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In What Sense Can Instruments and Bodies be said to Form Spaces?

Alex Grimes

A thesis submitted to the University of Huddersfield in partial fulfillment of the requirements for the degree of Masters of Arts by Research in Music Composition

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Composition Portfolio:

I. *Swerve* for solo violin (2013)

Duration: 5'30"

Performed by Ashot Sarkissjan, Huddersfield, 17 February 2014

II. *Glass Transition* for solo flute (2014)

Duration: 7'30"

III. *an Object that is not Oriented* for Double Bass and Drum-kit

Duration: 1'15"

IV. *I am innately genital...*

always whipping that invisible hole, O bitches of impossibility!

Duration: 2'01"

V. An Instrument is an Egg: a statistical/sculptural analysis of Beethoven's Piano Sonatas

Media: Audio CD

I. *Swerve* for solo violin (2013)

Performed by Ashot Sarkissjan at St. Pauls Hall, Huddersfield, February 2014

Abstract

My recent work is an exploration of the physical and conceptual mechanisms that interface people with instruments. Central to this investigation is a conception of the performer/instrument assemblage as a symbiosis of two parallel and interdependent systems: one – the performer – moves through space established by the other – the instrument. Each system possesses its own intrinsic properties and characteristics; each possesses capacities to affect and be affected by one another. The music emanates from this contiguous interaction.

Instrument surface is understood as a compositional resource itself, a topological façade, defined by ordinal distances, that guides gestures along its contours. Within these fluctuating constellations of spatial coordinates, I consider all the relevant ways a body can move, and establish some general combinatory rules that inform the convergence of forces within the body. The traditional subjects of compositional contemplation such as form, duration, dynamic, etc. are not attributing features to the work per se but emerge as results from spatiotemporal relations of (bodily) movement's correspondence with (instrumental) surface and mechanism.

This liberation of movement is understood as a liberation of timbre, and the inherent indeterminacy of this relationship is embraced. As such, I would hypothesize that sound is, to an extent, freed from the subtractive tendencies of perception that might otherwise subvert it into generalized typological categories. Once liberated from the imagination, sound can bypass the brain and directly engage the nervous system.

Introduction

“In what sense can eggs and organisms be said to form spaces?” (De Landa, 2002, 61)

My recent works begin from two fundamental precepts of instrumental performance practice:

1. Sound and movement are fundamentally linked.¹
2. Instruments, as architectures and as histories, condition movement along their surface.

The first statement regards bodies and their kinetic potentials, the expressive power of movement itself, and the intimate relationship of gesture to timbre. In practice it requires an identification of all the relevant ways a body can move in a given space, which opens the possibility of the body as an observed system, and thus a target for modeling activity (Abraham, Shaw; 1992). The second statement regards objects within the context of subjects, the reciprocating intensity of that relationship, and the topological and historical realities of both. It implies an acknowledgement of certain topological restrictions² that mark points of resonance constituted from the design and construction of a given instrument, shaped by pedagogy and put into practice by a given repertoire. It asserts instruments as spaces³ in themselves, not as inert receptacles subject to

¹ I do not dichotomize or hierarchize this relationship.

² Topological restrictions are a set of characteristics of a given distribution of space marked by points of attraction, which engender certain areas of resonance along its surface (De Landa, 2002).

³ Whenever space is mentioned throughout this paper, it is intended not in its purely geometrical sense – as an inert receptacle for events – but as an agent that

imposition of our sonic whims but as agents mediating the dialogue between sound, history, and us.

Implicit in this assertion of instruments as spaces is an acknowledgement of the possibility that a given instrument can change, not necessarily in terms of literal construction (although clearly this is also the case: range extensions, amplification, various preparations), but in terms of a shifting ontology of instrument surface. For example we can ask if a given piano in performance of Beethoven's Piano Sonata no. 17 in D minor is the same piano in performance of John Cage's *Etudes Borealis*. The piano is of the same parts, mechanisms and construction, but what has changed? What changes is how we think in the context of piano surface, and the privileged points of attraction it creates. I would propose that in altering our interaction with the instrument we alter the instrument itself. Further, the act of composing is simultaneously an act of reframing instrumental space by shifting points of attraction along its surface.

Dislocated and dissociated by language or culture or economy into the specialized ghettos of sex and mind, Soho and Bloomsbury, 42nd St. and W. 40th St., here is where my body tries to rediscover its lost unity, its energies and impulses, its rhythm and its flux. (Tschumi, 2001, 39)

At this point I can identify the performer/instrument assemblage as a symbiosis⁴ of two interdependent observed systems, each subject to change, each system exerting some force on the other which is in turn reciprocated, each system affording new realities

conditions immanent processes through its intricate relations of proximity and contiguity (De Landa, 2002).

⁴ "Whereas embryogenesis is a process through which a yet unformed individual becomes what it is, acquiring a well-defined inside, symbiosis represents a process through which a fully formed being may cease to be what it is to become something else, in association with something heterogeneous on the outside" (De Landa, 2002, 101).

for itself and its counterpart. Additionally, and crucial for a compositional practice extending from these precepts, *both* of these systems are subject to modeling in the genesis of new works. Through these modeling techniques gestures emerge by direct manipulation of the materials themselves, via mechanisms immanent to the body and to instruments. The fuel for this genesis is difference: the performer/instrument assemblage is conceived as a plane of converging heterogeneous continua, defined by ordinal relations,⁵ diverse rates of change, and rules of combination that are imposed to ensure that various parameters are linked by their differences (De Landa, 2002).

By extension of the initial precepts, my recent practice is influenced by choreographic, and architectural, as well as musical discourse. Through choreography we can access deep insights into the potentials of human movement and reframe how we think about gesture. Merce Cunningham sought to liberate movement from representational and historical referents, and decompose it into multiplicities (Gil, 2002, 121). In William Forsythe's work, dancers' bodies ricochet into oblique fragmentation "by sending the eyes in one direction, jaw in the other, rib cage in one direction, hips in the other" (Casperson, 2001, 97). What was revelatory in this discourse for my practice was the liberation of the body from the instrument. The body's degrees of freedom were subsequently decontextualized from traditional playing techniques, allowing me to *write the technique itself* when movement is re-contextualized into instrumental space. This is instrumental technique not as typological and discrete but as emergent from more fundamental forces such as trajectories of movement and pressure. Timbre in my practice is not excess; it is not a condiment applied to a greater construction of pitch and

⁵ Ordinal relations do not presuppose fully individuated numerical quantities but imply asymmetrical relations between elements. It is only the order of a sequence that is defined, and not the nature of the elements ordered (De Landa, 2002).

rhythm structures, but is itself the subject of the work. The hypothesis is that in composing movement itself I can access timbre itself in a very intimate and direct way, previously unavailable in conceptions of sound-objects and technique as typological and readymade.

In his paper on architectural sequences, Bernard Tschumi highlights three relations: space (S), movement (M), and event (E) (Tschumi, 2001). For the purposes of making pieces I propose a simple algebra among them:

$$S + M = E$$

In Tschumi's writings there is an advanced discourse on the reciprocal violence between architecture and event.⁶ Not only do we act upon architectural spaces, but additionally our actions are conditioned by the architectural object's own mechanisms: a door implies the movement of a body through it (Tschumi, 2001) the same way that a tone hole on a flute implies the movement of air through it. To this point, Tschumi gives the example of the "violence of narrow corridors on large crowds" (Tschumi, 2001, 124). In this way architectural design can be seen as a set of tools for structuring movements within a given space.

One could imagine a guitar where the twelfth position expands to many times its size while the first position contracts infinitesimally, or a piano that exudes a gravitational pull from the extreme low and high registers while a force of repulsion makes the middle nearly unplayable. The implication here is instrumental surface as a *nonmetric space*, that is, one that cannot be defined by its distances because they remain unfixed and subject to change (De Landa, 2002). Nonmetric spaces are features of a neighborhood topology: sets of points bound into neighborhoods by relations of proximity and

⁶ Violence is here a metaphor for intensity of relations.

contiguity that may be stretched or compressed without changing in nature (ibid).

Through simple differential relations we can map one space onto another one, effectively redesigning instrumental surface, shifting points of attraction within the vector field. This manipulation of an instrument's inherent topological restrictions affords each work a set of characteristic gestural tendencies as movement is mapped along its undulating surfaces.

Swerve for solo violin (October-December 2013)

When atoms are traveling straight down through empty space by their own weight, at quite indeterminate times and places, they swerve ever so little from their course, just so much that you would call it a change in direction. If it were not for this swerve, everything would fall down-wards through the abyss of space. No collision would take place and no impact of atom on atom would be created. Thus nature would never have created anything. – Lucretius (De Landa, 1997, title page)

The Lucretian Clinamen speaks to the creative potential of dispersals and collisions.

Through a volatile and indeterminate entangling, these processes form entities too detailed, too grotesque in their deformations to be the design of a simple ego. Possible strategies for organizing these processes – or rather strategies for creating processes that may organize themselves – are illustrated in Ilya Prigogine’s and Isabel Stengers’s classic work, *Order out of Chaos*. In their depictions of far from equilibrium thermodynamic systems they describe a turbulence of coherence, where “the system behaves as a whole, as if it were the site of long-range forces” (Prigogine and Stengers, 1984, 171), where millions of molecules move in “macroscopic organized motion” (155), “structured as though each molecule were informed about the overall state of the system” (171). This is what Deleuze and Guattari call the *fusional multiplicity*, “that which effectively goes beyond any opposition between the one and the multiple”, that which “constitutes the ontological unity of substance” (Deleuze and Guattari, 1987, 154).

