

4 | Instruments and Invention

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The study of composition necessarily involves some study of instruments. In order to write effectively for any instrument (acoustic or electronic), one needs to have an understanding of its method(s) of sound activation, pitch range, timbral characteristics, dynamic scope, and rhythmic limitations. While composers consult orchestration textbooks or online resources for some of this knowledge, it is also acquired through collaboration with musicians, hands-on experience with an instrument, and trial and error. In this way, organology, or the study of instruments, is an essential part of composition technique. Yet organology is also part of the creative process. With each new piece, the composer decides on a different approach to the chosen instrument(s) – which playing techniques to use, what physical gestures to emphasise, and even what objects should count as instruments to begin with. Instruments are inventions that enable us to invent.

This chapter examines the relationship between composers and instruments. More specifically, it is about how composers ‘get creative’ with the instrumental object, and how these small acts of subversion have a profound impact on both sound and meaning. A composer does exert their will upon instruments (and therefore the musicians); however, we can trace a less common narrative, one in which sound objects themselves provoke and facilitate experimentation. How do composers discover new sounds with old instruments? What conceptual priorities are evident when composers incorporate ‘external’ objects or processes into a piece? What are some of the motivations and objectives behind subverting traditional practices of writing for instruments? This essay focuses on externalised instruments rather than the voice or other body-based music-making. Also beyond its immediate scope are related topics of instrument design and digital instruments.

Composers and Organology

Several early twentieth-century cultural movements and figures set the stage for an organological framework of composition, wherein one’s

approach to instruments is as much a defining character of a piece as harmonic or rhythmic structures. The approach often correlates with the musical aim of discovering and revealing novel sounds. This modernist attitude is evident in Luigi Russolo's Futurist Manifesto *The Art of Noises* (1913). In the document, he advocates a radical overhaul of instrumental forces in order to better reflect the contemporary urban soundscape, calling for the 'joining and substituting of noises to and for musical sounds'.¹ Subsequent composers whose work features innovative approaches to instruments include Edgar Varèse, who envisioned music made boundless by technology, and American Experimentalists such as Charles Ives, Henry Cowell, Harry Partch, Conlon Nancarrow, and Lou Harrison. They were independently interested in alternative tunings and/or instrumental mechanism, further contributing to the rise of percussion in mainstream music-making. In the subsequent generation, John Cage composed with equal fervor for prepared pianos, silence, turntables, and vessels of water. His ground-breaking practice broadened many artists' receptivity to objects and techniques that are associated with non-Western and non-classical genres.

As Russolo dreamt of replacing the symphony orchestra with 'noise-machines', Erich von Hornbostel and Curt Sachs worked to organise and label existing instruments from around the world. The Hornbostel–Sachs music instrument classification system was first published in 1914, challenging the three traditional groupings of strings, winds, and percussion.² Instead, it assembles instruments according to sound-producing material: aerophones (air column), chordophones (string), idiophones (body of the instrument), and membranophones (membrane). Under these four broad categories, sub-categories describe how the material is activated, whether it is blown, struck, plucked, or manipulated with friction. Further descriptors (up to nine levels of hierarchy) refer to idiosyncrasies within each sound-making system, such as whether an aerophone is blown directly, like a flute, or by way of a vibrating reed, as with saxophones and oboes.

While there have been expansions and updates to the Hornbostel–Sachs system since its initial publication, such as the addition of electrophones in 1940, the four top-level categories still largely define how composers learn about and approach instrumental writing. Orchestration guides and a vast majority of the repertoire reinforce seemingly inextricable pairings of instrument and technique: strings are bowed or plucked, winds are blown, and keyboard and percussion are played with a striking action. Moreover, these resources expectedly focus on 'idiomatic' music as examples of good practice – writing that 'reflects what an instrument can

and cannot do, what it does willingly, and what it does reluctantly'.³ A harpsichord is unable to sustain notes, yet it can easily produce the illusion of continuous sound through rapid arpeggiation of chords. It perhaps more reluctantly creates *crescendi*, not by changing the actual volume of individual notes, but with increased density of texture. The limits of these instrument-technique pairings and musical idioms, though practical for typical use, fall short of describing the full extent of musicians' activities today and rarely account for moments of experimentation.⁴

