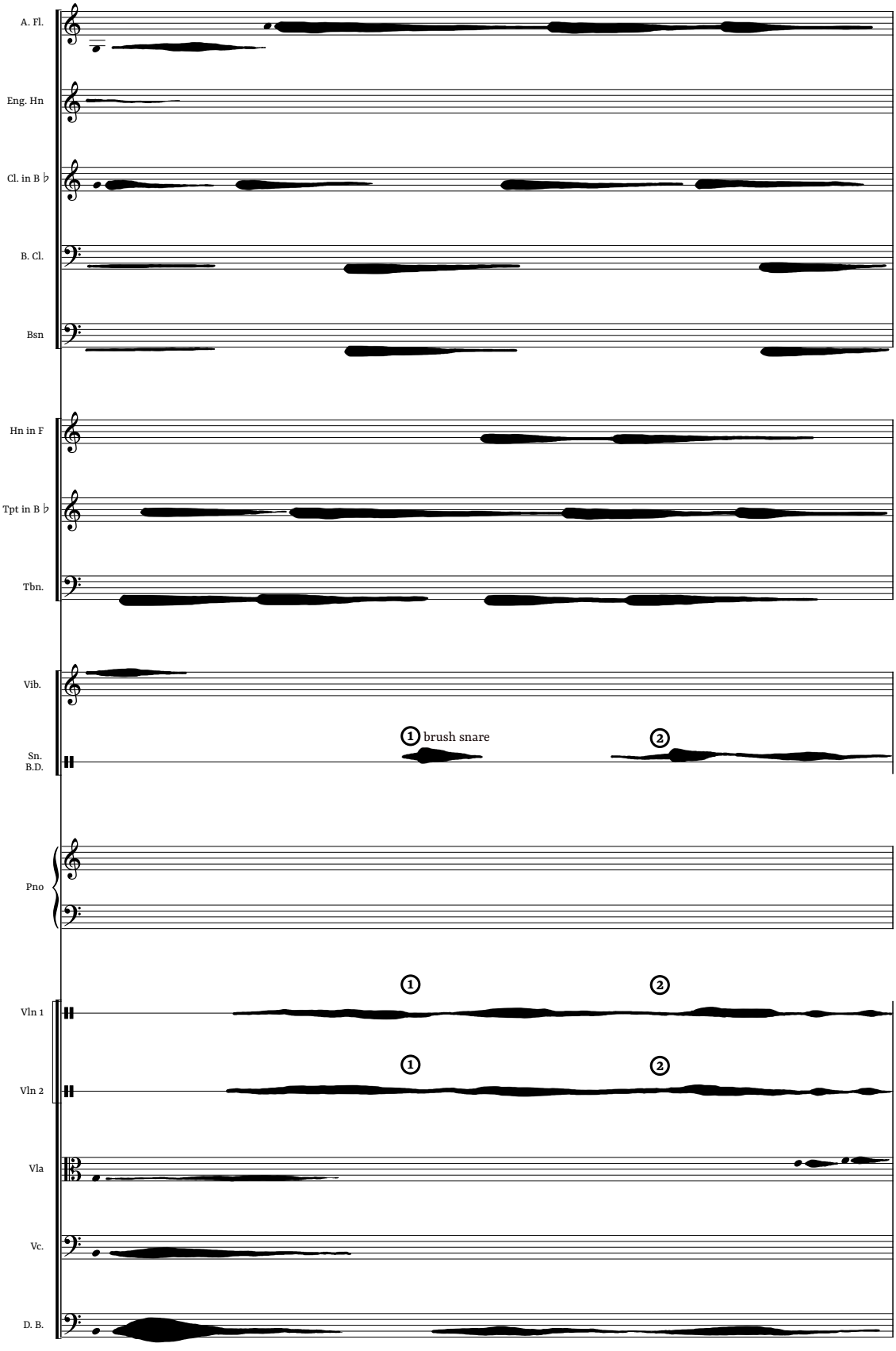

gliss. to E
A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
gliss. to E
Vln 1
Vln 2
Vla
Vc.
D. B.