In musical literature, the intricate tapestries of Ockeghem or Johannes Ciconia come to mind, or in the unraveling of Aldo Clementi’s entropic canonic machines, where an intervallic or rhythmic event at the local level may have longer-range repercussions. Figure 1 is the first measure of Evan Johnson’s *émoi* for solo bass flute, which was an object of study in the months preceding *Swerve*, and is a particularly intricate example of canonic structure. Note how the multiple self-similar strands of material interject and

converge within the phrase. I kept returning to self-similarity as an organizing structure for temporally dispersed material, as that “continuum of all substances in intensity and of all intensities in substance” (ibid). Not only does canon already imply dispersal of a given rhythmic or intervallic set, it necessitates multiplicity, it assumes a multiplicity of timescales in order to operate. I find something quite mysteriously beautiful about the canon: it seems the fractal speaks itself, through itself; that is, through its formalized self-extension.

Figure 1: Evan Johnson, *émoi* (Johnson, 2010).

The image shows a handwritten musical score for Evan Johnson's piece 'émoi' (2010). The score is written on a grand staff with a treble clef and a 4/8 time signature. It features a large, sweeping melodic line at the top, a complex rhythmic pattern in the middle, and a bass line at the bottom. The score is annotated with various markings, including 'quasi rogabac', 'salido', and 'HHH'. There are also numerical annotations such as '(13:8)', '(3:10)', and '(3)'. The score is framed by a large, hand-drawn arch at the top.

Swerve begins with the identification of pressure and trajectory as its primary forces and proceeds with recognition of the types of phenomena these forces imply, both conceptually and gesturally. Velocities, directionalities, viscosities, pressures: all imply passage through anterior or posterior states in order to exist. They all occupy liminal

spaces. In *Swerve*, once a gesture begins there are no binary relationships, but constant fluctuations of continua. There are no states of being, only processes of becoming.

Figure 2: *Swerve* time series.

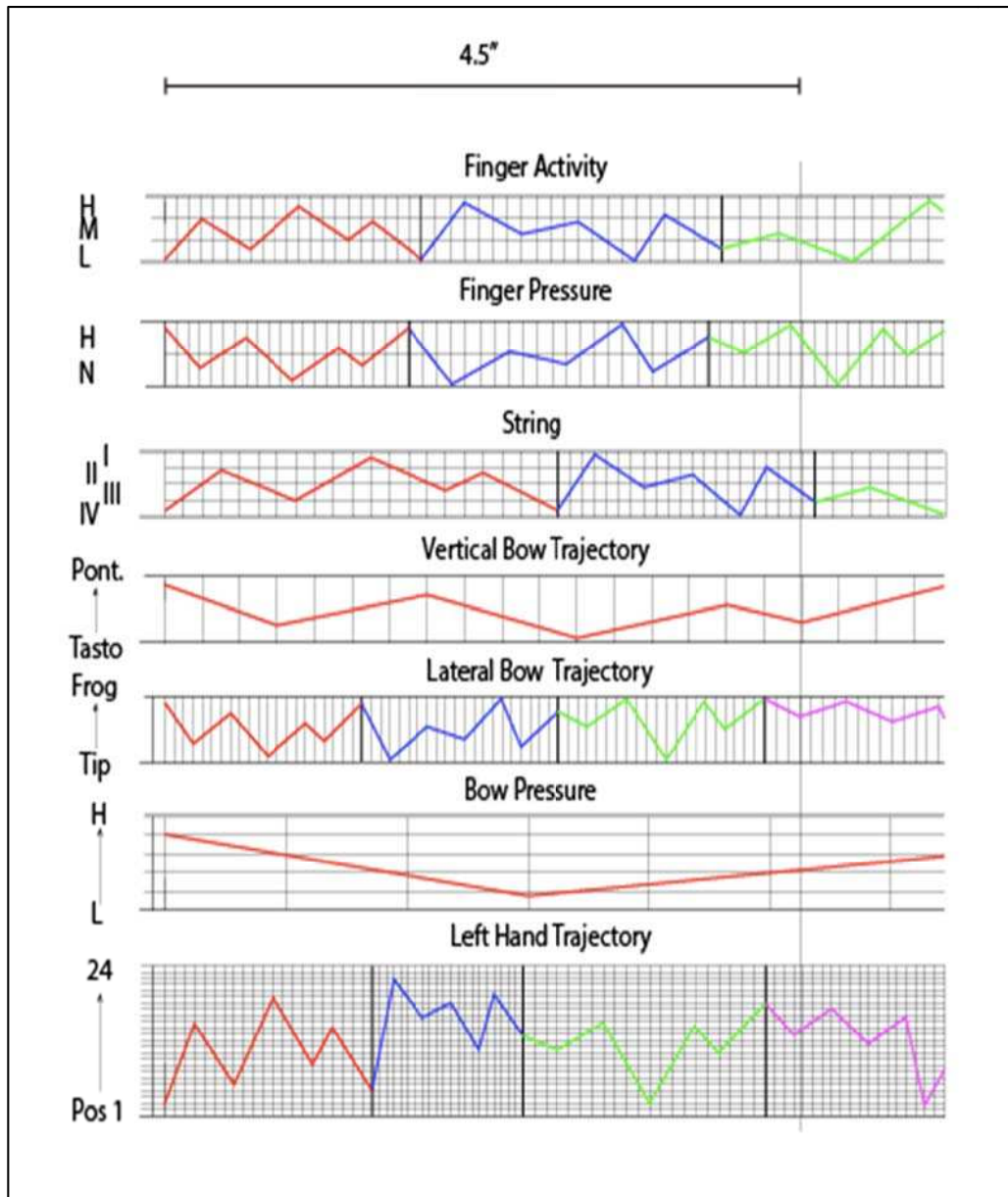


Figure 3: examples of trajectory transformations in *Swerve*.

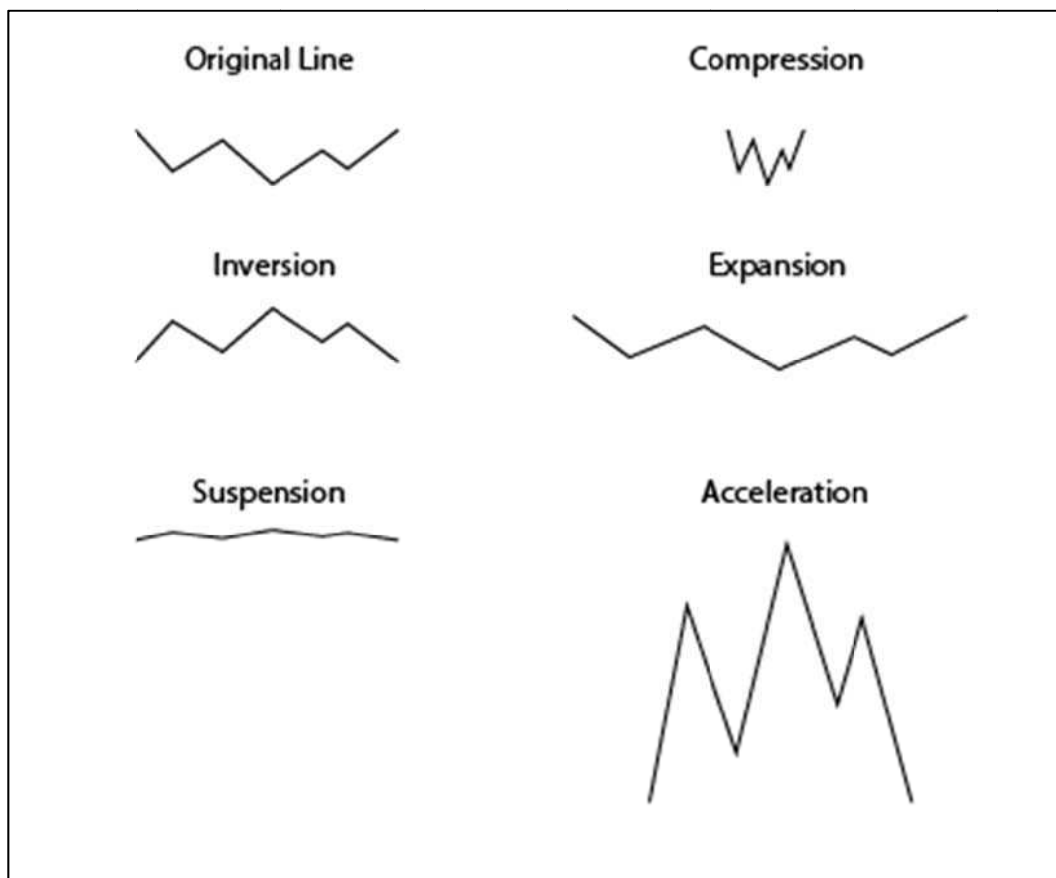


Figure 2 is an example of a pre-compositional tool like the one I used to make the piece. The first step in the process was to create a temporal dispersal tool that would generate a multiplicity of timescales, which are repeatedly applied to the trajectories. The vertical lines that pass through the vertices of each trajectory show the results of this dispersal. Each iteration of a line is colored to show the self-referential relationships between parameters. Each line of a like color has undergone at least one of the types of topological transformations listed in Figure 2.

If we start from pressure and trajectory and proceed towards pressures and trajectories, the result is mutual obliteration: notice in Figure 1 the dense and complex way the vertices interject into one another along the x-axis. Composing with this tool is

not an act of transcription. The information it provides effectively channels creative volition into making decisions about the particular hierarchical order and nature of these interjections. The nomadic sequencing (and re-sequencing) of parametric hierarchies based on information provided from a given tool and some general rules of combination will be referred to throughout this paper as a cascade.⁷ Not only does the cascade effectuate material on the local level, it can also produce formal constructs that emerge through particular regimes of parametric hierarchies. This is a crucial concept in my work – the linking together of parameters by their differences via a cascade is the precise point when information yielded from a given tool becomes musical material.

