SYSTEMATIC NOTATIONS AND THE RELATIONS BETWEEN PAPER AND MUSIC

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Notation systems like the Western music notation, the Laban movement notation, or multi-view orthography, allow users to draw to and from a conjunctive space-time of performance, rather than merely mapping spaces, or logical relations. They are hybrid representation systems, mechanisms extending the logic of literacy to drawing, providing an environment in which drawing, reading and writing rub up against each other. From the friction we are enabled to compose our thoughts; and while failure, bad ciphering, and creative accounting are possible, so is the construction of something beautiful.

Meanwhile, in classifications of drawing, the common music notation is recognised as a graphic practice, but a precise determination of its nature is absent in the literature. A proposal will be presented that they are Metric drawings, sufficiently distinguished from Projections, Topographical diagrams, or the consequence-relations of writing and character-strings, as to merit a separate order. Music notations, or multi-view orthography have provisional and descriptive functions, developed to enable the creation and dissemination of plan documents aimed at the design and manufacture of some-*thing*: a song, a gestural sequence, a teapot, or a steam-engine. The move from schema to convention in these articulate systems is also a move from private to public, denoting to directing, or motivation to instruction: we are enabled to see pulse as quantity, noise as music, and movement as extensible plane. They are readouts with which we may analyse, annotate, and recycle experience as a matter of record, but also as acts of creation.

A determination of the nature of a music notation will be presented in a classification of drawing built on insights from John Willats and Nelson Goodman. And through a set of working exercises exploring proposed subgroups of nominal, ordinal, interval and ratio notations, participants will engage with the entailments of systematic notations, seeking to understand what John Cage called the 'relations between paper and music.'

INTRODUCTION

We say ourselves in syllables that rise
From the floor, rising in speech we do not speak. (Stevens, 1990 p.310)

I like this poet's image of the voice rising from a firmament, coming through us in the pitching and prosody of vocalizing, language and the voice a chemical re-action, rather than mere speech, telling things. Stevens' lyric suggests the work of the artist is to watch this reaction, reporting or attending to its effects. In John Cage's philosophy of performance, of course, the ground is impossible silence. His silent piece, 4'33," is a performance of nothing, excerpting the silence of everything else. Meanwhile Michel Serres, philosopher of science, writes of the essential flow of noise, creased by messaging: 'in hearing and in space itself, in observers and observed, (noise) passes through the means and tools of observation, be they material or logical, be they channels that were constructed or languages' (1983, p.50). All these metaphors of passage -- between language and voice, silence and sounds, observed and observer -- remind me of something vital in the marking-up of experience in notations, whether poetic, musical, or critical: Drawing is a liminal practice, permitting crosstalk between visual and auditory, and between pictures and writing.

Deanna Petherbridge (in Garner [ed.], 2008, pp.27-42) made this same observation in her review of the difficulties in defining drawing as a thinking practice. A key insight of 4'33" is that a broader experience of space and time waits to be perceived as music, thus in music writing since Cage, space-time is taken as a colloidal system of noise, sound and silence, and the crafting of the utterance a distillation. For the purpose of understanding the roles of drawing in such distillations, and seeking to clearly reflect on the implications of symbolic representation (in

which drawing is a foundational practice) whether simply channelled on the page, or spoken in syllables, Nelson Goodman's notation theory (1976) and John Willats' analytics (1997) were identified as key reference points.

Goodman's work is an essential starting point for a range of disciplines concerned with symbolic communication, even for those that diverge from its conclusions. Under his rubric, an articulate notation scheme must support consistent, repeatable interpretation and performance, and he offers the Western music notation as our flawed, pragmatic best. I will not give a full account of the philosopher's notation theory, but as an exercise in understanding his essential distinction between 'dense' and 'articulate' symbol systems, Goodman asks us to consider two primarily linear images: an electrocardiogram, and a Hokusai drawing of Mount Fujiyama (1976. p.229). While specific lines in each image may resemble each other, tracking across surfaces, they are deployed in schemes with different objectives, and thus stand for different things. What matters in the diagrammatic line is the path it traces through its data field. Contingencies such as line weight or color are irrelevant: the image is a readout; to change qualities of its appearance would not affect its meaning. In contrast, in Hokusai none of these contingencies are irrelevant, all are at play. A pictorial representation is syntactically and semantically dense: any mark in its field may be freely interpreted in significance, conceivably endless in routes of reference, and therefore, in Goodman's terminology, replete.