The contemporaneous development of free-thinking Futurist ideas along with the rigid Hornbostel–Sachs classification system is perhaps symbolic of a perpetual tension that composers face. One strives to write idiomatic passages that are realistic to play, while simultaneously seeking out a personal way of composing for the instruments in the hopes of contributing something unique to the repertoire. In light of this, the act of subversion – disrupting the way instruments sound without rejecting them altogether – can be a dialectical solution to an age-old dilemma. The meteoric rise of digital technology at the turn of the twenty-first century, coupled with recent efforts to diversify and decolonise the field of contemporary classical music, further motivate a subversive approach to instruments.

Today, being creative with the instrument itself is part of a composer's task, whatever their musical style. This encompasses a variety of approaches, such as inventing a new technique, modifying the instrument, or using unconventional objects. All these endeavours typically fall under two strands of thought. The first method attempts to expand the musical vocabulary of an existing instrument: extending its pitch range, thwarting the expected method of sound production, and/or prioritising noisy timbres over pitch. The second method is more conceptual, broadening the definition of what is musically 'useful' in a composition. This includes expanding the roles of 'non-musical' objects, such as audio equipment and toys, into the realm of 'instrument', as well as showcasing sounds that are usually considered residual by-products of music-making.

Expanded Vocabulary

Experimentation with instruments can be motivated by challenging the technical bounds of pre-existing works. Although it is overly simplistic to generalise that older music is conservative while newer music is experimental, the development of certain techniques can be traced in a linear

fashion within the Western classical repertoire. For example, the upper range of the violin has been increasingly explored over the centuries, particularly through the use of natural and artificial harmonics. Even as Niccolò Paganini's *24 Caprices* (1802–17) for violin set new standards for high notes in the early nineteenth century, the first movement of Salvatore Sciarrino's *Sei Capricci* (1976) 'one-ups' the frequency domain, reinterpreting Paganini's first caprice through harmonics only. In Sciarrino's rendition, rhythmic gestures and contours are preserved while the notes shimmer over an octave above the original pitches. Of course, new techniques, sounds, and musical priorities develop alongside broadening skills of performing musicians. Luciano Berio's series of *Sequenzas* is a paradigm of this interdependence of risk-taking between composers and performers. Developed for and dedicated to specific collaborators, each work integrates 'extended' techniques into solo works of unparalleled virtuosity.

Certainly, extending the upper range of an instrument is the more obvious direction of exploration. This is partially due to acoustics: the fact that an infinite number of overtones vibrate over a single fundamental pitch, limited only by the range of human hearing. In contrast, the opposite task of extending an instrument's lower range is seemingly impossible without altering the physical size of the resonating body. However, with sensitive ears, tenacious practice, and a bit of imagination, this 'impossibility' can be achieved and reproduced with consistency. What follows are examples of techniques that allow the instrument to sound lower than its 'lowest' note.

Subharmonics coax the violin to produce pitches up to a full octave below G₃ without detuning the string. They were developed in 1993 by violinist and composer Mari Kimura, who initially discovered the ultra-low sounds while riffing on a pedagogical bowing exercise. She has since refined and articulated the technique for wider usage by other performers and composers. The technique consists of manipulating bow pressure and speed so that the bow exerts an even amount of weight on the string across an entire stroke. Pitch shifts within this acoustic zone from G₃ down to G₂ are managed with changes in bow location relative to the bridge.⁵ Due to this unique activation method, the resulting timbre is intense and nasal, quite unlike the *cantabile* tone commonly associated with violin playing. Thus, subharmonics not only provide new notes with which to compose, but also the potential for a different kind of emotional expression.