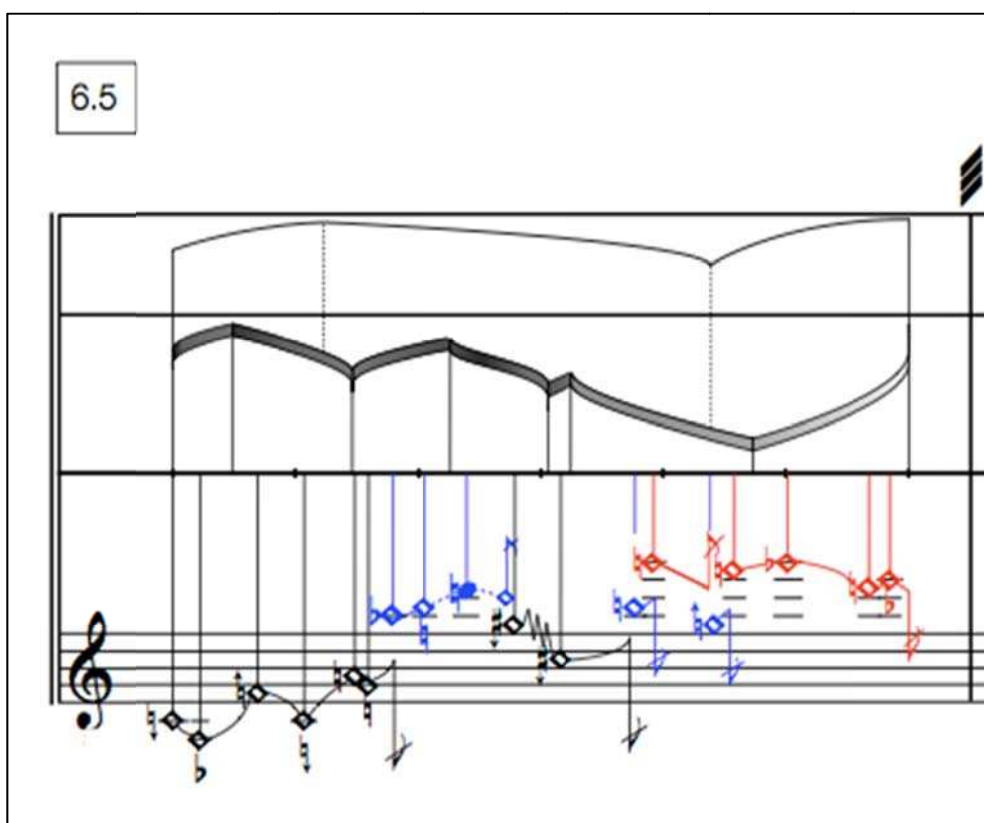
The parody among the parameters – the way they constantly redistribute themselves within the gestural hierarchy – affords a high level of detail between the back, middle and foregrounded elements. In listening to certain works the mind will follow a detail as it subtly slips out of its foregrounded position; meanwhile the new detail surges forward to the point where it has enveloped the listener, where it may move past our ears and be picked up, if only slightly, retroactively. It is at this point of aural overload that the soundscape effectively overflows its boundaries, saturates the perceptive apparatus, and dissolves the space between what we hear and ourselves.

In *Swerve*, the fact that everything occurs in between everything else – its pervasive liminality – leads to a kind of blurriness in the aural result, but a blur that is nonetheless obtained from this precise system (Deleuze, 2002). Additionally, it can be said that there

⁷ See Manuel De Landa's elucidation of Deleuze's 'quasi-causal operator' in *Virtual Science and Intensive Philosophy*. He describes its operation as a "condensation of singularities, a process involving the continuous creation of communications between the series emanating from every singularity, linking them together through non-physical resonances, via the cascade ... while simultaneously ramifying or differentiating the series, ensuring they are linked together only by their differences" (De Landa, 2002, 104)

are two kinds of blur in the piece: there is the first kind I spoke of obtained by this operation of “destroying clarity by clarity” (Bazin, 1958, quoted in Deleuze 2002, 9); the second is a result of the curved trajectories in the notation denoting constant change in rates of motion into and out of the vertices. This ‘blur’ in the local level material leads to a kind of aural *malerisch*⁸ effect. Lines break lines, forces break tones, an acceleration or force smears small detail only to be overcome by some new force moment by moment.

Figure 3: Opening phrase of *Swerve*.



It is on the other side of that zero point along the x-axis of Figure 3 that the Clinamen, or *Swerve*, actually happens, that precise moment when the threshold from laminar flow

⁸ “...stands for that depreciation and gradual obliteration of line (outline and tangible surface) and for the merging of these in a ‘shifting semblance’ of things—it is an attempt to represent the vague and impalpable essence of things” (Herbert Read, in his introduction to Wölfflin’s *Classic Art*, 1952, quoted in Deleuze, 2002, 156).

to turbulence is breached. The phrase is made of initial reverberations from the dispersal immediately following this hypothetical collision. Here, the cohabitation of multiple self-similar spaces and timescales is probably most evident: note the clear inversion of trajectories between the lateral movement of the bow and the glissando in the left hand. The 'vertical' movement of the bow (in relation to the bridge) and the diminishing bow pressure are a result of the same temporal and directional relationship stretched out over many times the length of the initial left hand glissando. What is perhaps less immediately clear, though probably more so when we refer back to Figure 1, is that the alternation between the strings (which obliterates the initial glissando) and the instance of wide vibrato on the fourth string (which obliterates the left hand trajectory) are also manifestations of the proportional relationships of the vertices.

I would like to point out the importance of the chosen parameters – and especially the ways in which the various continua are divided – to the sounding result of the piece. Note the even division of the left hand positions up the neck of the violin: an even division of logarithmic scale. This mapping of one set of relationships onto another disconnects the distances that order positions along the neck from the nature of the positions as ordered. What at the time seemed like a lazy solution was in the end exactly what gave the piece its unique gestural tendency: the violin being played in *Swerve* is not the violin as it appears to the eye, is not the one handed down to us from history. This instrument dilates as it moves up the neck, and has a repulsive force at its nut. Much like Tschumi's example of the crowd in the narrow hall, this violin is not only acted upon, but reciprocates with its own forces, significantly affecting movement along its surfaces. This tendency is immediately clear in Figure 3, as the left hand trajectory repels off the nut and flies up the neck into the denser atmosphere of the higher positions, where it seems

to meander aimlessly for a few seconds, as if it is stuck. This was a revelation: the possibility of instrumental surface itself as a non-metric topological space, where distances do not define proximities because they are subject to change, a surface that can be bent and stretched (De Landa, 2002, 23). This tendency revealed itself in the course of writing the piece, and I must admit I was initially not aware of it. Because the scaling does not change, this contortion of surface conditions gestures to a greater or lesser degree throughout, depending on the intensity of line transformation. In more recent pieces, I intentionally explore these manipulations of scale as a compositional resource, including their transformations as a formal device.

***Glass Transition* for solo flute (January-May 2014)**

If a melt is deformed slowly, its distorted atomic structure has time to adjust or relax; it behaves as a liquid. However, for increasingly rapid deformation ... the melt crosses a threshold between liquid and solid behavior, called the *glass transition*. If rapid deformation takes place at viscosities above the glass transition, the melt cannot adjust It behaves as if it were a solid, breaking as any brittle solid does if the applied stress is excessive. (Best, Christiansen; 2001, 153)

Glass Transition, as a title, is intended as a verb, not a noun. In the program note, this quotation is set alongside a quote from Jacques Lacan.⁹ This is in order to imply speculation on the possibility of this phenomenon as a psychic event as well as a thermodynamic one.¹⁰ It is a comment on the dangers of a kind of psychological mineralization, of stratification; of rendering stone the power structures that exist both in us and in society. It is an appeal to remain in a liquid state.¹¹

⁹ “I propose that the interest the subject takes in his own split is bound up with that which determines it—namely, a privileged object, which emerges from some primal separation, from some self-mutilation induced by the very approach of the real, whose name, in my algebra, is the *objet a*.” (Lacan, 1979, 83)

¹⁰ I will take this opportunity to explain the presence of ideas taken from the natural sciences in the conceptual frameworks of *Swerve* and *Glass Transition*. I should mention here that I do not place scientific thought above the arts on a hierarchy of fields of knowledge (I do not directly translate scientific data into my pieces for example). My general interest in the literature of the natural sciences, and these concepts in particular, is due to what I perceive to be an intense engagement with the phenomenal world. What especially interests me is this attempt at transference, via language, of the phenomenal to the conceptual as a potential mode of self-inquiry, because we are of both. For example, we could ask ourselves how trauma can induce a “rapid deformation”, distortions and further transformations in the psyche. I speculate that the terminology of thermodynamic phenomena may offer insights into the mechanisms through which we ourselves can change. I am not trying to anthropomorphize these phenomena; to the contrary, I am interested in the non-human (or pre-conceptual, phenomenal) in the human.

¹¹ These terms ‘stratification’ and ‘mineralization’ are intended similarly to how Manuel De Landa uses them in his interview with Erik Davis (Davis, 1992).

Glass Transition is an exploration of the liminal spaces between air noise, harmonic/multiphonic, and fundamental: a probing of the spectral thresholds afforded by a given set of fingerings. It hypothesizes that because of the array of potential sounds for any given fingering on the flute, dispersing the gestural apparatus into oblique relationships could result in some interesting sonic transformations as a performer moves through instrumental space. I have talked to flautists who dislike playing multiphonics because of their inherent instability. One can imagine the kind of straightjacketing required of the lips and the airstream in order to select one fragile sound of the many possible within the small space of the tone hole. This is an example of the reductive nature of our cognition (via fear?), a side effect of that “primordial self-mutilation” (Lacan, 1979, 83): the delimiting of myriad potentials to one. Of course, in the operating room or in engineering a bridge this reduction is required, but in the context of sonic art this is sound in the zoo not in the jungle. Taming the inherent indeterminacy of a sound world in this way does not interest me. I have tried to unleash it via a liberation of movement from that which otherwise might condition (Gil, 2002).