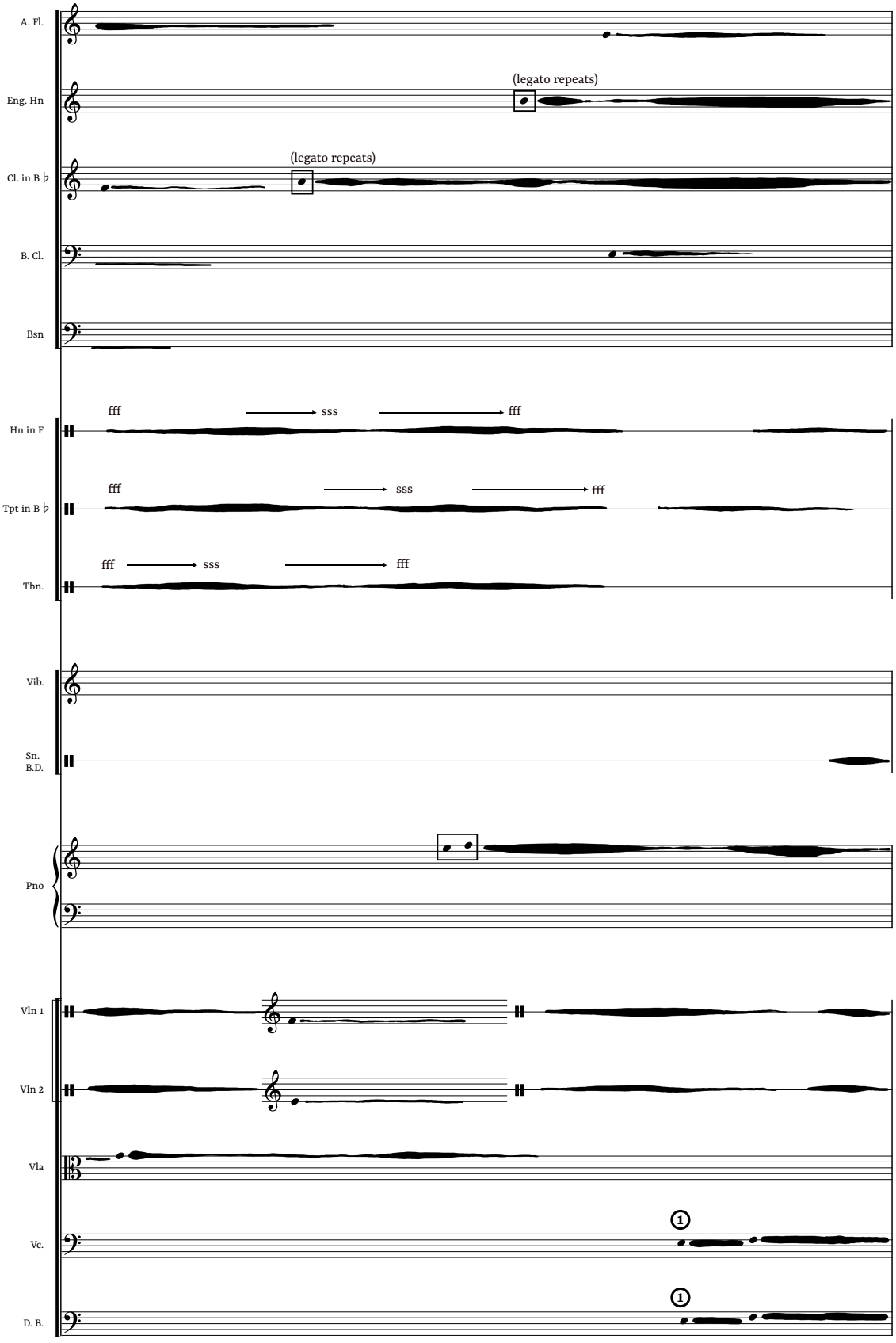

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
slowing
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.

