

#2

INSTRUMENTAL INFRASTRUCTURE: SHEET MATERIALS, GESTURE AND MUSICAL PERFORMANCE

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Thin sheets of material are suspended and placed around the space: tracing paper, silver acetate and aluminium panels. Smaller aluminium panels rest on low plinths, overlapping but not touching one another, surrounded by layers of tracing paper laid beneath them. Before being sounded they are still, flat, bright. The flat panels are first activated by rice dropped in single grains, and then cascades. The paper is touched with fingertips and nails, swept and rustled, before being scrunched and dragged across other material surfaces. The larger aluminium panels and acetate sheets are suspended vertically, hung like mirrors in two rows. Speakers placed behind these hung materials project prepared electronics and acoustic sound. Miniature microphones hidden at the performer's wrists are brought close to the sheets of material, tracing lines and shapes on their surface, first simply picking up otherwise inaudible frequencies before later being used to induce feedback loops with speakers set behind the hanging layers of aluminium and acetate. Sound itself activates the acetate sheets, which tremor and rustle: they are sounded by sound. Shards of reflected light are thrown around the space, making sound vibrations visible. A performer moves between the corridors created by the hung materials that make up this instrumental infrastructure, glimpsed between the mirrored panels as they are sounded using hands, mallets, superballs. The flickering light now resembles rippling water as the performer moves forwards. Half hidden from view, a single sheet of tracing paper is folded into an origami paper boat and placed in the fading pool of rippling light.

2.1 Introduction

Over the past 20 years, themes of practice focused on rapidly expanding the *tools* (instruments, objects, materials), *medium* (composed music, performed sound) and *methods* (collaborative practice, compositional practice, performance practice) of music creation

and performance have become central to new Western art music. An increasingly significant theme of practice is the musical use of both sonic and non-sonic materials in the development of new work. Ciciliani suggests that this is driven by artists who are ‘working from the understanding that sound alone is no longer sufficient to express their musical ideas’ (Ciciliani, 2017, p. 24), yet still seek to root their work in musical practice (Walshe, 2016). It is particularly apparent in works with interdisciplinary or intermedial influences. As new compositional and performance practices exploring the sonic/non-sonic have developed, in some works an entanglement of material roles has taken place. In these works, materials that are used instrumentally are also used as infrastructure or props, or even as notation.¹ In a number of percussive works, the distinction between instrumental object and implement (or mallet) is also less clear. This entanglement of roles is a key feature of an approach I refer to as ‘post-instrumental practice’.²

The opening paragraph of this chapter describes *Permeating Through the Pores of Shifting Planes* (2019) by Annie Hui-Hsin Hsieh. *Permeating Through the Pores of Shifting Planes* (hereafter *Shifting Planes*) was commissioned for *Sheets of Sound*, a percussive performance project by Louise Devenish centred around the use of sculptural instrumental installations in combination with electronics.³ Although some standardized percussive items were permitted, the exploration of non-standard instrumental materials was prioritized. The starting point for *Shifting Planes* included exploration of the instrumentality of various sheet materials, from both a sonic and a non-sonic perspective. Three questions guided the development of the work: When using unfamiliar instrumental materials of varying scale, how does the relationship between the visual and the auditory change? How can performative gesture be used as compositional material when using large instruments distributed around a performance space? How can sheet materials fulfil plural roles on stage (instrument, infrastructure, prop, mallet, etc.)?

2.2 Instrumental sheet materials

Shifting Planes used a range of sheet materials including paper, silver acetate, and aluminium, as shown in Figure 2.1. The core of the setup was eight custom-made aluminium panels, cut at random in either square or rectangular sections from a 5 mm thick aluminium sheet. The four smallest panels were placed horizontally on plinths towards the front of the space, with several large sheets of tracing paper placed in layers beneath them. Upstage, the four larger panels were suspended vertically. Behind the suspended panels were four sheets of acetate, each concealing from view a large speaker on a stand.

¹For examples of instrumental infrastructure, see Ash and Adam Fure’s *The Force of Things: An Opera for Objects* (2017) or Matthias Schack-Arnott’s *Everywhen* (2019). For an example of materials used simultaneously as instrument, infrastructure and implement, see Kate Neal’s *Never Tilt Your Chair Back* (2017). For an example of instruments as notation, see Enrique Tomás’ *Tangible Scores* (2014–2018) or Mark Applebaums’s *Straightjacket*, movement 4: *Taquinoïd* (2009).