Saxophonist Evan Parker often speaks on what he terms ‘biofeedback’. Parker notes, “You brush a key, unintentionally, and the column is broken for a moment in a place where you didn’t intend it to be broken. And, as a consequence, instead of the fundamental note being produced you may produce an overtone of that note. So you then try to bring that accidental thing under control” (Parker, 2009). This idea of biofeedback not only points to the reciprocal relationship between performer and instrument but also acknowledges cracks on the surface of gestural intent and their potentially significant sonic consequences. *Glass Transition* attempts to widen those cracks into gaping holes, and build a work entirely from material within these holes. The

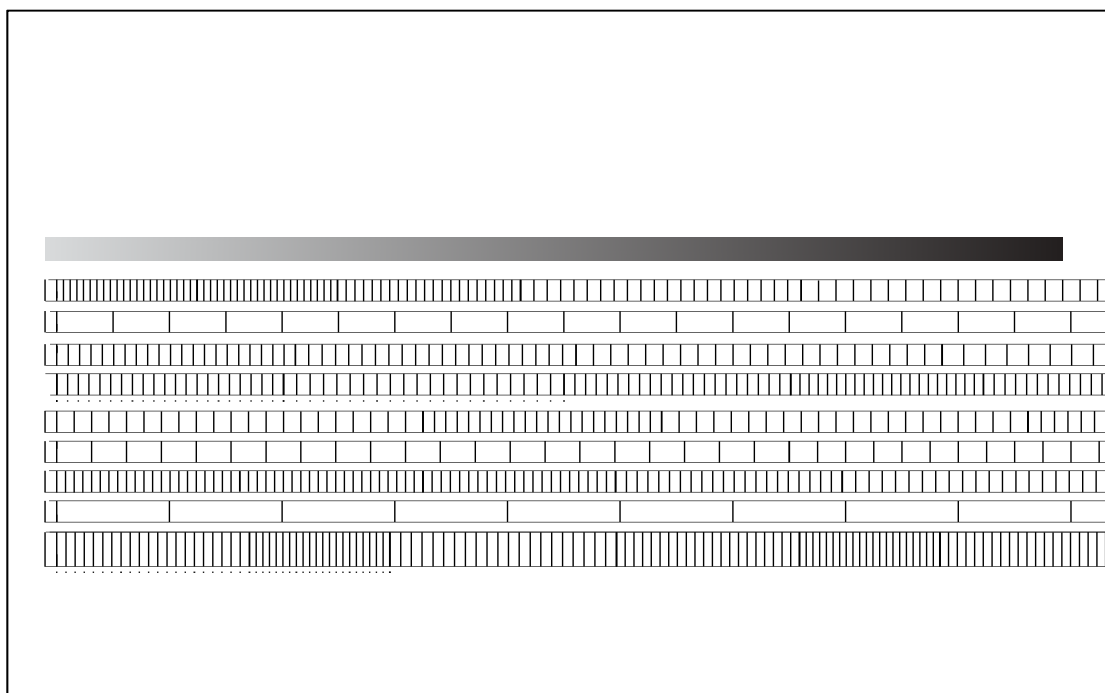
main difference between this approach and Parker's is that there is no attempt to control the accidents.

In Aaron Cassidy's music for example we can actually hear the collision between a strictly prescribed action and a highly volatile, indeterminate sound world (Cassidy, 2008), where each performance of the same notation could result in a range of sonic realities (degrees of difference within a haecceity). Additionally, Charlie Sdraulig's work employs tenuous gestures on the threshold of audibility, making use of involuntary movements such as trembling and other lapses of intent. These are just a few examples that attest to the asymmetry between gestural intent and sonic result, demonstrations of the oblique relationship between what we intend to say and the truth of what we say. It is the instability of this collision of gesture and intent that most interests me, the liminal spaces it affords. *Glass Transition* is an empirical study of the relationship between movement and sound, and in order for this to work it requires a split, a severing of their mutual reference. Because we are quite used to movement as sound, I wanted to explore some sonic consequences of movement as movement in order for sound to be sound.

Figure 4 shows the raw material and the first step in the process: a gradient box depicting a hypothetical stream of air. Once on the page, the air stream is subject to numerous contortions and deformations, expansions and contractions through the various parameters that impinge on it. A similar dispersal tool as the one used in *Swerve* provides the durational relationships of these points of contact. The first parameters considered were exhale duration, air pressure¹², embouchure size, and air direction.

¹² Air pressure is treated independently of embouchure size.

Figure 4: A hypothetical stream of air prior to its deformation via changes in embouchure and direction.¹³



Although the piece seeks to “render expressive movement itself” (Gil, 2002, 122), I was generally aware, through my own research and workshops with flautists, of possible sonic results of a given gesture, or at least of its position in relation to the aforementioned liminal spaces. I was inclined to push the gestures toward these spaces, or rather build a virtual instrument that attracted movement towards them, via topological contortions within the tone hole. I considered the contingency of these parametric relationships in depth. I had a general image of the gestural tendency of the piece: for the air to skip along the upper regions of the tone hole like a rock skipping along the surface of water. If it reaches below a critical threshold, the stream is likely to disintegrate like a celestial object upon atmospheric entry. Under certain conditions, contingent on other parameters such as exhale duration, air pressure, and embouchure

¹³ This example is around 30” in duration.

size, a stream of air may make its way to the bottom. If an airstream somehow makes the viscous journey, it is likely to abscond via a sharp upwards trajectory.

What actually occurs in the piece is not as reduced as these analogies would suggest. They do however inform certain combinatory rules that change probabilities as a given gesture takes shape via its particular cascade. For example, a longer stream of air curves the probabilities of air pressure/intensity downward sharply, while a smaller average embouchure generally increases the vertical space available for air placement in relation to the tone hole. Once an exhale duration is revealed there is a random operation among three potential parameters to start a given cascade (between air pressure, embouchure size, and air placement.) Let's say our initial parameter selected by our operation is air pressure. The probabilities are weighted by a simple power law distribution (40%, 30%, 20%, 10%) among four regions of intensity.¹⁴ The aforementioned analogies inform the initial distribution: for a longer duration of airstream, the lowest intensities of air pressure fall in the 40% category, medium low is 30%, medium high is 20%, the highest in the 10% category. If a low value occurs then the probabilities remain weighted towards a larger embouchure size, and a higher placement of the airstream via this power law distribution. If however a high value occurs then the power law changes for air placement, curving the probabilities towards spaces lower in the tone hole and a smaller embouchure. These operations initiate a successive determination of subspaces that progressively completes the event, down to the tongue activity and every finger. Figure 6 shows the work at this point in the process, with numerical values assigned air pressure, embouchure size and air

¹⁴ Each parameter is broken into four general regions, air direction for example consists of an extreme high region over the tone hole, a region more directly above the tone hole, one just below the 'horizon' of the tone hole, and one at the extreme bottom.

placement. Each color identifies one of the three aforementioned parameters.¹⁵ Note the parody between them as they constantly shift in the hierarchy.

Figure 6: values yielded by the cascades of contingent probabilities. Phrase 21 is a clear example of these contingencies: a tight embouchure (pink, 87) weights the probabilities towards more air pressure (yellow, 89).



The shapes this tool produced were strange, often irrational, and counterintuitive. I stretched and curved the shapes, bringing out certain visual elements, pushing the directionality and gradient trajectories slightly in one direction or another. There is a line of suggestibility here one has to be wary of: we must keep from smoothing out the images out too much. If too easily categorized, too easily reduced (“it’s *basically* a...”), there is a danger that the referents that had taken so much effort to remove would end

¹⁵ Blue is exhale duration, yellow is air pressure, pink is embouchure size and green is air placement.

up right back in the score. In much the same way that the shards and scrapes of Stan Brakhage's films suggest nothing more than what they are, these shapes must not suggest anything other than the specific movement in its raw singularity: movement itself, not its generalization. The working hypothesis is that in order for sound to be itself, movement must be itself. It must not refer to anything other than what it is, including sound. In order to induce what Deleuze called the "unthought in thought" (Deleuze, 2004, 242), or thought that resists assimilation into prior conceptualization, the notational image must be infused with that "little bit of chaotic reality" (Dale, 2002, 97).

The piece is constructed from nine pages similar to the mapping on Figure 6. Each page moves within a contained set of fingerings via the dispersed processes. These specific fingerings were chosen to maximize the potential sounds available.¹⁶ Note that in Figure 7 all of the fingerings change via single key transitions moving in parallel motion. This is in order to enhance fluidity of the finger movements and provide a path through the maze of prescribed fingerings (Almeida, Chow, Smith and Wolfe; 2009).

¹⁶ I cross-referenced multiphonic fingerings from Carin Levin's *Die Spieltechnik der Flöte* (Levin, 2002) with the virtual flute website (Botros).

Figure 7: an example phrase from Glass Transition (p.6).