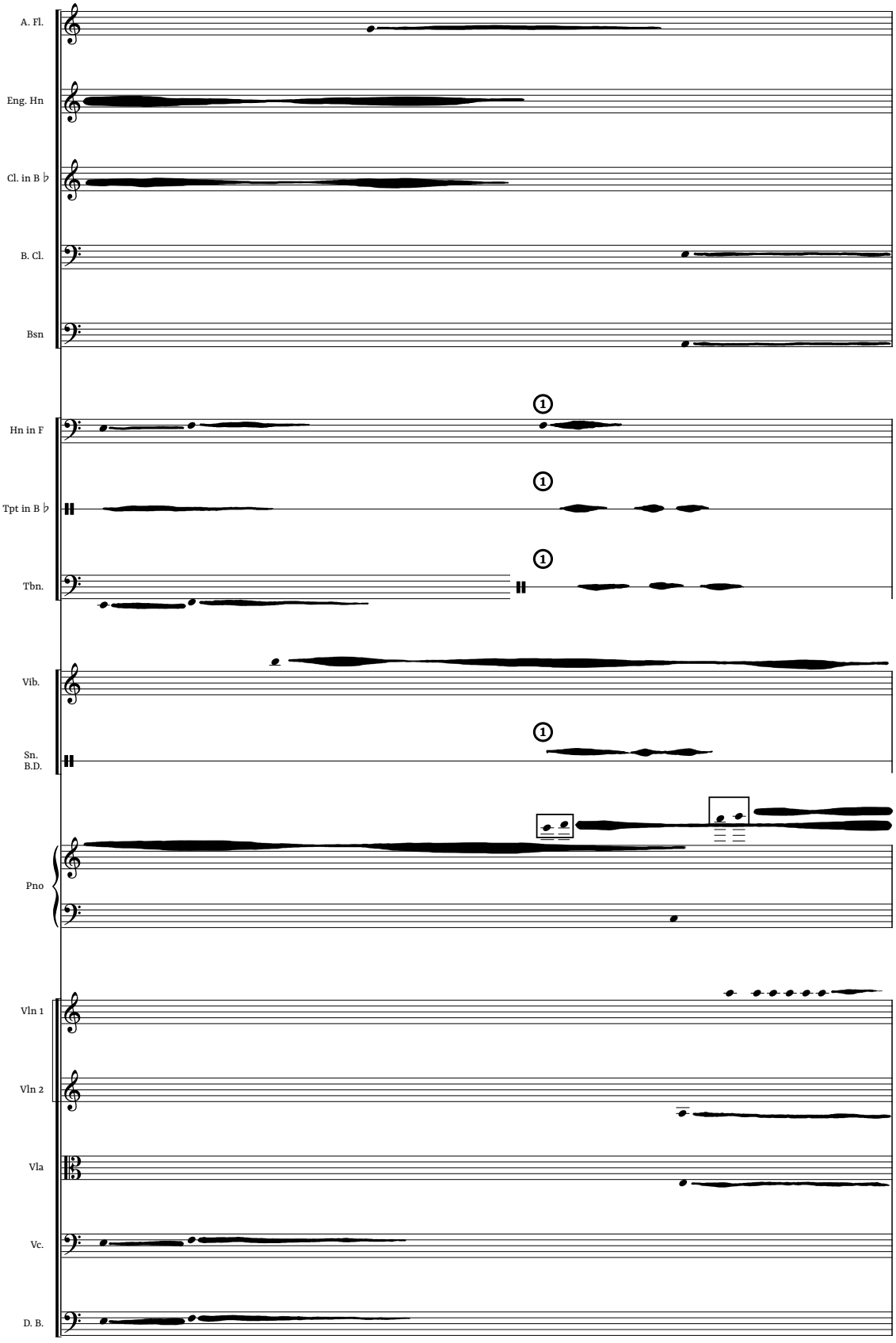

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
1
2
alternate hits with perc. 2
bass drum fast but quietly
alternate hits with perc. 1 kick drum fast but quietly
mute head if necessary to match tone
sul tasto
8va