Thus in graphic notations, such as those in Cage's "Notations" (1969), stable readings as design/performance are simply impossible. This is not to say that they *cannot* function as scores, merely that there are degrees between poles of articulation, and those degrees have real effects on legibility. It is because of its simple graphic conventions and visual geometry that the common music notation has persisted, even in a music culture which accepts the noise, silence, and indeterminacy of contemporary compositional practices.

On not defining drawing

The task of making any definitive statement on drawing -- something so thoroughly embedded in culture through pictures, diagrams and writing -- is tricky. A taxonomical approach circumvents the failure of words, allowing us to see drawing as a field: not some *thing*, but engagements better determined than defined, and only in review of its vexing abundance.

Goodman makes an effective division into branches of pictures, notations, and text, but like the habitual description–depiction dichotomy, this is a problematic classification: once proposed, distinguishing between examples proves difficult. Any of us who have seriously engaged with drawings understands they are prodigal things, read and misread, broken down in consumption, which Petherbridge deems a necessary and useful condition (2010, p.13). Therefore, I carry forward an argument in Willats (1997) for a binary organisation into the Drawing and Denotation systems. Briefly, we use the Drawing systems to generate view-centred representations, 'putting things where they go, (mapping) spatial relations in the scene into corresponding relations in the picture' (1997, p.2). In contrast, Denotation systems 'map scene primitives onto corresponding picture primitives' (1997, p.4), schematically correlating the system being inspected with the drawing. Keeping the focus on the page, Willats gives us an artefactually oriented model, and a stronger footing for classification because of the implications of necessity tied to systems of practice.

The classification model presented here was developed in my research at The Glasgow School of Art (Griffin, 2011), informed by examinations of design-drawing practices, diagrams, and the mongrel interests of the fine artist. I reviewed research stressing social context, author function, and characteristic codes, and read reports of computational and A.I. inspired research. The model inclined towards structural, rather than functional-social aspects of drawing, reflecting an expectation that realising the abundance of drawing comes by taking seriously the implications of our enormously long history of engagement with it, foregrounding cognitive values rather than some aspect of artefactual status. Minimising cultural contingencies has also, for me, had the heartening effect of bringing together Lascaux and the virtual studio as sites in which we draw, rather than conceiving their differences in terms of rupture.

In previous classifications where the Western music notation is included, it is insufficiently explained, subsumed into categories of diagram, or thrown down as a kind of hub, vaguely associated with an unwieldy number of relations. The objectives of my model, differentiating it from other taxonomies, were

1. A closer inspection of music notations, *qua* drawing, to show its relationships to other drawing systems.
2. To decentralise specific modes of drawing in favour of a multi-disciplinary view appropriate to the persistence of its subject as a strategic, executive practice rooted farther back in our history than we can clearly see, bearing fruit across multiple domains of knowledge.

Taxonomies, typologies and classifications

> If worlds are as much made as found, so also knowing is as much remaking as reporting (Goodman, 1975, p.72).

Timothy Ingold writes that while a drawn line may work to circumscribe some shape, its tracery primarily represents the 'movement of becoming' (2010, p.18). In related terms, knowledge-representation diagrams target difference and emergence (Pope, 1986), also generally the subject of graphic-geometrical discourses. Pinker (in Lehrdal, 2003, p.271) discusses "entity and relation" as central conceptual metaphors in verbal languages. And these are also conspicuous in the vital impurity of the sketch – the very embodiment of Ingold's movement of becoming – and therefore embedded in the socially charged engagements of life-drawing, where we reach across studio spaces to touch a comrade with a stick of dirt. And we can *listen* to them, the musicologist Lehrdal suggests (2003), in the symbolic language of music, reminding us that geometrical proofs and the tally-sheet of a music notation are both methods of understanding transformation and performance.

Taxonomies of graphics and drawing have understandably tended towards domain-specificity. Lohse (et al, 1991), for example, is a widely cited paper describing five types of technical diagrams (tables, maps, diagrams, networks, icons) arrived at through user group studies -- not the progressive dialectics of Schenk's (2007) or Lawson's (1994) studies of graphical interactions between designer, team, and client, but efficacy assessments by users, at the point of consumption. And much of the recent literature on design-drawing converges on its ideational benefits as dialogues with materials, experience, and objective, in a more or less targeted search. In this, Tversky writes that drawing is 'a cognitive tool developed to facilitate information processing… reflecting conceptualisations, not perceptions' (1999, p.1). Similarly, in 1735 the mathematician Leonard Euler resolved the problem of whether a route could be plotted crossing each of the town of Königsberg's seven bridges only once. His (negative) solution demonstrated the simplest of mark-making strategies as a thinking tool, and on the entailments of Euler's achievement, the graphics theorist Edward R. Tufte wrote: 'Often the most effective way to describe, explore and summarise a set of numbers – even a very large set – is to look at pictures of those numbers' (2001, p.9). In the Königsberg bridges problem, which manages both largeness and smallness of scales, Euler developed a schematic, metonymic restructuring of a logical problem, for fruitful application beyond the merely theoretical. He did not actually cross the bridges, but used aspects of their relations to resolve a larger question of connectivity. The simplest of denotative drawings in Willats' analysis, such an external representation is itself a classification exercise, a paring away of the intractable that supports Goodman's perception that notations and digitality are akin.