For Kimura, going beyond the conventional pitch range of an instrument is also about subverting classical music stereotypes – of what the music should sound like and also who is making it. In the notes from her

debut recital of this technique in 1994, she writes, 'I wanted to free myself from the boundaries of Western musical idioms, associated with traditional violin literature, to reflect my own Japanese heritage in my compositions.'⁶ Despite having a rigorous classical training, Kimura's creative practice challenges the 'ever-higher' type of virtuosity by heading in the opposite direction altogether. In fact, this is made clear in her 2010 album 'The World Below G and Beyond', which features her own set of *Six Caprices for Subharmonics*.

To extend the low range of wind instruments, one could use an auxiliary instrument (e.g. switching from oboe to Cor Anglais) or extend the length of the resonant tube with a hollow prop. However, there is a less unwieldy method. Certain fingerings on the bassoon enable perceived pitches as low as F1: a perfect fourth below its 'lowest' note of B \flat 1. These are 'sounds with a missing fundamental', a psychoacoustic phenomenon where one's brain constructs the fundamental below a collection of higher frequencies recognised as its harmonics.⁷ On the bassoon, this technique consists of omitting various keys from standard fingerings to produce complex multiphonics. These sounds 'trick' the ear into hearing low fundamentals that are not actually present.⁸ In Timothy McCormack's *Body Matter* for amplified bassoon (2014–15), written for Christopher Watford, the ultra-low sounds function as guttural outbursts at moments of dramatic climax. For McCormack, the idea of 'amending' standard fingerings serves as the foundation for investigating a 'soundworld caught in the middle of a metamorphic shift'.⁹ This transformation also occurs in the performer's body as they navigate intricate and complex maps for the bassoon key interface.¹⁰ *Body Matter* uses an elaborate hybrid score with tablature elements to convey deviations from standard practice – departures that, for the performer, are both sonic and haptic.

While range-extending techniques for violin and bassoon expand *what* can be achieved on these instruments, they do not radically change *how* the instrument is played. Subharmonics are still produced by dragging the bow along the string, and any multiphonic fingering is latent in the bassoon's keywork, waiting to be sounded through blowing through the instrument. What happens if one challenges how the instrument is 'supposed' to be played? One option would be to borrow the conventional sound activation method of a particular instrumental family and apply it to another group: striking wind instruments percussively, bowing parts of the piano, or singing into a drum. In this category of techniques, previously described instrument-technique pairings are intentionally decoupled. The following

examples discuss friction techniques within the realm of percussion, expanding the expressive vocabulary of that instrumental family.

Western orchestral percussion instruments such as timpani and snare drum are not designed to vibrate through friction. They are designed for a striking action, where the percussionist's main task is to attend to the beginning and end of a sound. Once a note is played on the marimba with a standard mallet, the sound begins to decay instantly. Since the instrument's resonators delay this deterioration, the player might choose to dampen the note early. String players, on the other hand, spend most of their efforts managing the middle of a note, or its sustain. They achieve various tone qualities, from wispy to rough, through different combinations of bow speed and pressure.

Anna Thorvaldsdottir's *Aura* (2015, rev. 2017) transfers these concerns of speed and pressure to percussionists, along with a new awareness of pitch space and instrument geography. The work uses multiple friction techniques to create an evocative, singing quality in percussion instruments. The opening bars feature a tam-tam rubbed with a superball mallet, followed by a bass drum activated with two bows to produce a 'deep droning sound'.¹¹ This musical layer is also orchestrated with white noise (from brushes and hands on the skin of other bass drums), as well as an ethereal low F3 from bowed vibraphones. Thorvaldsdottir thus achieves a haunting chorus of sounds through several blended timbres. Applying friction to 'unpitched' percussion such as tam-tam and bass drum has other consequences. These instruments temporarily occupy 'pitched' space, albeit a rather unstable and microtonal one. Their notes clash with more precise, equally tempered pitches of the vibraphone and bells, further contributing to the highly nuanced soundworld of *Aura*. Gesturally, friction techniques require experimentation in order to attain the desired sound on different surfaces, specifically the negotiation of speed versus pressure. Too little pressure and no sound results, while low speeds render discrete clicks rather than a smooth tone. New spatial areas on the instrumental body also come into play. Activating the bass drum with a superball mallet requires the percussionist to trace a continuous path on the drum-head, venturing beyond and between typical strike points.