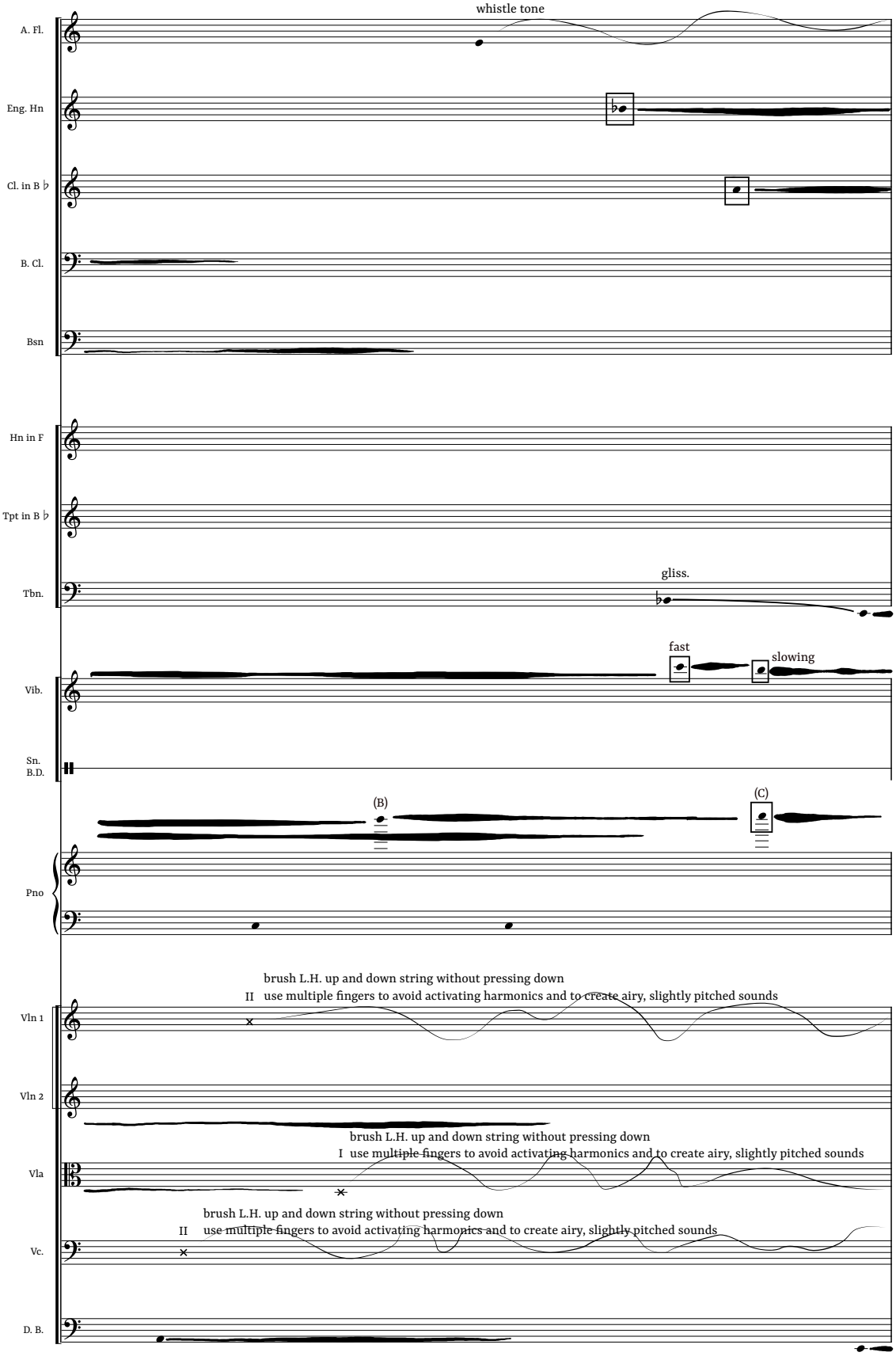

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
fff
∫ (**sh**e)
Hn in F
sss
Tpt in B ♭
fff
∫ (**sh**e)
Tbn.
Vib.
Sn.
B.D.
8va
Pno
8va
8va
8va
Vln 1
8va
8va
8va
Vln 2
Vla
Vc.
D. B.