²This forms the basis of my Australian Research Council project ‘The role of post-instrumental practice in twenty-first century music’ (2020–2023).

³Other works commissioned for this project include *Percipience: After Kaul* (2019) by Louise Devenish and Stuart James, and *Catacomb Body Double* (2019) by Matthias Schack-Arnott. The premiere was presented by Tura New Music, with funding support from the Australia Council for the Arts.



Figure 2.1: *The instrumental setup of Permeating Through the Pores of Shifting Planes (Photo: Nik Babic, 2019, CC BY)*

The randomized sizes of the aluminium panels formed a unique and specific pitch set, with each panel capable of producing a different range of frequencies depending on how and where on their surface or edges they were activated. For example, the largest panel produced a clear, low frequency when struck in the centre with a soft mallet, as well as very high, sparkling frequencies when struck on the edge with a thin metal beater at a 90-degree angle. The various materials themselves encouraged different application of tools, techniques and movements to each sheet, further diversified by how they were set up, which is shown in Table 2.1. In addition to the usual percussive techniques of striking, rubbing, shaking, scrunching and dropping, the sonic palette was expanded further through the use of microphones and loudspeakers to incorporate non-contact, gestural activation techniques.

The use of microphones and loudspeakers as musical instruments is now a common practice, with numerous works using only these materials as their instrumentation. The evolution of this practice and associated repertoire has been well documented (van Eck, 2017), and is common enough within percussive practice that the musical use of microphones and loudspeakers has been included in recent pedagogical texts focused on percussive implements (Dierstein, Roth, & Ruland 2018). Notably, the use of small DPA microphones (such as the 4060 series of miniature omnidirectional microphones) attached to performers' wrists in performance is emerging as a standard 21st-century percussive technique, as microphones placed at the wrist facilitate close microphone access

to sounds and sounding techniques at their source.⁴ This can be particularly effective in works exploring varied proximity to sound, and in works with large or distributed set-ups.

In *Shifting Planes*, DPA wrist microphones are initially used to access otherwise inaudible acoustic sounds produced by very small movements, such as the tactile sound of fingers brushing on paper. In the central section of *Shifting Planes* the fundamental tones of the aluminium plates are sounded using mallets or hands, before an additional, otherwise inaudible melodic line is brought forward from the decaying resonance using non-tactile gestures to guide the microphone across different areas of the panel to amplify a range of frequencies. This sound world was supported by an electronics part, that could be played with or against during this section. As both the wrist microphones and the four speakers sounding the electronics are hidden from view, the distinctions between who or what is making the sound become blurred. For a short section, the three types of sound-related gestures that occur in music performance—sound-producing, sound-accompanying or sound-tracing—occur simultaneously (Godøy, 2006, p. 154). Later in the work, the wrist microphones are used to stimulate feedback loops with the concealed speakers, created by the performance of gentle, specific gestures that are determined in rehearsal during tuning of the PA to the performance space. The resonance also activates the hanging acetate sheets between them, shown in Figure 2.2. The non-tactile means of activation enables the audience to hear the vibrating sheet materials without also hearing attack or friction sounds. As the microphones and speakers are concealed and the performer does not make contact with the acetate sheets, again it is not immediately clear who or what is making the sounds. Here, a ‘dance of agency’ (Pickering, 2012) between human, instrument, microphone and loudspeaker occurs, as the sonic result is not entirely controlled by either human or materials. This is further impacted by the acoustic of each space in which the work is presented, and is monitored by an off-stage technician during performance.

Godøy hypothesizes that ‘there is a continuous process of mentally tracing sound in music perception... mentally tracing the onsets, contours, textures, envelopes, etc., by hands, fingers, arms or other’ (Godøy, 2006, p. 149). Hsieh seeks to explore this notion in her work, and with regard to the development of *In Shifting Planes*, states ‘I’m very fascinated by the relationship between the visual and the auditory in performance. What am I seeing in the performance that informs me about what I’m hearing? How do you revert the expectation between *you-hit-something*, *you-hear-something*? What happens when you give a super big gesture, but the sound is almost inaudible [or vice versa]? Is that perceived as loud or soft?’ (Hsieh in Devenish, 2020). With these questions in mind, additional compositional materials were drawn from the gestural possibilities that emerged from the choices of instrumental materials and how these materials were arranged for performance.