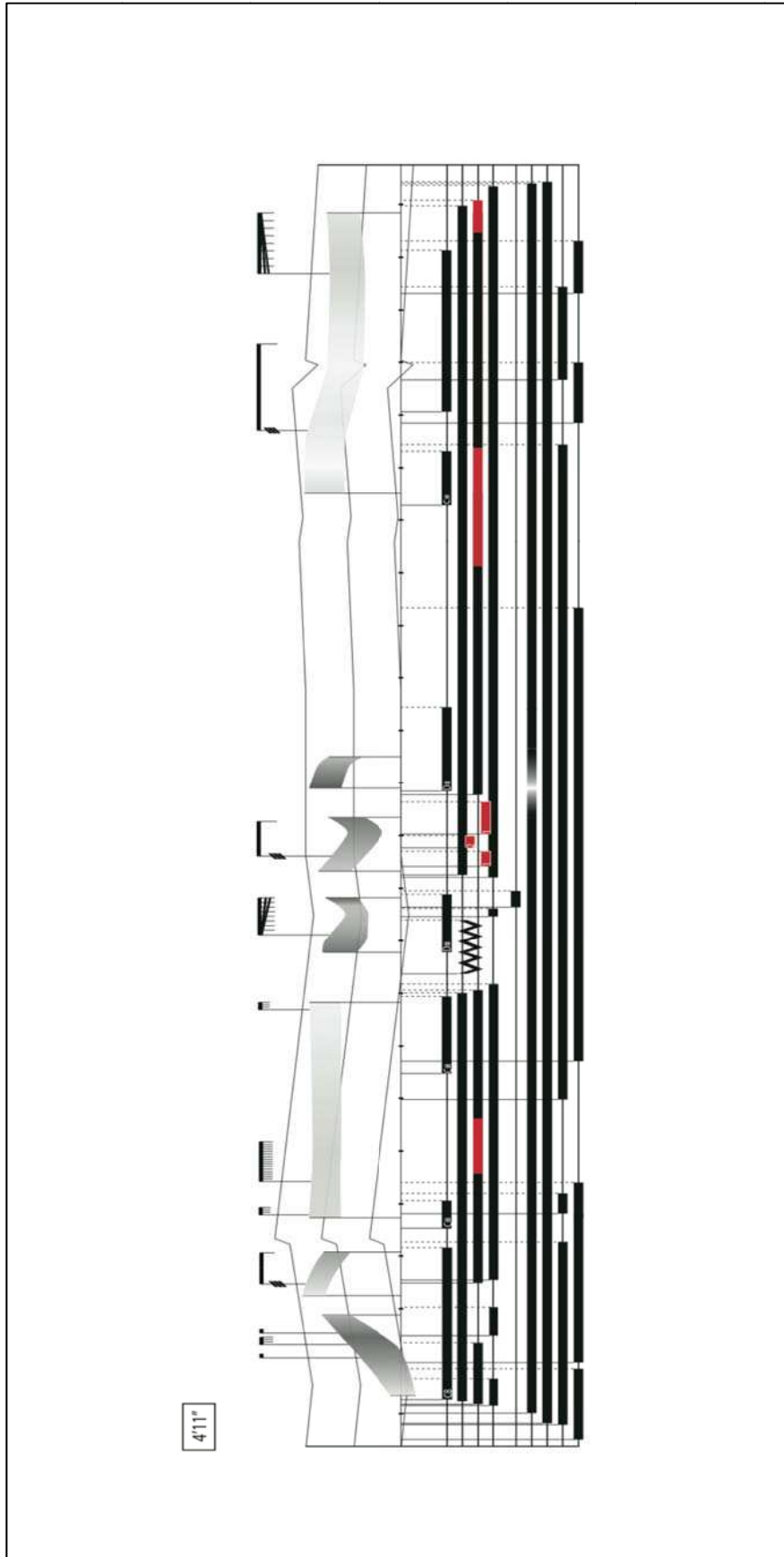


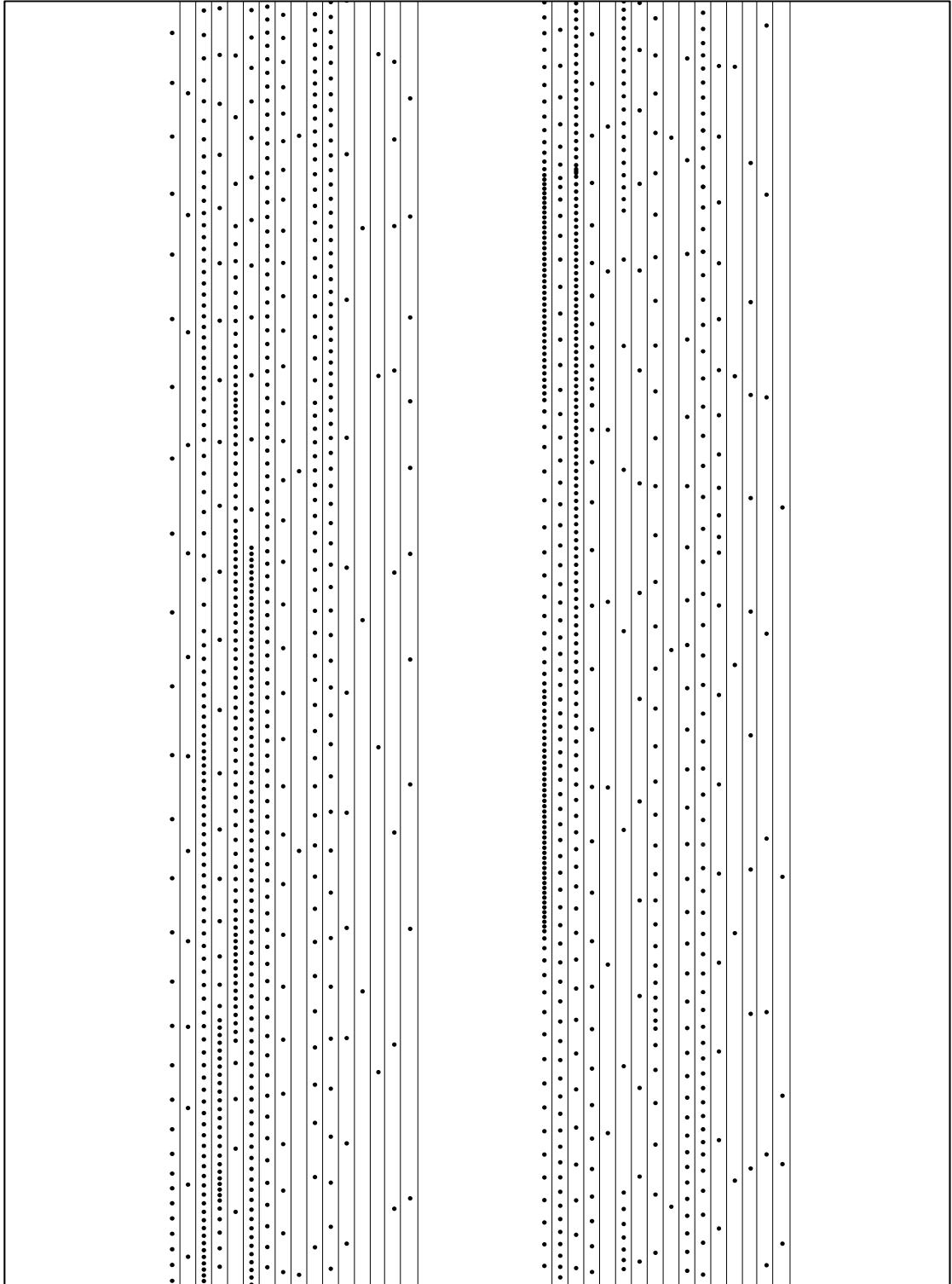
Figure 8: Durational relationships used to temporally disperse parameters in *Swerve* and *Glass Transition*.

The figure illustrates durational relationships used to temporally disperse parameters in *Swerve* and *Glass Transition*. It consists of four examples, each showing a tempo, a 21:26 ratio, and a corresponding musical notation.

- Example 1:** Tempo = 5 bpm. The notation shows a sequence of 21 notes followed by 26 notes, with a 21:26 ratio indicated above the notes. The tempo is marked as $\bullet = 5 \text{ bpm}$.
- Example 2:** Tempo = 10 bpm. The notation shows a sequence of 21 notes followed by 26 notes, with a 21:26 ratio indicated above the notes. The tempo is marked as $\text{♩} = 10 \text{ bpm}$.
- Example 3:** Tempo = 20 bpm. The notation shows a sequence of 21 notes followed by 26 notes, with a 21:26 ratio indicated above the notes. The tempo is marked as $\text{♩} = 20 \text{ bpm}$.
- Example 4:** Tempo = 320 bpm. The notation shows a sequence of 21 notes followed by 26 notes, with a 21:26 ratio indicated above the notes. The tempo is marked as $\text{♩} = 320 \text{ bpm}$.

An arrow labeled "etc." points downwards from the first three examples to the fourth, indicating a progression of tempo.

Figure 9: two excerpts extracted from the new tool used to disperse durational relationships in an *Object that is Not Oriented* and *I am innately genital... always whipping that non-existent hole, O bitches of impossibility!*



A New *Dispersal Machine* (May-June 2014)/ Some Thoughts on Notation

All spatial and temporal assertions should not be seen as attributing features to space or time or spacetime, but rather as attributing some spatial, temporal, or spatiotemporal relations to material objects. (Sklar, 1976, 167)

Figure 8 shows the polyrhythmic relationships – which are effectively turned into poly-tempo relationships¹⁷ – used in the ‘dispersal machines’ of *Glass Transition* and *Swerve*. This system afforded an intricate layering of timescales. It is essentially three tempi: 5, 8.0769, and 13.0473 bpm multiplied exponentially via traditional subdivisions (2:1, 4:1, 8:1, etc.). Removing these ratios from their polyrhythmic context means that as they proliferate they are no longer divided evenly into each other and never come back into unison. As such the specific values and relationships are less important than the mere fact that they are different. It became clear that I was more interested in durational relationships that could accelerate and decelerate freely without being tied to an arbitrary divisor. In addition, ontologically this was not the expression of time I was looking for. In traditional rhythm notation, we have meter and its nested hierarchy of subdivisions: planes of even pulses at densities of various ratios. In my notations, duration is generally not something that is repeatable, but is instead singular and unique. There should be no even subdivisions.¹⁸

¹⁷ Each set of 21 pulses is treated independently, extracted from the context shown in Figure 6 and strung together in different ways.