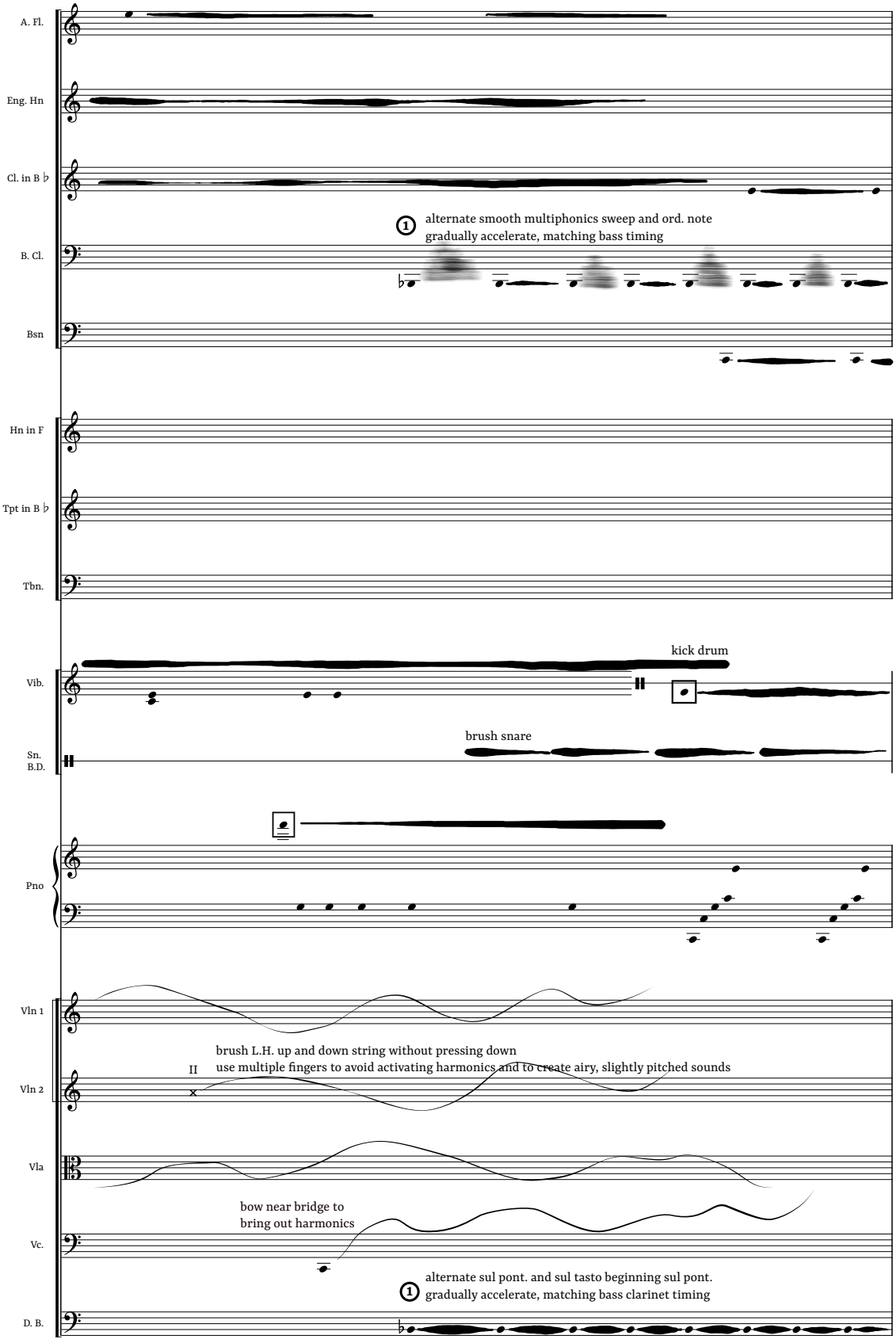

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
bass drum roll
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
bow bridge
bow bridge
sss
sss
sss