During the creative development of *Shifting Planes*, it quickly became apparent that gestures and techniques that were effective on unamplified materials were ineffective when the microphones were used and vice versa. As choreographer Jonathan Burrows notes, ‘technique is whatever you need to do, to do whatever you need to do it’ (Burrows, 2010, p. 68), and for *Shifting Planes*, this meant drawing on and adapting established

⁴In addition to *Shifting Planes*, some examples of recent Australian percussion works using this technique include Matthias Schack-Arnott’s *Annica* (2016), and a number of the works in Speak Percussion’s *Fluorophone* project (2015).



Figure 2.2: *Non-tactile activation of the silver acetate sheets via microphone and loud-speaker feedback loops (Photo: Nik Babic, 2019, CC BY)*

percussive techniques, microphone techniques, performative gestures and everyday gestures to develop a set of techniques specific to this work, both in the composition and performance stages.

2.3 Gesture as compositional material

In addition to the materials themselves contributing to the design of the work, a significant part of the compositional process included analysis of the performer's movement and physicality used in video and audio recordings of previous performances. In both a pre-concert artist talk and an interview, Hsieh described her early compositional process as being guided by the natural and musical physical gestures I use in performance:

Studying gestures tells composers a lot about what [the performers they are writing for] prefer to do, how you approach scenarios, what your musical sensibilities are. Following someone's gesture is a way of understanding your musical choices, the intention behind the musical decisions you made, as well as a way of guessing how you move and which compositional ideas could work for this performer. How you move is a way of showing what you're thinking. (Hsieh in Devenish, 2020)

Gesture thus became a source of compositional material in *Shifting Planes*, providing a rich platform for exploration of perception of musical gesture and sound. The use of

Instrument	Implement	Activation method
Aluminium panel	Rice and small plastic beads	Dropped in single grains, and in small handfuls Poured from a bottle in cascades Bounced off a drumhead
	Mallets: Bass drum beater Yarn mallet Dreadlock mallet Superball	Struck Struck Struck (tips and shafts) dragged (surface and edge) Rubbed across reverse side of plates
	Hands	Fist Fingertips Nails
	Microphone feedback, electronic sound	Activated by vibrations from the loudspeakers
Tracing paper	Hands, nails, fingertips	Scrunched, folded, brushed
	Rice and small plastic beads	Bounced off the bell plates, brushed
	Dreadlock mallet	Dragged, caught
Acetate Sheets	Microphone feedback, electronic sound	Activated by vibrations from the loudspeakers
	Hands	Shaken gently

Table 2.1: *Activation techniques used on the sheet materials in Shifting Planes*

physical gesture as compositional material has been a cornerstone of percussion music for decades, cemented by the large body of instrumental theatre works composed for Trio Le Cercle in the 1970s and 1980s by composers including Mauricio Kagel, Georges Aperghis and Vinko Globokar. In recent decades, composers such as Jessie Marino, Natacha Diels and Jennifer Walshe have continued the trajectory of gesture as compositional material. Over time, the three primary methods for employing gesture in percussive music that have emerged are choreographic, tactile and virtual. Choreographic gesture does not directly contribute to sound making, in that it does not produce or capture sound, nor does it connect with any instrument other than the body. For example, Jessie Marino's trio *The Flower Episode* (n.d.) is a rhythmic group choreography of six hands, with most gestures not requiring the intentional production of sound. Similarly, Mark Applebaum's *Aphasia* (2010) and *Ceci n'est pas une balle* (2012) by Mathieu Benigno, Alexandre Esperet and Antoine Noyer require the performer to silently execute specific, precise gestures; however, in these works this is done in time with a pre-recorded tape. *Aphasia* is described by the composer as 'essentially a choreographed dance work' (Applebaum score 2010), with the gesture aligning with pre-produced sound, rather than generating live acoustic sound. In contrast, tactile percussive gesture is used to produce sound through connection with acoustic objects or instruments, or to capture sound from activated instruments using microphones, and these approaches are frequently used together. For example, in Juliana Hodkinson's *Lightness* (2015, rev. 2018), three percussionists strike matchsticks on ignition 'runways', rhythmically drag matchsticks across different grades of sandpaper, and precisely extinguish lit matches in small trays of water. The quiet, delicate, or proximal sounds that result from these gestures are captured by

wrist microphones worn as described above. Finally, virtual gesture is common in the performance of MIDI instruments or software programs which rely on sensors to capture specific performative gestures in space to activate electronic sounds or to trigger samples, such as Jean Geoffroy and Thierry de Mey's Light Wall System.