Goodman further argues that the robustness of symbolic languages is related to the efficacy of its expressions in task fulfillment, and in the title of an early chapter in Tufte's seminal volume on data graphics ("Graphical excellence," 2001, pp.13-52), it is clear the author's use of "excellence" conforms to Goodman's efficacy. Indeed, the five principles of Tufte's influential data graphics theory are entirely based on economy, and as printed, they also beautifully express the very theory they describe (2001, p.105).

SPACE AND TIME INSCRIPTIONS

> Billions of galaxies are never bigger, when they are counted, than nanometer-sized chromosomes; international trade is never much bigger than mesons (Latour, 1986, p.20).

Paul Valéry proposed that the poet's work is not a mere application of word to thought, but a synthetic, symbolic tuning (Tamplin, 1976, p.812). This principle applies to the re-actions of the reader, as well, diving into language as Serres has written, 'as if lost,' and then drawing through form, presumably to find some surface (1983, p.53). And as Latour suggests above, thinking over representations – here, numerical – we equalise discrepancies, bridging vagueness to the tangibility of performance, scaling incomprehensibilities to the handfuls of our limited mental spaces. But in drawing, production and potential are only separable in theory. In practice, the representational, instrumental, and communicative roles go on together. The creative underspecification of sketching is an example of such a unified structural-functional enterprise. While it has been called an unstructured approach, this is wrong: the sketch is a search through structuring -- as much building as finding.

Music notations are drawings, of course, but how to classify them? Unlike pictures, they do not map from scene to page, nor do they map logical relations, as in diagrams. The markings in all such practices are more or less projective or denotative, emphasising attributes or relations. But an additional order of Drawing is proposed here which I call Metric, each species of which uses some admixture of diagrammatic reasoning, iconicity, and the quasi-pictorial nature of character-strings (Elkins, 1999, pp.135-137), to map a space of time. In functional terms, a music notation is a document with a readout through which the composer gives over a calculation of audible movement, incidence, and potential, to performer and audience, relating the future to a present of plotted variables. Bringing to drawing the logic of literacy, music notations are "imagetexts" (Mitchell, 1994, p.89), writable diagrams mapping to and from a conjunctive space-time of performance. Music-compositional graphics therefore take advantage of the same aspects that the generalisations of the Euclidean space of the page offers the geometer: '(the) advantage gained in utilizing notational systems is clear,' writes James Blachowitz, 'we can manipulate them with greater accuracy and efficiency than analog models would allow... we can calculate with them' (1997, p.13). They are metric drawings, and thus a calculus of the body, with the performance as its sum.

All things are both spatial and temporal, of course, but in drawing a tree we do not target time, except as interpretive potential or hierarchical sequencing. Even Duchamp's strangely lucid "Nude Descending a Staircase" (1912) can only suggest through metaphors of fanning lines, tonal transitions, and directions of across and down. But metric notations have additional concrete instructional motivations, and a future-subjunctive compositional tense. This is not the tracing of semblance or distribution, but a reaching for communicable correspondences between differently orienting experiences.

In order to speak across perceptual modes, Forceville (2008, pp.462-482) suggests that we need engagements between (at least) two sign systems. And as Latour suggests, such engagements are made, their in-betweens bridged through systematising notations which regulate the cognitive tool. Music notations map pulses onto picture primitives, onto the page, then away again into performance. Similarly, movement notations encourage calculations of sinew, breath, and reveries onto the page, rendering leftward motions of the hand as characters for computation in both virtual and actual spaces. In navigating immensely complex calculation sets for cultures of dance, the Labanotation, factoring action, segments the dancer and aspect-characters of her movements into a timeline, exploring isomorphic relations between phenomenal experience and organising marks. Similarly, the music notation mechanism treats gestures of sound-production as cyphers, permitting transformations of observation into utterance, which may be garbled by imprecise readings (a motivation for many 20th century graphic notations), but which exploit drawing's synthetic cognitive advantages to a productive, rather than merely reactive engagement.