¹⁸ “Relations like being coincident spatially or being simultaneous temporally or having a given invariant spatiotemporal interval between them are relations material points, events or unextended events can have only to one another. They cannot have these relations to points of space, instants of time, or event locations in spacetime, for there are no such things over and above the material “occupants” of

Figure 9 shows two excerpts from the new system.¹⁹ It is a field of sixteen rows of proportionally mapped pulses (to the nearest .0001 cm) accelerating and decelerating to random tempi over a random number of pulses, between two and thirty. The range of tempi in the top row (in this case the column to the far left of each example) is between 1 and 640 bpm; as the rows go down the page the maximum speed decreases in increments of 40 bpm until the bottom row, the range of which is between 1 and 40 bpm. Because the pulses never accelerate or decelerate to and from the same tempi, every single durational relationship implied by the diagram is singular and unique. It is almost three meters in length, and contains approximately 44,000 individually plotted points.²⁰

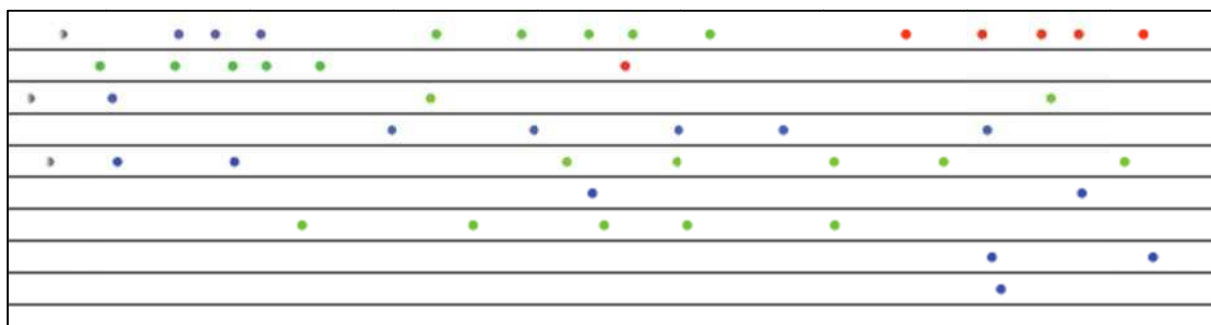
The processes by which I extract constellations of durational relationships out of the system are largely the same as before: various self-similar patterns expose nooks and crevices of the fluctuating tempi. Figure 10 is an example of the kind of shapes a particular pattern creates. It may be evident that they are similar patterns, but each one has its own unique formation. The 'shapes' these patterns yield (here depicted in colors) expand and contract in unusual ways, imbuing notational objects with intricate asymmetries.

them... any talk of relations born to each other by points of spacetime itself is pure nonsense, for there are no such "points" (Sklar, 1976, 168).

¹⁹ Although showed running vertically here, I normally use it horizontally.

²⁰ Making this tool was absurdly tedious and time consuming. Although it employed a simple differential calculation to map the evenly divided accelerations and decelerations, each point is more or less individually calculated. I have to thank David Pocknee for coding the data into an SVG file. Without his help I would probably still be plotting these points.

Figure 10: a self-similar pattern of pulses extracted from the dispersal machine, which may be used to construct phrases.



In embryogenesis, the parallel development of many simultaneous sequences of events and various couplings between the rates at which substances react with each other can facilitate the emergence of brand new designs (De Landa, 2002). A given process may decelerate or accelerate in relation to another process (Ibid); the space opened by their relations of convergence and divergence “determining in part their respective capacities to affect on another” (De Landa, 2002, 96). In *Intensive Science and Virtual Philosophy*, Manuel De Landa notes an example:

The graphic patterns which many organisms display in their skins (e.g. zebra stripes or leopard spots) may be explained as the result of the variable concentration of chemical substances, a concentration which depends on the rates at which substances react with each other relative to the rates at which the products of such reactions diffuse through an embryo’s surfaces.

Similarly, when we look at igneous rocks – at the haphazard lines, colors, and shearing – we can actually see the intense chemical processes active in their creation. It reminds us that a thing *is* its duration and that we cannot consider an object without also considering the multitude of processes that constitute it.²¹ In a similar way, these accelerations and

²¹ To cite an extreme example: within a crystal a molecule may travel 1mm in 3.2 million years, driven by a gradient in its chemical potential (Best and Christiansen, 2001).

decelerations inscribe themselves into the notation, constituting the gestural image from the strange, sheared constellations. Much like Merce Cunningham's choreographic technique, this dispersal system opens voids or vacuoles of time between movements of the body (Gil, 2002), constructing successive determinations of subspaces to be reassembled in the notation, brought into coexistence through identified resonances within a given cascade (De Landa, 2002).

Although inspired by aspects of choreographic thought, the notation itself is not choreography. It would be more accurate to say it *implies* a choreography, in that it does not depict movement without the context of instrumental spaces. It is a choreography that ricochets off of instrumental space. It is a notation that inserts itself within the metabolic activity of the symbiosis between performer and instrument, space and event. It marks the points of contact between actions and instrumental surface; an interface catalyzing new relations of proximity and contiguity, "shattering the atmosphere ... in order to offer the expanse for an impossible space" (Artaud, 1965, 24).

In correspondences with performers, some have noted the paradoxical space the notation inhabits, particularly in the case of *Glass Transition*. On one level the notation is clear – even flat – immanently possible and readable, but with a slight shift of perspective becomes completely transparent, as if it could evaporate off the page at any moment. Where exactly is this box that delimits the space around the tone hole of a flute? Exactly how much pressure is the black end of a gradient? What is the specific contour of a given acceleration implied by this line? How do I articulate 1.5178 cm as opposed to 1.168 cm? Lines of questioning such as this are necessary in performing my work. Questioning of the performers relationship with the notation and the performers relationship with their instrument, my notation seeks to invoke states of hysterical questioning in rehearsal.

The analytic experience is based on the fact that, at least ordinarily, we do not know what we say: what we intend to say is not the truth of what we say: the agent of speech conveys a meaning unknown to him. Far from being the master of meaning, he acts, in the words of J.A. Miller, as its appointed functionary. Thus, the agent suffers the truth rather than delivering it. His place only seems to be one of acting subject, a *semblance* brought in by speech as such. He who claims to speak in the name of truth cannot speak it, precisely because he speaks in its name. (Wajcman, 2003)

Just as there is no person completely transparent to himself or herself, there is no performer completely transparent to their own performance. There is no one that knows his or her own anxiety enough to master it, and therefore there is no mastering the notational object. “There is always something left over, something is always impossible to imagine, and this is the object of anxiety” (Rousselle, 2014). Rather than *interpreting* this music, it would be more accurate to say the performer *creates* this music from their own anxiety in the face of the void of their desire, using the notation as a ground for this operation.

It is difficult to speak intelligently about the performer/notation assemblage without acknowledging Deleuze and Guattari’s discourse on becomings. Becoming the gestural structure (Wishart, 1996) requires “composing the singular points of one’s own body ... with those of another shape ... which tears us apart but also propels us into a hitherto unknown and unheard of world of problems” (Deleuze, 2004, 241). It requires entering into proximity with the image, with “the speed of the image” (Deleuze and Guattari, 1987, 274). Despite this proximity of movement, however, there is always heterogeneity in the relationship.

The tarantella is a strange dance that magically cures or exorcises the supposed victims of a tarantula bite. But when the victim does this dance, can he or she be said to be imitating the spider, to be identifying with it...? No, because the victim, the patient, the person who is sick, becomes a dancing spider only to the extent that the spider itself is to become a pure silhouette, pure color, and pure sound to which the person dances. (Deleuze and Guattari, 1987, 305)

Once a gesture is ingrained into the musculature, once this proximity has been achieved, the performer then uses the gestural image as a point of departure to which they dance.

an Object that is Not Oriented for double bass and drum kit (June-July 2014)

I really felt that you were shattering the atmosphere around me, that you were creating a void in order to allow me to progress, in order to offer the expanse for an impossible space to that which within me was potentiality only, to a whole virtual germination that must be sucked into life by the interval which offered itself (Artaud, 1965, 24).

an Object that is Not Oriented comes out of a study of ‘gestural spine’, inspired by Merce Cunningham’s discourse on the torso as a central axis of balance in his choreography. The piece is an inquiry into the complex whole-to-parts relationship employed by de-coupled²² parametric movement and to what extent disconnected parameters can develop independently in the same body (Gil, 2002). It seeks to identify some of the ways in which parameters condition each other within a gesture via their contingencies within a given cascade.²³ It asks if the types of relationships between forces active within the body during a given gesture – in order for it to speak musically – exist along thresholds or strata that delineate a kind of field of structural integrity. To what extent can this ‘field of structural integrity’ of a given gesture be useful for building rules of parametric constraint?

On balance in his choreography, Cunningham writes,

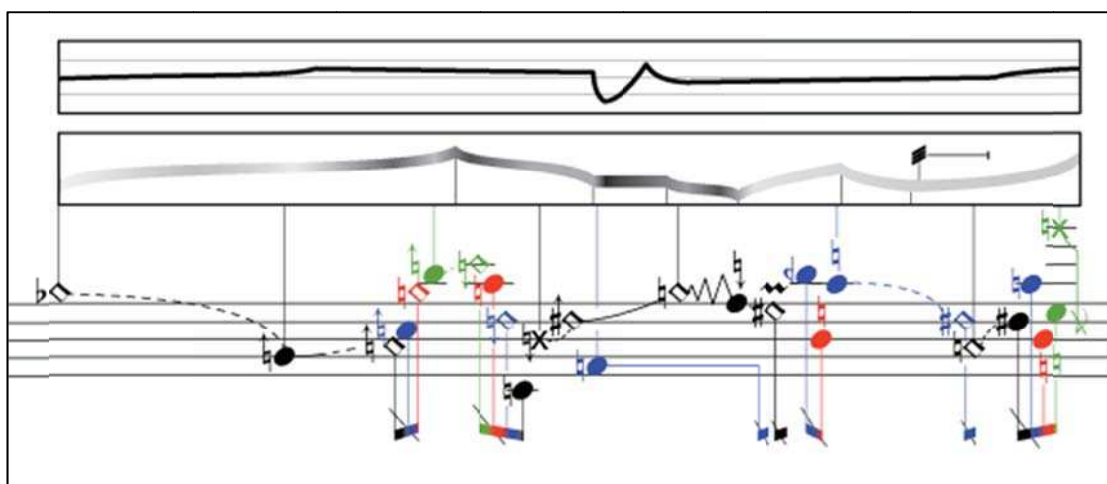
This involves the problem of balance of the body, and the sustaining of one part against another part. If one uses the torso as the center of balance and as the vertical axis at all times, then the question of balance is always related to that central part, the arms and legs balancing each another on either side and in various ways,

²² “... wherein the individual components of sound-production on an instrument are separated and treated as independent polyphonic voices... the sounding surface is now the effect of multiple and often conflicting layers of physical action” (Cassidy, 2004, 43).

