SHAPING TIME

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The same returns not, save to bring the different. Time keeps budding into new moments, every one of which presents a content which in its individuality never was before and will never be again. William James[1]

The past is consumed in the present and the present is living only because it brings forth the future.
James Joyce [2]

Making time;
Keeping time;
Losing time;
In time;
Out of time;
In no time;
Take your time.

What time is it? It's about time.

INTRODUCTION

Music, of all our creations, is about time. Music, shaping time, brings time's transient presence into consciousness—making time palpable, as if hand held.

[1] William James, "The Sentiment of Rationality," in *The Will to Believe and Other Essays in Popular Philosophy*. (New York: Dover Publications, 1956), 107.
[2] James Joyce, *A Portrait of the Artist As a Young Man* (New York: Viking Press, 1960), 251.

We necessarily experience the world in and through time; our body actions, the flow of objects and events around us are experienced as successive and contiguous. How and why, then, do we step off these temporal action paths, to selectively and purposefully interrupt, stop, contain, and measure the natural passage of continuous actions/events?

The episodes with children that I follow, here, recapitulate in innocent form efforts of philosophers and scientists throughout history to hold time still so as to reflect upon it, to digitize, count, and notate its passing presence.

> Time: First, does it belong to the class of things that exist or to that of things that do not exist? Then secondly, what is its nature? One part of it has been and is not, while the other is going to be and is not yet.
>
> Time, on the other hand, is not held to be made up of "nows." Again, the "now" which seems to be bound to the past and the future--does it always remain one and the same or is it always other and other? It is hard to say.[3]

In contrast, dictionary definitions ignore these elusive issues by depending on calmly putting time into space:

> Time: A space or extent of time. A limited stretch or space of continued existence. “A long time. A short time.”[4]
>
> Oxford English Dictionary
>
> Time: The period between two events or during which something exists, happens, or acts; measured or measurable interval.[5]
>
> Webster’s New World Dictionary

[3] Aristotle, *Physics*, 4.10 (Chicago: Encyclopedia Britannica, Inc., 1952).
[4] *Oxford English Dictionary*, [1957 ed.], s.v. “time.”
[5] *Webster’s New World Dictionary*, [1957 ed.], s.v. “time.”

How, then, do we learn to turn the moving flow of our complex, organized bodily actions––like clapping, drumming, or bouncing a ball, swinging on the park swing, or rollerblading—into discrete, static entities that we believe represent our experience of those objects and our sensory mastery of them?

Children, in seeking to make descriptions of objects (or themselves) in motion, also find ways to hold time and motion still, to contain and bound it, to make bits and pieces of their *going on*. I will argue that in their efforts to describe organized rhythmic actions (clapping, walking, drumming), children give us a window into our everyday assumptions. In particular, those assumptions that hide the poignant complexity of how we have learned to make, understand, and to use descriptions of continuous motion that have been compiled into common symbolic expressions. Studying children's efforts to make descriptions of themselves as well as things in motion also provide us with insight into the critical (silent) transformations through which the *know-how* of familiar action, becomes the selective *know-about* that is expressed in symbolic conventions that compress, consolidate, and hold time's evanescence still.

But to study children's spontaneous productions, taking them seriously in search of answers, we need to become something like cultural anthropologists: like the anthropologist entering a new culture, we need to begin with the assumption that what is found there—rituals, myths, modes of representation—no matter how they may initially seem strange, incomprehensible, meaningless, they make sense to the inhabitants of that culture. Once making that assumption, the task becomes mutual and reciprocal: we must learn to understand our own belief systems, our own deeply internalized intuitions for making sense, even as we learn to understand the sense-making of the other. As Clifford Geertz has said of the practice of

anthropology: ". . . progress is marked less by a perfection of consensus than as a refinement of debate. What gets better is the precision with which we vex one another."[6]

PART I

WHAT DEVELOPS IN MUSICAL DEVELOPMENT?

Influenced initially by traditional cognitive developmental theory, I saw the children's inventions and wrote about them as exhibiting a clear developmental progression based in Piagetian theory. Reflecting on the typology from a greater distance in time, I now see the children's work quite differently and in this broader context perhaps more interestingly. To begin with, I am troubled by Piaget and others who propose that to achieve a later stage in development requires *overcoming* features that characterize an earlier stage. Vygotsky, in taking issue with Piaget's view of "progress," puts it perhaps a bit starkly:

> For Piaget the child's mental development consists of the gradual *replacement* [emphasis mine] of the unique qualities and characteristics of the child's thought by the more powerful thought of the adult. . . . With age the characteristics of the child's thought are replaced in one domain after another and ultimately disappear entirely**.** One must be done away with so that the other can take its place. . . the child's thought must be known as any enemy must be known in order to be fought successfully.[7]

On this view, "progress" implies, for instance, gradually giving up a response to context where properties may shift and change their meanings. Heinz Werner in contrast to Piaget makes what I

[6] Clifford Geertz, *Interpretations of Culture* (New York: Basic Books, 1973), 29.
[7] Lev S. Vygotsky, *Thinking and Speech,* ed. Robert W. Rieber and Aaron S. Carton, trans. Norris Minick (New York and London: Plenum Press, 1934/1987), 175.

now believe to be the critical point: "The lower level is not lost; it develops as an integral part of a more complex organization."[8]

Following Werner, I no longer see the children's drawings as illustrating a process of *giving up* aspects that are thought to characterize "earlier stages." Instead I see the typology as if it were an *accumulating palette of useful and provocative sensory organizers*—emergent possibilities that gather and evolve throughout a musical life. Thus, as I shall show, the mature musician is responsive to shifts in meaning of the properties of events as they change their function in response to activity and context, while also recognizing that properties *as* properties remain invariant in spite of situation and function.