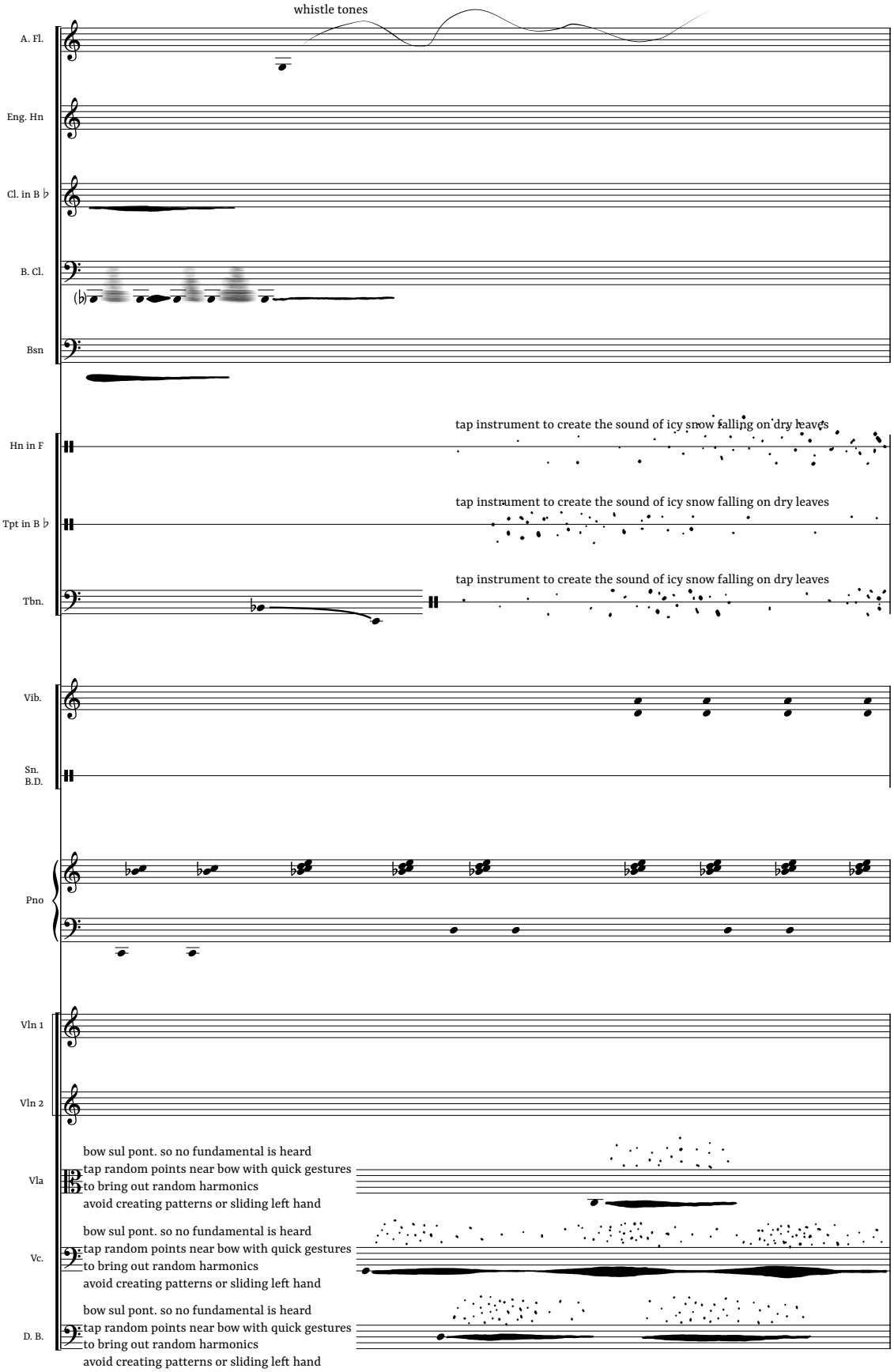

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
1 brush snare
2
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.