The work of the composer or the choreographer is never accountable as a merely statistical operation; no thing can actually be reduced to number or order, except as input into a

system, for transformation. Tufte discusses relational diagrams wherein ‘any variable quantity could be placed in relationship to any other variable quantity, measured for the same units of observation’ (2001, p.46), referring to such narrative drawings as the “greatest” of all graphics because of this insight generating utility -- a semiotic which permits possible causal relationships to be grounded in a present of plotted variables, allowing us see the rate of evaporation of water, for instance, or the relationship between thermal conductivity and temperature in copper, or comparing employment and inflation, or calculating expressions of fear and rage as social behaviours (Tufte, 2001, p.50).

The pulses of musical utterances are not things that can be pictured, or distributions denoted. The complex of a music notation cannot simply label or concatenate, it must behave like a control interface – a surface of exchange between experience, user, and sign-system. Like Valéry’s translator-poet, we must be enabled to constitute searches for form. A metric drawing is thus a control interface; a passage through a conjunctive space of time, allowing us to hold the moon in hand, or mesons, or pulses of the body, finally to construct bridges and arguments from their evanescence.

Metric drawings

In aid of developing the idea of a Metric order as a classifier in the taxonomy, I adopt the measurement scales – nominal, ordinal, interval, and ratio -- defined by S.S. Stevens in pursuit of an answer to the question of measuring human sensation (1946). Measurement is a rule-based assignment of numbers to objects or events (Marradi, 1990), and in the broader sense of applying symbolic characters to real things as proxies, it is also a practice of discrimination and classification, where correspondences between objects and counting systems are determined, resulting in representations which become plastic in a semiotic sense.

Quantification of qualitative entities is, of course, a practice with a long history, most recently renewed in the fields of information and data visualisation design. But while music notations have functions as documents of process and analysis, their real importance is in directing our attention to action, delineating a ‘relationship to the future’ (Hanoch-Roe, 2003, p.155). They are drawings of spatiotemporal events acting as both input and readout mechanisms. In their activity spaces every mark is a character, and their referents – those things which are scored -- are rendered at once static and dynamic, both description and proposition. They are thus algorithmic, intervallic environments in which we represent contiguities, forces and dynamics, and distributions between audition and vision, with the value-added capability of being played-back. Quality and quantity are conflated, and we get a view beyond mere representation, encoding for further passage towards production and instruction. In their articulation they become control interfaces between experience, sign system, and user, allowing views and manipulations on the sum and substance of their art – in all cases, space and time in performance. Thus it is that in systematic notations we find our best opportunity to accomplish the measurements of human sensation Stevens would have us consider.

Finally, music notation systems are not simply tools to do a job, but mechanisms for determining how the job can be done. They are environments in which drawing, reading and writing rub up against each other, and from their friction we are enabled to compose our thoughts; and while failure, bad ciphering, and creative accounting are possible, so is the construction of something beautiful. The move from schema to convention, as Goodman and Willats say in their ways, permits analysis and annotation, permitting users to push the envelope of the notation’s domain – to score impossibilities.

The geometry of inscriptions

With a metric classification we extend Willats’ geometric analogies of projection and topology, but also a more generic view described by Latour, who notes that in the two-dimensions of the page space, we ‘merge (the inscribed) with geometry… (which) result is that we can work on paper with rulers and numbers, but still manipulate three-dimensional objects “out there”’

(citing Ivins, in 1986, p.20). Note that both pictorialism and the written word in the west have been theorised to be derivative of our social compulsion to count, and to document that counting. Denise Schmandt-Besserat has persuasively traced the evolution of systematised marking through artefactual tallies 'developed to keep track of property, beginning with a simple one-mark one-piece of property relation, developing into numerals as tallies became cumbersome for large sums and calculations' (in Tversky, 2001), resulting in a culture of numeracy where numbers are not merely representative tokens.

Music and music notations are inscriptions, but while we sing the one -- conversing with singing and with song -- with the other we orchestrate, nudge, proscribe, and diminish, from a place of thought. Standing for silence, then, paper is a surface that we work, but as we fold, crumple, etch, and shape it through the mediation of articulate notations, the paper becomes a space of time. They are hybrid representational systems, in Recanati's sense (2007, p.511): they are mechanisms grounded in the entity-relation metaphor at play in all drawings, fashioning action and instruction, applicable therefore to grapes, anger, song, or leftward motions of the hand. Responding to a rhetorical question from Cage about the relations between paper and music, then, notation proves to be kind of calculus of the body, a reckoning of future and past.

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