Gødoy observes that gesture-based control of digital musical instruments (DMIs) can be seen as an evolution of musicians' relationships to traditional acoustic instruments (Gødoy, 2006), and the roots of these techniques can be connected to standardized instrumental techniques. Although all of the works described above are frequently performed by percussionists, any musician or actor could perform these works. Marino refers to the kind of performance skills required for her work as a 'virtuosity of the everyday' (Marino, 2020), using performance techniques that foreground everyday human gestures. In *Shifting Planes*, everyday gestures such as pouring from a bottle, brushing materials off surfaces, standing before a mirror, and folding a simple origami paper boat are woven together with percussive and microphone gestures. This kind of blended performance practice requires another type of virtuosity common in new music, which I have previously referred to as a 'new virtuosity' (Hope & Devenish, 2020).

2.4 Instrumental infrastructure and notation

In *Shifting Planes*, the multidimensional role of the sheet materials emerges through their performance. The sheet materials used in this work first appear as a theatrical set, within which a performance will take place. As the work progresses, the materials on stage are transformed (via their use in performance) from stage infrastructure to musical instrument and back again. The varied roles of the instrumental materials and their engagement in performance is notated using a hand-drawn action score that included a combination of text instructions, pictographic representations of physical gestures, and limited elements of conventional music notation. *Shifting Planes* is scored on graph paper, with each unit representing five seconds, and is relatively sparsely notated. An excerpt of this score is shown in Figure 2.3. Hsieh believes that the composer is never really in control of physical gesture, and that 'the more important the gesture, or the more featured it is in performance, the less it should be notated' (Hsieh in Devenish, 2020), as everyone has a unique body and unique ways of moving.

Each of the three sections of the work comprise notations addressing gestures and actions that the performer should execute. The first section is entirely text based, with written instructions such as 'slowly tip out', 'gently swirl the remaining grains' and 'listen and react to the texture heard in the fixed media'. The second section introduces line-based pictographic notation, which depicts gestures to be 'drawn' on the surface of various sheet materials using a range of indeterminate implements. Line-based gestures and their position on a surface or in space can be easily notated, either on standardized five-line manuscript or using graphic notation. It is particularly useful for music not bound by pulse or metre—that is, led by listening, movement and play. The act of drawing or tracing lines or outlines on surfaces or in space as a means to elicit sound appears in a range of ways in the percussive repertoire. For example, lines can be executed rhythmically using short rapidly drawn lines, as in my realization of Mark Applebaum's *Composition Machine No. 1* (2014) using a thick texta pen on amplified butcher's paper.

Alternatively, they can be drawn texturally using large circles drawn using a slow, smooth motion, as in my realization of Cat Hope's *Tone Being* (2016) using cardboard tubes on a tam-tam (Devenish, 2018). In the former, the lines leave a trace on the butcher's paper, resulting in visible graphic drawings. In Hope's work, and in *Shifting Planes*, lines are drawn using various percussive implements and do not leave a visible trace.