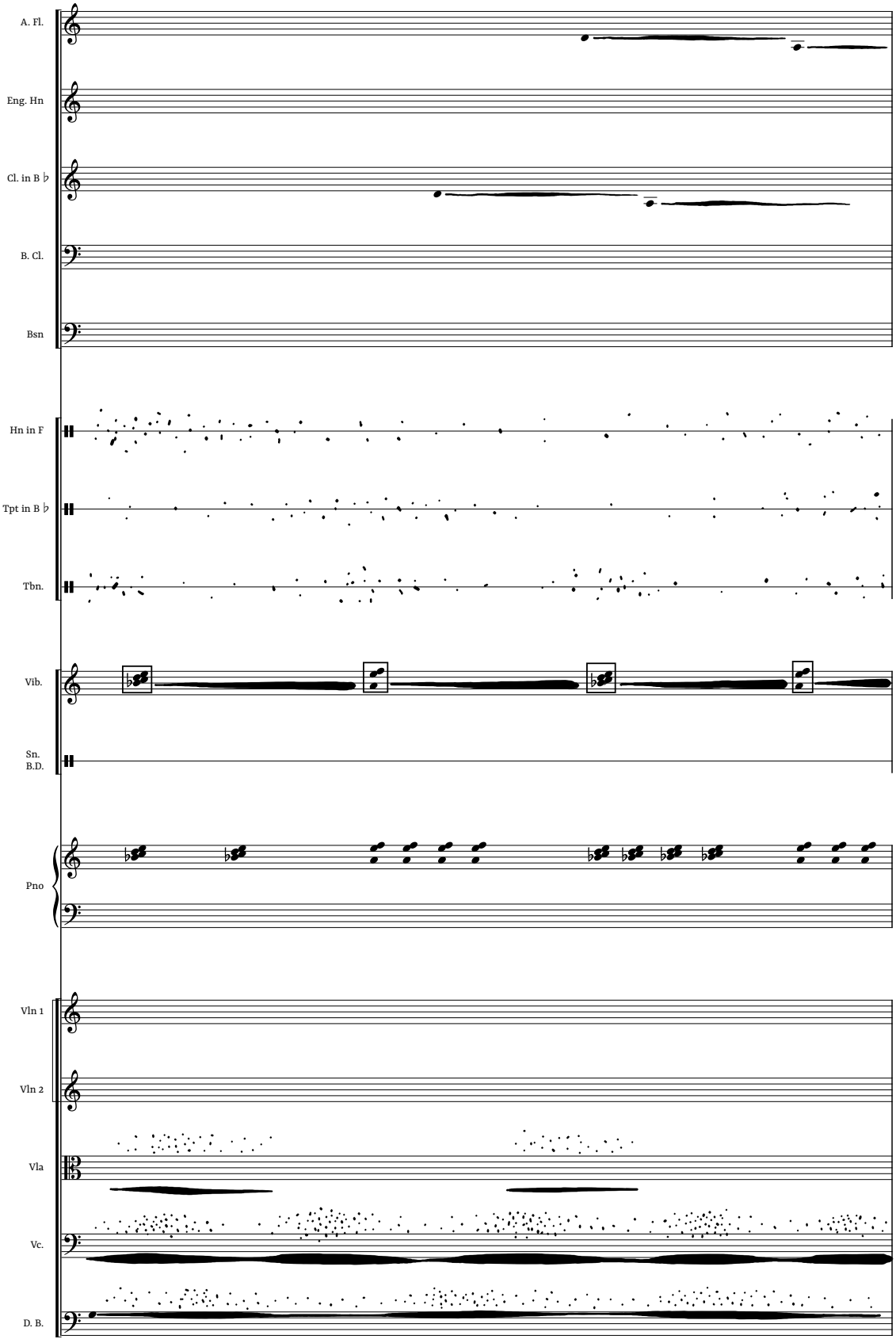

A. Fl.
Eng. Hn
(legato repeats)
Cl. in B ♭
(legato repeats)
B. Cl.
Bsn
Hn in F
fff
sss
fff
Tpt in B ♭
fff
sss
fff
Tbn.
fff
sss
fff
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
1
D. B.
1