²³ For example, in order to vibrate a string on a bass via vertical bow movement, lateral bow movement must either cease or be limited significantly. Figure 11 is a specific example of this.

and moving against each other. If one uses the torso as the moving force itself, allowing the spine to be the motivating force in a visual shift of balance, the problem is to sense how far the shift of balance can go in any direction, and in any time arrangement, and then move instantaneously towards any other direction and in any other time arrangements, without having to break the flow of movement by a catching of the weight, whether by an actual shift of weight, or a break in the time, or other means. (Gil, 2002, 119)

Figure 11: The first phrase of the bass part in *an Object that is Not Oriented*.²⁴



I should mention that my application of this idea in the piece is along two lines: one is more literal, which uses the movements of torso in three stills taken from a boxing match (Figure 13) as a formal device for shifting gestures along privileged instrument surface areas in the course of the piece. In the case of the drum-kit part this means a rotation from the far left (the hi-hat, snare, crash, and rack-tom) to the far right (the floor tom and ride cymbal) over the course of the 75-second piece. The bass part is made from probabilities that, among other effects, generally force a downward pressure towards the bottom of the instrument. Here 'spine' is used in its literal sense: the contortion of the spine as a way of reorienting gestural space over a period of time.

²⁴ The top box shows vertically oriented bow movement, the lower box with the gradients shows laterally oriented bow movement. Note when the vertical movement intensifies, in this case moving from normal position to the shoulder, later movement ceases. This is an example of a 'parametric constraint'.

The other application is less formal, less literal and involves my role as a subject, 'balancing' these stochastically generated points by fleshing out the movements between them. At 1.2 seconds the bow will be at near the tip, while at 1.5 seconds the left hand will be in third position, at 1.9 seconds the bow pressure will be somewhat light etc. This is more or less the kind of data this system yielded, turning the compositional process into a continuous balancing act with the 'field of structural integrity' always in mind. My task became to complete the phrase from these dispersed fragments of future and past events by linking them together in a given cascade.

I found the boxing match to be an appropriate working metaphor for the duet: the coupling of the two simultaneous movements between players as well as the implication of an overall feeling of anxiety, which inspired the title and program note. The instrumentation was chosen because of the prominence of torso movement in playing these particular instruments and the easy analogy of that movement to a fight. Watching bass players perform soloistic works is like watching someone in a wrestling match: back bending, angling the torso around the body of the instrument, grappling with the neck. Likewise, watching drummers play always reminded me of boxing: the raising and lowering of the hands, rotation of the spine to access different drums, the nimble footwork.

The stills – screenshots taken from clips of a boxing match I found online – cover a timespan of three seconds in slow motion; in real time they probably cover no more than one second (boxing slow motion, 2008). However, in the piece these respective actions curve probabilities that disperse along a range of timescales among the parameters.²⁵ For

²⁵ As such these movements themselves are not in the work actually, but exist virtually, acting as points of attraction for details on the local level.

example, imagine the left hand of one of the boxers moving from the first picture to the third over 20 seconds, while in the right shoulder it takes over a minute. The drastic difference in timescale between the original actions as they happened in real time and how they operate in the piece opens interesting metaphors regarding different timescales active within the body at any given time. One image I kept coming back to was the local-level activity of the gestures themselves as the relentless, multilinear firing of synapses within the body slowed down to timescales relevant to human perception. One would think this chaotic synaptic activity would be pushed to its limit in the context of a fight.

Figure 12: is the last phrase of the drum kit part and shows how the probabilities of hand/beater placement have been curved to the low tom and ride cymbal. This is reflected in the last still of the boxer on the right.

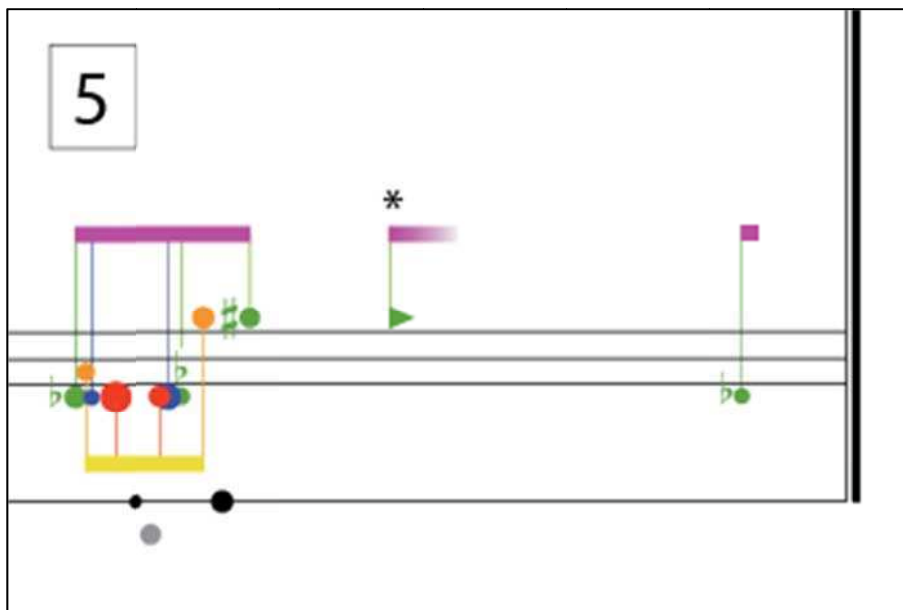


Figure 13:



***I am innately genital... always whipping this non-existent hole, O bitches of impossibility!* for speaking pianist and performer with trash (July 2014)**

The title, taken from Antonin Artaud's correspondences with Jacques Rivière, is extracted from this passage:

I am innately *genital*, and if we examine closely what that means, it means that I have never made the most of myself. There are some fools who think of themselves as beings, as innately beings. I am he, who in order to be, must whip his innateness. One must be a being innately, that is, always whipping this sort of non-existent hole, O bitches of impossibility! (Artaud, 1970-4, vol. 1:19, quoted in Dale, 2002, 88)

Artaud is a monster.²⁶ Not a being, but a substance, a catalysis, interfacing the virtual with the actual, the cultural with the natural. It is through Artaud that we may learn how to think: always whipping, always forcing thought to its limit. *Genital* here refers to "the birth of innateness which is the becoming innate of being born" (Dale, 2002, 89). Artaud expresses a becoming innate which must constantly turn around and face itself with itself, with that which, in confronting its own limit (Dale, 2002, 98), guarantees its annihilation (Deleuze, 1994, 141). This is the creative act itself; "there is no other creation" (Deleuze, 1994, 147). It is through this process that we can engender our own innateness (Dale, 2002, 89). This does not happen naturally, it always involves some force, some mechanism to force change or even destruction. We begin with catastrophe.

The text is "there is no meaning in catastrophe," set in English, Spanish, Portuguese, French and Russian. The sounds of the words are removed from their roles as signifiers

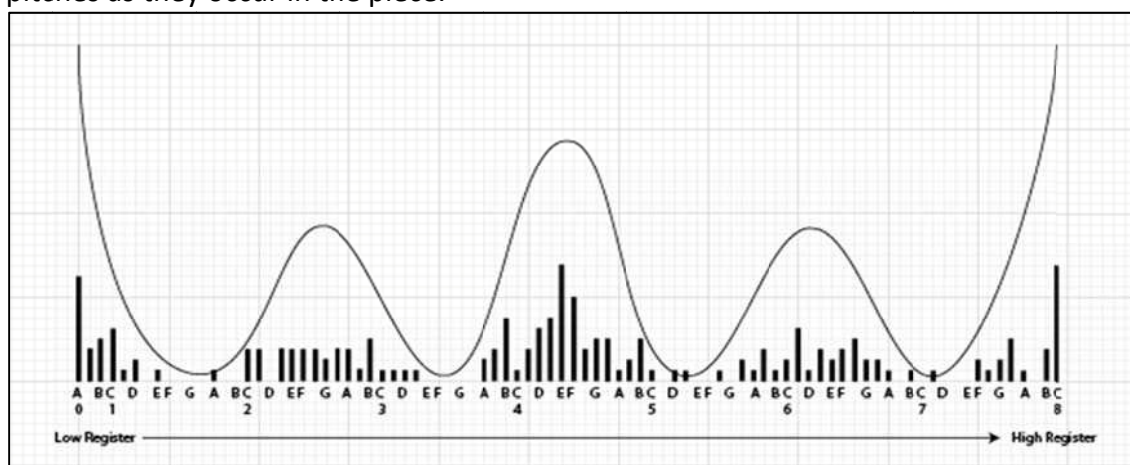
²⁶ Monster is intended in its Foucauldian sense: "It is the space of emergence itself, i.e. the location where sheer potentiality becomes the possible of and in the event ... it lives in the unbridgeable gap between knowledge and world. It is found where thought is incapable of corresponding to the world... the monster is the sign of this separation ... (it) is a threat for thought, an unveiling of its limit, of its inadequacy ... a conceptual place that never remains completely accessible to the transparency of thought, but which at the same time forces thought to open itself toward its own not-thought ((Nuzzo, 2012, 55-59)."

within the context of language via their translation into IPA. The words are then broken into syllables and temporally dispersed, causing the displaced sounds to slice into one another forming hybrid, stitched-together phrases. The languages recombine into a kind of political monster, a Frankenstein assembled from the historical violence and hegemonic realities that condition us through language. The text is subject to 'float' through a given phrase while the left-to-right reading of the instrumental part can stay a bit more steady and consistent. "A similar example is the constrained freedom of melody in a Chopin nocturne, as opposed to the left hand chords that keep it held together" (A.R. Costello, personal communication, July 17, 2014). This process of translation, extraction, dispersal, and recombination hosts a multitude of annihilations in the text. I wanted to give the impression of three separate co-existing worlds, that of the percussive piano part; the sliding, scraping trash; while the stitched together text hovers over this activity.