Such varied applications of friction percussion in Western art music, as in Thorvaldsdottir's piece, clearly stem from an experimental mindset. New methods continue to be explored on various objects and instruments, with different implements of activation ranging from the bow to special mallets and hand techniques. However, friction drums, as a specific category of instruments, are neither new nor restricted to the Western

classical tradition. These membranophones are rubbed directly by hand or through an attached stick or string (e.g. 'lion's roar'). They are prevalent in folk traditions from around the world reaching back to ancient times, manifesting as the Italian *caccavella*, Brazilian *cuica*, and many others.

The distinctive sound of folk friction drums surely prompted the investigation of friction on orchestral percussion instruments. Amadeo Roldan's *Ritmica* No. 5 for percussion ensemble (1930) features friction sounds directly inspired by Afro-Cuban instruments. The timbre's cross-over from folk music traditions to contemporary concert music was further accelerated by popular Hollywood film scores of the ensuing decades. In Jerry Goldsmith's 1968 score to *Planet of the Apes*, there are many notable moments for the friction drum. During 'The Hunt, Part 2', stuttering groans of the friction drum depict an uneasy calm within the strangeness of Ape City after the preceding violence of the humans' capture.¹² Such creative effects were developed in part by Emil Richards, percussionist in the original soundtrack (as well as thousands of other films). In fact, there is a commercial series of superball mallets created by Richards himself, a lasting acknowledgement of the spontaneous atmosphere of studio recording and its evocative sonic results.

Finally, instruments can be made to vibrate in a myriad of ways that prioritise noise over pitched sounds. Just as previously 'unpitched' percussion instruments can be made to sing, strings, winds, and keyboard instruments can also express with non-*cantabile* behaviours such as whispering, creaking, or clicking. Helmut Lachenmann is perhaps the composer best known for broadening the vocabulary of unpitched sounds for orchestral instruments. Since the 1950s, he has tasked himself with 'confronting the norm' – not only of musical sounds, but also of beauty, a concept that for him 'had become not [only] idealised but stylised'.¹³ A particularly rich library of noises can be found in his string writing, ranging from whispers of white noise to 'Lilliputian snoring of great purity and charm',¹⁴ which results from high bow pressure and reduced bow speed. Lachenmann's string techniques include modified versions of conventional playing as well as newly invented gestures. Within the latter category, examples include bowing areas other than the strings (on the bridge, pegs, tailpiece), and 'vertical' bowing perpendicular to the bridge. This 'play' with the bow can go even further: in *Toccatina* for solo violin (1986), the player is tasked with 'dabbing' the strings with the screw of the bow where the left hand would normally stop notes. The resulting sound is a metallic ping unlike any other, while the bow standing vertically out of the instrument is an

arresting visual effect. Lachenmann's output sets an important precedent for critical encounters with any instrumental mechanism.

For Liza Lim, expansion of musical vocabulary into the realm of noise is a conscious reaction to the destabilising experiences brought on by the Anthropocene. She frames the subversion of conventional playing methods as a 'radical idiomaticity' – to embrace all types of sounds by 'both following and pushing against the natural resonances and resistances in instruments'.¹⁵ If pitched-focused music epitomises a certain period of human achievement, then noises represent the prehistoric soundscape as well as that of an uncertain future that we must soon reckon with. Noises allow different instruments and objects to communicate through a common sonic language.¹⁶ In the last movement of *Extinction Events and Dawn Chorus* (2018), this language is decidedly not human. While the movement opens with a tentative melody improvised on kazoos, 'this trace of human voices is finally subsumed by a chorus of spinning *waldteufels*, creating the inhuman chattering and ratcheting noises of an amplified fish-world'.¹⁷ At rehearsal C, a brass trio consisting of horn, trumpet, and trombone then enters with a strange 'fish call', imitating the *waldteufels*. Each instrument's short utterances are coloured with a variety of noises. The horn plays notes stopped percussively with the tongue while the trombone's tone is distorted with simultaneous singing. These 'noisy' techniques, along with placement in the extreme low register of the instruments, disguise the pitch content of the notes. Within the larger texture, the brass and percussion music now share a liminal zone, where the distinct origins of the sounds no longer define the listening experience.