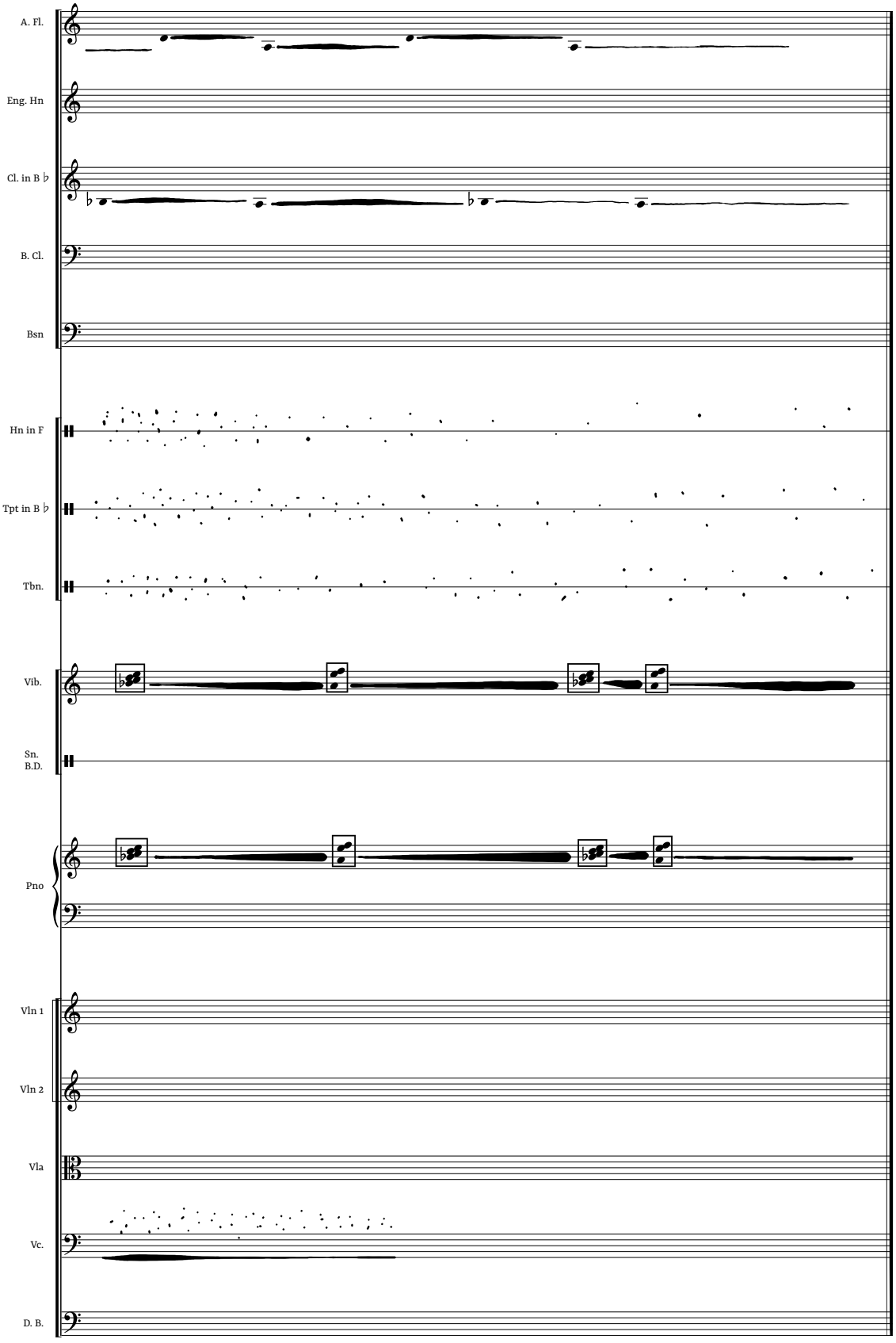

A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.


whistle tone
A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
gliss.
fast
slowing
Vib.
Sn.
B.D.
(B)
(C)
Pno
brush L.H. up and down string without pressing down
II use multiple fingers to avoid activating harmonics and to create airy, slightly pitched sounds
Vln 1
Vln 2
brush L.H. up and down string without pressing down
I use multiple fingers to avoid activating harmonics and to create airy, slightly pitched sounds
Vla
brush L.H. up and down string without pressing down
II use multiple fingers to avoid activating harmonics and to create airy, slightly pitched sounds
Vc.
D. B.


A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.
1 alternate smooth multiphonics sweep and ord. note
gradually accelerate, matching bass timing
kick drum
brush snare
brush L.H. up and down string without pressing down
use multiple fingers to avoid activating harmonics and to create airy, slightly pitched sounds
II
bow near bridge to
bring out harmonics
1 alternate sul pont. and sul tasto beginning sul pont.
gradually accelerate, matching bass clarinet timing


whistle tones
A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
tap instrument to create the sound of icy snow falling on dry leaves
Hn in F
tap instrument to create the sound of icy snow falling on dry leaves
Tpt in B ♭
tap instrument to create the sound of icy snow falling on dry leaves
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
bow sul pont. so no fundamental is heard
tap random points near bow with quick gestures
to bring out random harmonics
avoid creating patterns or sliding left hand
Vla
bow sul pont. so no fundamental is heard
tap random points near bow with quick gestures
to bring out random harmonics
avoid creating patterns or sliding left hand
Vc.
bow sul pont. so no fundamental is heard
tap random points near bow with quick gestures
to bring out random harmonics
avoid creating patterns or sliding left hand
D. B.


A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.


A. Fl.
Eng. Hn
Cl. in B ♭
B. Cl.
Bsn
Hn in F
Tpt in B ♭
Tbn.
Vib.
Sn.
B.D.
Pno
Vln 1
Vln 2
Vla
Vc.
D. B.