The concept of catastrophe extends to the piano. The piece employs a second performer, manipulating several trash objects along the strings of the piano. As shown in Figure 14, various gestural actions are depicted in the trash part which function both as sound worlds unto themselves as well as affecting the timbre of the piano part. Because the objects are only semi-specified, the nature of the gestural notation, and the configuration of piano insides vary, there is a large degree of indeterminacy regarding sonic surface in the piece moment to moment.

events.²⁷ This particular curve ensures a wide registral distribution, this in order to maximize the disjunction between registers: to create not lines but ruptures.

Figure 16: distribution of topological restrictions in *I am innately genital...* Probabilities weighted beforehand are depicted by the curve. The bar graph is a statistical analysis of pitches as they occur in the piece.



To this end the pedal plays an important role: opening the door, as it were, allowing sounds to be held for a bit longer before impartially shutting it again without

²⁷ Although this is a short piece that doesn't require a particularly well-articulated formal construct, I will take this opportunity to talk about form within the context of my work more generally. Figure 16 depicts a one-dimensional heterogeneous continuum – a plane, defined by ordinal distances, on which topological accidents accumulate (in terms more familiar to musical discourse, stochastic operations) (De Landa, 2002). These heterogeneous continua exhibit a given statistical distribution that marks the individual outputs of a given differential relation; as such they do not have reality on their own but require actualization by topological accidents (Ibid). Topological accidents, or chance events, can be understood as fluctuations or perturbations in the system. Each event carries with it the potential to dislodge a trajectory from the influence of one continuum to another. Just like 0° C marks neither a freezing nor melting point for water, but implies both directions at once, a melting-freezing that is “always forthcoming and already past” (Deleuze, 1990, 80), these heterogeneous continua are rate-independent – that is to say they co-exist simultaneously (De Landa, 2002). In larger works there are at least three or four diagrams like figure 16 for each parameter, which, when actualized by an operator that is rate-dependent (see figures 8 and 9), engender trajectories that may cross critical thresholds, bifurcate and trigger a change of form. The ‘art’ in this procedure is where exactly to set the thresholds. My ability to gauge the affective potential of this emergent form is ongoing and accumulates piece by piece.

regard to the material it annihilates. These annihilations occur not only on the instrument and the text but in the perception of the listener as well. I speculate that one experiences the constant obliteration of material by new material in a state of constant forgetting, as a subjectivity constantly forgetting its subjecthood.

An Instrument is an Egg: a statistical/sculptural analysis of Beethoven's Piano Sonatas (collaboration with David Pocknee, July 2014-ongoing)

What distinguishes a space as opposed to a mere set of points is some concept that binds the points together. Thus in Euclidean space the distance between points tells how close points are to each other As Frechet [a pioneer in the development of topology] pointed out, the binding property need not be the Euclidean distance function. In a metric space, which can be a two-dimensional Euclidean space, one speaks of the neighborhood of a point and means all those points whose distance from the point is less than some quantity... However, it is also possible to suppose that the neighborhoods, certain subsets of a given set of points, are specified in some way, *even without the introduction of a metric*. Such spaces are said to have a neighborhood topology. (Morris Kline, *Mathematical Thought*, 1160, quoted in De Landa, 2002, 185; De Landa's emphasis)

These diagrams are attempts to render visual the conceptual frameworks that mediate our engagement with instruments via a given repertoire. When we approach a piano, the cardinal ordering of keys, hammers, and strings is not the instrument we have access to. All interactions with instrumental mechanism take place via some conceptual 'screen' that binds points along the surface into a neighborhood, which is ingrained into the musculature in training. As such the act of composing can be understood as the construction of one of these neighborhoods – a particular constellation of privileged points of attraction that interface the performer with the instrument, that grants us access to instruments by opening spaces of possibility out of what before was only potential.

Data on the overall duration of each key's usage was extracted from midi files of Beethoven's Piano Sonatas (www.kunstderfuge.com). This data was then used to scale the length and width of each key accordingly. The smallest keys are those that go untouched. These diagrams are initial steps to 3-D print the rescaled keys to the proportions of the keyboard and install them on an actual piano, rendering them

playable. What is initially striking in the keyboard diagrams is the hegemony of the middle register in this repertoire.²⁹ We can speculate on some possible explanations for this: the limited range required for easily identifiable intervallic relationships and a preference for ‘smooth voice leading’, or the presupposition of a human performer with a torso seated before this middle register.

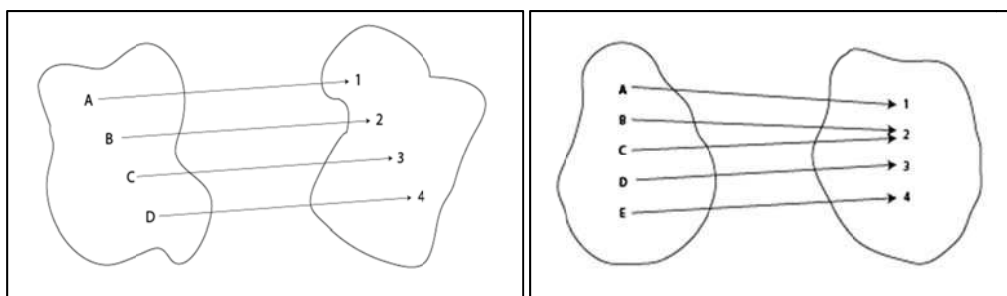
Imagine that first time you sat at the piano, completely ignorant of any technique. The surface of the keyboard extends along this horizontal plane, and aside from the black key/white key dichotomy, any key is just as likely as the next to be played. There are no learned exercises to regurgitate, no scales, melodies or chords to grab onto. This is keyboard surface as more or less ontologically symmetrical. The piano we perceive as beginners may be closer to what Manuel De Landa terms a *flat ontology*, consisting of unique, singular individuals, differing in spatial distribution but not ontological status. In that first lesson the teacher establishes basic postures and regions of bodily interaction conducive to proper technique, and isolates a particular position to be explored more in depth. We have already raised the status of certain spaces, initialized the construction of a conceptual screen or neighborhood, and broken the ontological symmetry of the beginners mind. Pedagogical practices enacted in training can be understood as the emergence of a molar, hierarchical structure built from accumulations of general types (scales, chords etc.) and particular instances (individual works that make up a given

²⁹ One may object to this characterization on grounds of the narrower ranges of historical pianos, the range available to Beethoven at the time. However, speculation on the historical pianos used in composing this repertoire is not of interest here. What is of interest is the way in which this repertoire conditions both composition and performance practices of today. Moreover, this objection is actually *to the point*, that musical historicism necessitates dislocation – extrication from a given cultural context that does violence to the historical and contemporaneous alike.

repertoire), a process of progressive differentiation that qualitatively “forms’ the player via a given repertoire. What these diagrams seek to express is pedagogical practice as a progression of *symmetry breaking* transformations that actuate privileged zones of activity within polarities established by repetition (De Landa, 2002).

To illustrate the mechanisms of these symmetry breaking transformations I will introduce two types of differential relations: a bijective function – a one-to-one correspondence of one codomain mapped onto its domain, and an surjective function – where every element of a codomain is mapped to *at least* one element of a domain, thus certain elements are subject to omission (Academy, 2009).

Figure 17: Depiction of a bijective function and a surjective function, respectively.



We could view the initial domain as the instrument/performer assemblage in its beginner stage, the instrument as pre-differentiated, ontologically symmetrical, pure potential. Via the teacher’s imposition of a pedagogical filter on the student’s activities, every lesson and practice session applies a surjective function to the instrument/performer assemblage, creating a codomain that in strengthening certain elements necessarily omits others.³⁰ Through repetition, applications accumulate over

³⁰ This can be explained by the subtractive/selective nature of human perception more generally. “Selection is pragmatic. Discarding aspects of things that have no interest for our needs, we detect our measure of possible action upon them.

time producing successive domain to codomain relations, gradually constructing the conceptual screen that informs our engagement with instruments. Pedagogical practice, in determining the nature of differential relations, plots the points of attraction that progressively differentiate a given instrumental space. Pedagogues can impose answers, prescribe rote practice without offering understanding, promote performance practices without regard to the cultural context in which they exist or inspire curiosity, invoke critical questioning, and unveil the potentials of a given instrumental surface to a student. I would propose an ontology of instrumental surface that while perhaps cannot be said to be flat, is at least bumpy (Harman, *Speculative Realism*, 2013).

These deformations imposed by pedagogy, depicted on keyboard surfaces in the diagrams are irreversible. Without some procedure to step outside of our cultural conditioning a flat ontology is not possible for us. One cannot perceive an instrument outside of a given conceptual/pedagogical constellation that binds points of attraction into a neighborhood. As such I will need to introduce one more term to illustrate this reality, that of an ordinal series. Unlike a cardinal series (one, two, three...), which is defined in terms of bijective functions and quantitatively defines the nature of the elements it orders, an ordinal series (first, second, third...) implies asymmetrical relations between abstract elements; it orders elements without defining them quantitatively, only requiring that a given element be in between two other elements (De Landa, 2002). Via the surjective differential relations employed by pedagogical practice, ordinal distances establish the neighborhoods that for us define instrumental surface.

Perception is biased towards instrumentality rather than vibrancy. Simplification rather than reception." (Bennett, 2011)

This analogy of recurrence to size is a way of illustrating the virtual contortions a conceptual screen imposes on instrumental surface via desire. The diagrams point to a danger in certain narrow pedagogical approaches that tend to emphasize one repertoire at the expense of all others. Overemphasis of a particular set of neighborhoods over time risks hardening the interface between performer and instrument, effectively turning instruments into stone. Aided by the diagrams, one can imagine what such an instrument would look like. These are the instruments that we allowed to petrify, to calcify in their fixity. As I have tried to show it is not the instrument that turns to stone but ourselves.

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