Expanded Roles

Composers also experiment with instruments in a more conceptual way by adopting an inclusive view of things previously deemed 'non-musical'. These objects and sounds are usually considered residual by-products of music-making or external to music performance altogether. In other words, composers can first expand the definition of what is musically 'useful', then arrive at innovative sounds by way of a broadened instrumentarium.

To examine this approach, let us first look at musical instruments in the context of other objects. Consider a spectrum of increasing 'playfulness' with tools and toys placed at the extremes ([Figure 4.1](#)). Tools are designed to be used in a few prescribed ways in order to help humans to complete

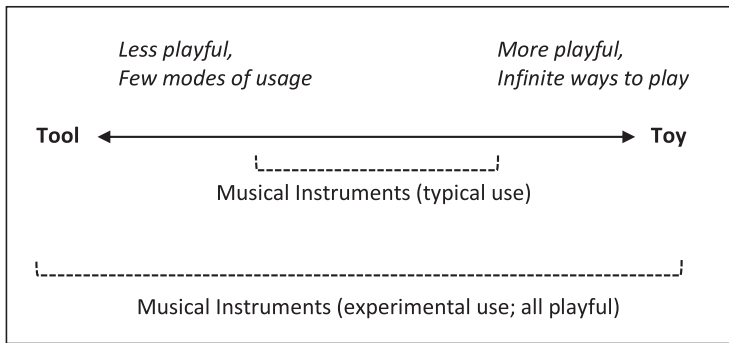


Figure 4.1 Conceptual rendering of musical instruments in relation to other objects.

a specific task. An electric drill has different speed settings and various sizes of drill bits, but all components serve the intended function of creating holes in a surface. Toys, on the other hand, exist to enrich our sensory experiences. While they can have suggested modes of play, the most captivating toys also allow for infinite variations of use and open-ended objectives. A set of blocks might be advertised for a specific result, yet in practice, children almost always ignore the instructions in order to manifest their imaginations.¹⁸ With conventional usage, musical instruments occupy a space on this spectrum somewhere between tools and toys. There are many accepted ways to play musical instruments; furthermore, the interpretive and creative will of musicians creates ambiguity in terms of what is ‘proper’ use. Yet there remain clear boundaries with what is ‘non-musical’, as well as a specific task: to perform music, and in the Western classical tradition, to execute written scores.

What defines a ‘tool’ versus a ‘toy’ is not the material object itself but how it is used.¹⁹ Children often transform adult tools by subverting their intended usage: a collection of drill bits can be anthropomorphised into toy soliders with a single twist of the imagination. In a similar way, composers have the ability to deliberately place audience perception of a sounding object along this spectrum. The transformational factor here is the attitude of playfulness, where even serious activities are done with a sense of flexibility and enjoyment. This creative stance ‘reambiguates the world . . . mak[ing] it less formalized, less explained, open to interpretation and wonder and manipulation.’²⁰ In other words, playfulness allows for an experimental approach, where tools, toys, and everything in-between can be made musical.²¹

A loudspeaker is usually seen as a piece of electronic equipment that passively transmits other sounds or music. Composer and sound artist Marianthi Papalexandri-Alexandri takes advantage of the mechanical properties of speakers, arriving at a radical re-interpretation of the object. In a series of sonic sculptures created in collaboration with Pe Lang, numerous miniature speakers are suspended from thin nylon threads, emitting intermittent clicks. The largest and most notable rendition, *Speaking of Membranes* (2014), has a cumulative sonic effect of popping corn kernels or a herd of bubbling sea creatures. Upon closer observation of the mechanical system, one realises that the speakers are activated acoustically, without any electronic input. The speaker membrane transmits a 'crackling impulse' when the attached string rubs against a rosined wheel that is turning very slowly.²² Papalexandri-Alexandri's approach to the speaker is subversive challenging the basic idea that a speaker needs electricity to have any meaningful application. Her work deploys playfulness as a disruptive method, 'revealing the seams of behaviors, technologies, or situations that we take for granted'.²³