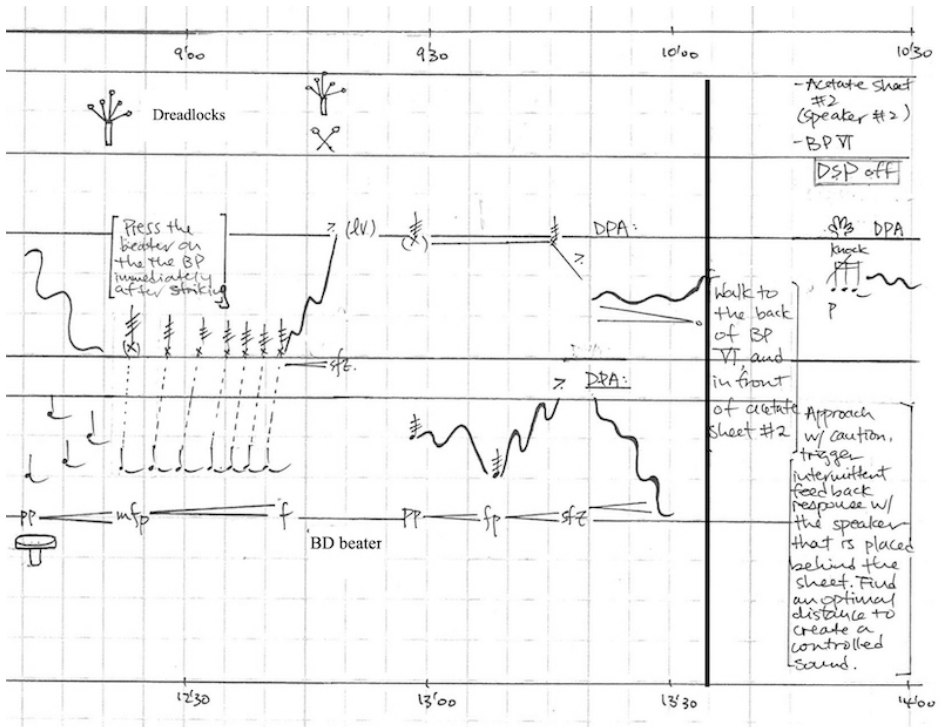


Figure 2.3: *Excerpt of the score Permeating Through the Pores of Shifting Planes showing hybrid notation (Photo: ©A. Hui-Hsin Hsieh, 2019, used with permission). Dynamic graphic score created with Decibel Score application (2013)*

2.5 Conclusion

The increasing entanglement of materials as instruments, infrastructure, implements and increasing diversification of performance technique is effectively breaking down boundaries between musical practices: composition, performance, music, movement, installation. The design, layout and use of tangible and intangible instrumental materials is increasingly influenced by how performers might interact with these materials using musical, performative and everyday gestures and techniques and vice versa. *Permeating Through the Pores of Shifting Planes* was an initial exploration into the sonic and perfor-

mative affordances of sheet materials, with particular consideration given to the relationship between the visual and the auditory in performance. The detailed investigations into gestures, a dispersed, installation-like setup, and individual performative movements at the early stages of development allowed almost all of the original ideas to be realized in performance. The use of my gestural, material and electronic instrumentarium was an effective way to ‘grease the wheels’ of a new collaboration, making use of all of the creative languages at our disposal. New music premieres always seem to take place with less time in the venue on the complete set-up than is ideal, and Hsieh’s consideration of my performance style, interests in improvisation and graphic notations as well as her consideration of familiar percussive instruments and techniques in the early stages, resulted in an idiomatic work that came together quickly in the final stage and rehearsal period. Furthermore, this allowed deep and layered exploration of the questions that drove the work throughout the entire process.

The research questions surrounding visual-auditory relationships in performance, sheet materials as instruments and the plurality of material roles in performance, were explored on micro and macro levels over the course of *Shifting Planes*, using large gestures to expose small sounds, and small gestures that (with the assistance of amplification) conveyed large sounds. The notion of large-small and small-large gestural/sonic combinations and consideration of how the visual can affect the auditory have appeared in percussive practice and pedagogy for decades. For example, young orchestral players are encouraged to ‘think loud, play soft’ to achieve the perfect pianissimo triangle note, and to consider how much more effective a crescendo shake roll on the tambourine seems when the shake roll is accompanied by a gesture that raises the tambourine from low to high. Similar gestural concepts are embedded in all percussive techniques. When combined with the wrist microphones, these concepts can be explored further, particularly when working with feedback loops. When there is no attack to rebound from and the sound emerges from the aforementioned ‘dance of agency’, the performer can focus their gesture wholly on the care of the sound they are working with, and the ways in which gesture can guide listeners. In *Shifting Planes*, these concepts saw the transformation of an inanimate instrumental ‘set’ that a performer sounds, into an animated, vibrating instrumental infrastructure that a performer responds to, and this has formed the foundation of further collaborative artistic research.

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