Any inclusion of such 'found objects', such as these experimental settings for the loudspeaker, brings layers of conceptual meaning to their respective contexts. One must also remember that this act has audible consequences, as each object generates a unique set of musical parameters. Even though the sounds in *Speaking of Membranes* are lacking in pitch content, each click has a particular timbre, duration, and dynamic. This information affects orchestration decisions – to determine the number of speakers needed to create the desired effect, as well as their spatial arrangement.

When composers incorporate toys into an instrumentation, the silly aspects of play collide with the seriousness of the concert experience. As a result, these pieces can take on heightened political meanings. Mauricio Kagel's highly theatrical *Match* (1964) uses common associations of toys and games to guide the narrative drama. Scored for three players, the percussionist acts as referee for an imaginary ballgame between two cellists. While the cellists exchange blows with a dizzying array of advanced string techniques, the percussionist attempts to control their behaviour through silent gesturing and musical interjections, many of which come from sound-making toys.²⁴ The sonic signatures of these toys represent different psychological tactics employed by the 'referee', ranging from bullying willpower (blowing police whistle), to blasé encouragement (twiddling a Chinese clatterdrum), to leaving it up to chance altogether (throwing a set of dice). Kagel's noisy trinkets in *Match* are not completely divorced

from the act of innocent play. But as props of the musicians' interactions with each other, the instruments also 'become symbols of the performer's power.'²⁵

For Hannah Kendall, the music box's image as an innocent toy is key to its power as a 'polarising technique'.²⁶ Mechanical toys such as the music box are highly approachable, 'mesmerizing because they are frames of the otherness, because they are tiny worlds that operate by their own condition'.²⁷ With soft dynamics and a twinkling timbre, the music box is Kendall's ideal envoy to subtly insert 'otherness' into a Western classical framework. In addition, its mode of operation defies traditional virtuosity as a necessary component for contemporary music. It is operated with a simple turn of the crank, semi-automatic, and requires no specialisation.

In *Where is the chariot of fire?* (2021), Kendall uses the music box to embed 'You are my Sunshine', 'Carrying You', and the spiritual 'Deep River' within an orchestral texture. These songs are set in conversation with Lemn Sissay's poem 'Godsell' (from which the title is derived) and its violent imagery of plague, fire, and betrayal. The music box's initial contribution is an ironic statement, where the pianist plays the two cheery songs against an angular cello solo and ensemble utterances of increasing agitation. The final appearance, executed by a violinist at 'slow-medium turn speed', is more poignant but still veiled. 'Deep River', with its references to the horrors of slavery, is presented underhandedly to the listener – through the music box's soft, pleasant sound and in harmonic dissonance with surrounding textures. The object's innocent reputation and unassuming timbre work in tandem with the songs' simplicity (monophonic/diatonic) and semantic meaning. These facets serve Kendall's 'creolisation' of the orchestra in both musical and political ways, subverting its ideals of optimal resonance and high-brow complexity while also reminding audiences of alternative histories and overlooked peoples.²⁸

Sounds themselves have functional or playful associations that can be interpreted along the aforementioned spectrum. For example, all musicians create sounds from practical tasks that are not necessarily part of the music: the clatter of marimba bars as they are unhinged from the frame, the cacophony of an orchestra warming up, the rhythmic inhalations of cueing pick-up beats, and so on. Composers readily use these 'found sounds' from players, instruments, and musical accessories as creative fodder.

The three *intermezzi* in Hans Abrahamsen's *Schnee* (2008) magnify and develop the process of tuning. Each interlude slightly lowers the pitch of an instrumental subset, causing microtonal relationships to proliferate within the overall ensemble of nine players. As a result, the music increasingly

deviates from standard equal temperament tuning. Using a seventh-partial cello harmonic as reference, *Intermezzo I* first asks the horn to adjust their pitch accordingly, ultimately sustaining a 'tuning A' that is 1/6 tone lower than usual. The trio of strings (violin, viola, and cello) then spends several seconds (de)tuning their open strings to the new A before continuing onto the next three canons at this lowered pitch. The subsequent interludes depict practical details of string and woodwind tuning, respectively. In *Intermezzo II*, the strings replicate a common practice of checking tuning using octave harmonics, while in *Intermezzo III* the instruments tune using their lowest note (piccolo) or notes with the most open and closed fingerings (E \flat clarinet). The final canons ('5a/b') showcase the results of this process, with three distinct layers of tuning. The pianos remain at equal temperament, piccolo and E \flat clarinet are 1/6 tone lower, while violin and viola are 2/6 tone lower. The canonic syntax of *Schnee* is an optimal environment to audibly perceive this pitch 'smearing', given the motivic imitation that occurs between instruments at original pitch and those that are altered. Thus, the mundane task of tuning informs both large-scale formal and long-term pitch structures.

The striking sounds of Sky Macklay's *Choppy* for reed quintet (2017) are informed by a gesture that is equal parts mundane and mischievous. After a boisterous introduction, the oboist and bassoonist are asked to remove the reed from the instrument and 'throw reed into the water near the surface/causing chaotic bubbles and gurgles'.²⁹ A small container of water is a normal tool of the trade; all double reed players have it nearby to prevent their reeds from drying out. While most musicians might only think to blow bubbles into the water as a joke, Macklay's knowledge of this sound comes from her experience as an oboist in free improvisation and open score settings.³⁰ Codifying this act of 'playing with the reed water' using precise rhythms, relative pitches, articulations, and expressive markings, establishes its musical potential. Macklay integrates this 'intriguing, unwieldy, and exciting' sound by pre-emptively orchestrating it, following spectral ideas of acoustic resynthesis. Immediately before the appearance of the 'reed water music', the single reeds (B \flat clarinet, bass clarinet, alto saxophone) rapidly cycle through fingering patterns while overblowing, creating a similarly high-pitched, gargling texture. With the image of choppy waters in mind, Macklay literally brings in agitated liquids and takes them through a compositional process of 'creatively orchestrating the ways that those waves clash and distort each other'.³¹ The irreverent humour of *Choppy* further reinforces the role of playfulness in experimentation.

Conclusion

The appearance of so-called ‘extended’ techniques in a piece rarely shocks or surprises the listener today. After all, ‘Musical play and playful music take shape in the spaces that open up between sign and sound, instruction and execution, the probable and the implausible, the permissible and the imaginable.’³² In an age where almost anything can be converted into digital data, these spaces for experimentation are wide open. That an instrumental technique deviates from convention is less interesting than the *why*, a composer’s individual reasons for taking a certain approach. Whether it is pursuing virtuosity or giving voice to previously oppressed ideas, investigating these motivations allows each kernel of sound some context for greater meaning. In addition to invaluable input from performers, experimental instrumental practices develop in dialogue with a variety of subdisciplines, including non-Western traditions, film music, installation/sound art, and free improvisation. An organological approach to composition challenges the social hierarchies embedded in music-making, turning associated highs and lows into fluid, transitional zones. Violins are free to explore high frequencies exclusively through noise or fulfill the musical roles of a ‘low’ instrument through Kimura’s technique of subharmonics. Papalexandri-Alexandri’s speakers take on literal and metaphorical lightness, while Kendall’s music boxes bear a heavy burden of meaning. Subversion of traditional instrumental practice, then, is simultaneously protest and play.

Listening List

<https://shorturl.at/jDHL5>

Notes

1. Luigi Russolo, *The Art of Noise*, trans. Robert Filliou (California: Ubu Classics, 2004 [1967]), 11.
2. Hornbostel–Sachs takes up a similar four-category scheme introduced by Victor-Charles Mahillon in 1880, which was possibly informed by the *Nāṭyasāstra*, an Indian treatise from the fifth century. See Deborah Lee, ‘Hornbostel–Sachs Classification of Musical Instruments’, *Knowledge Organization* 47 (2020), 72–91.
3. Jonathan De Souza, *Music at Hand: Instruments, Bodies, and Cognition* (Oxford: Oxford University, 2017), 77.

4. For a thorough critique and proposed alternatives to the Hornbostel–Sachs system, see Cristina Ghirardini (ed.), *Reflecting on Hornbostel–Sachs’s Versuch a Century Later* (Venice: Edizioni Fondazione Levi, 2020).
5. Mari Kimura, ‘How to Produce Subharmonics on the Violin’, *Journal of New Music Research* 29/2 (1999), 178–84.
6. Edward Rothstein, ‘Review/Recital; A Violinist Tests Limits in Music of Her Time’, *New York Times* (21 April 1994).
7. Jan Schnupp, Israel Nelken, and Andrew King, *Auditory Neuroscience: Making Sense of Sound* (Cambridge: Massachusetts Institute of Technology Press, 2011), 98.
8. See Ben Roidl-Ward, ‘Multiphonic-a-Day Episode 5: The Case of the Missing Fundamentals’ (for *Vince DiSantis*), (2020), www.youtube.com/watch?v=oxaiBOhGWTE (accessed 21 March 2022); also Trent Jacobs, ‘Extended Low Register Fingerings’ (2015), www.tjbassoon.com/2015/03/27/extended-low-register-fingerings/ (accessed 27 March 2022).
9. Timothy McCormack, (programme notes) *Body Matter* (self-pub., 2015).
10. McCormack discusses his relationship to the bassoon’s complex mechanism in Ben Roidl-Ward, ‘Multiphonic-a-Day Episode 19: An Interview with Timothy McCormack’, (2020), www.youtube.com/watch?v=s4HNNiCbOu0 (accessed 5 April 2022).
11. Anna Thovaldsdottir, (programme notes) *Aura* (New York: Wise Music Classical, 2017).
12. ‘Jerry Goldsmith’s Planet of the Apes’, *Academy of Scoring Arts* (2018), www.scoringarts.com/eventlibrary/jerry-goldsmiths-planet-of-the-apes (accessed 4 May 2022).
13. David Alberman, ‘Abnormal Playing Techniques in the String Quartets of Helmut Lachenmann’, *Contemporary Music Review*, 24/1 (2005), 41.
14. Alberman, ‘Abnormal Playing Techniques’, 43.
15. *Ibid.*
16. Liza Lim, ‘An Ecology of Time Traces in *Extinction Events and Dawn Chorus*’, *Contemporary Music Review*, 39/5 (2020), 544–63.
17. *Ibid.*
18. Sidney Brower, ‘Tools, Toys, Masterpieces, Mediums’, *Children’s Environments Quarterly*, 1/2 (1984), 7–8.
19. For a comparative analysis of scientific versus musical instruments, see John Tresch and Emily Dolan, ‘Toward a New Organology’, *ORISIS*, 28 (2013), 278–98.
20. Miguel Sicart, *Play Matters* (London: Massachusetts Institute of Technology Press, 2014), 28.
21. For more on ludomusicology, see Roger Moseley, *Keys to Play: Music as a Ludic Medium from Apollo to Nintendo* (Oakland: University of California: 2016).

22. Marianthi Papalexandri-Alexandri, 'Speaking of Membranes' (2015), www.vimeo.com/117043997 (accessed 21 April 2020).
23. Sicart, *Play Matters*, 29.
24. Björn Heile, *The Music of Mauricio Kagel* (London: Routledge, 2016), 46–9.
25. Heile, *Mauricio Kagel*, 49.
26. Hannah Kendall, email correspondence, 20 May 2021.
27. Sicart, *Play Matters*, 43.
28. Kendall, e-mail correspondence.
29. Sky Macklay, (programme notes) *Choppy* (self-pub., 2013).
30. Sky Macklay, email correspondence, 20 July 2021.
31. *Ibid.*
32. Moseley, *Keys to Play*, 16.