But, as I shall show, the scope of possible sensory organizers as revealed in the children's drawings also predicts the emergence of an essential tension—one that begins early on in musical studies, and continues to pervade and also enliven mature musical life. In its most potent form, it is the tension that we experience as we move back and forth between *action and symbol*. Perhaps the typology suggests in practical form, the philosophers' quandaries as they contemplate parsing continuous time. Hasty helps to make the tension explicit with "the opposition of meter and rhythm," most particularly in the role played by notation and pedagogy:

> Now it must be granted that in our elementary training we do not reflect on the issue of homogeneity or on what metrical homogeneity must mean for our conception of musical rhythm and time in general. But it must also be granted that the practice and pedagogy of metrical notation are not detached from theory. Since we have little reason to reflect on the conceptual framework we accept in learning to read, with long familiarity we can

[8] Heinz Werner, *Comparative Psychology of Mental Development* (New York: International Universities Press, 1973), 216.

> come to accept certain customary notions of meter and rhythm simply as matters of fact . . . . Indeed, I would argue that all our systematic theories of meter draw upon a conceptual framework grounded in the technology of *metric notation*. And yet, for all the subjectivity and vagueness that the idea of rhythm seems to present, it may serve as a reminder of the real complexity of musical experience and perhaps also as a reminder of the inadequacy of our conception of temporality.[9]

In his recent book, *Time Reborn,* Lee Smolin makes the argument with respect to physics:

> By succumbing to the temptation to conflate the representation with the reality and identify the graph of the records of motion with the motion itself, these scientists have taken a big step toward the *expulsion of time* from our conception of nature. . . . They [Descartes, Galileo, Kepler, and Newton] showed us how to display the records of these motions in simple diagrams whose axes represent the positions and times in a way that is frozen and hence amenable to being studied at our leisure.[10]

With all of this in mind, I have come to see the children's drawings as a display of our emergent efforts to hold motion and time still. In that cumulating process one is also tempted to see "progress" as a move towards the expulsion of time—*motions frozen and hence amenable to being studied at our leisure.*[11]

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[9] Christopher Hasty, *Meter As Rhythm* (New York: Oxford University Press, 1997), 6-7.
[10] Lee Smolin, *Time Reborn* (New York: Houghton Mifflin, 2013), 34, 38.
[11] Smolin, 38.

PART II

A TYPOLOGY OF CHILDREN'S

INVENTED NOTATIONS

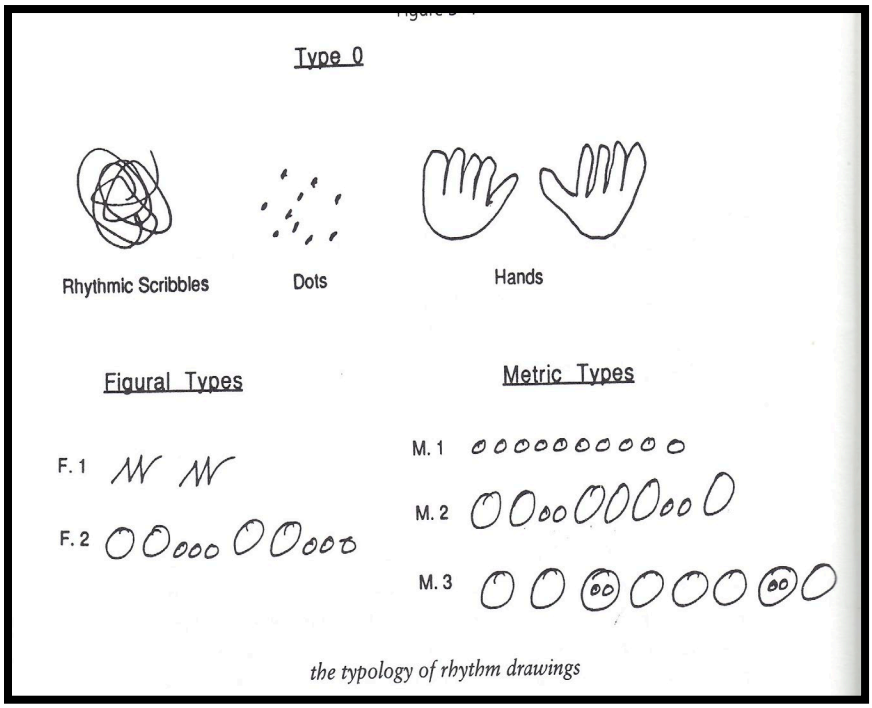


Figure 1a. A Developmental Typology

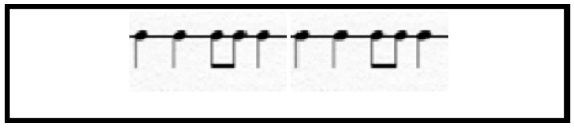


Figure 1b. The given rhythm.

I begin with an analysis of the invented notations as I originally organized them—a developmental typology. I interweave this with comments and examples of how the particular qualities of each type are expressively integrated into mature analysis and performance.

The original typology, shown in Figure 1a,[12] derives from 186 drawings made primarily by children between the ages of 6 and 12. During their regular music classes, the children were asked to listen to a clapped rhythm, to clap it back, and then: "Put something on paper that will help someone else who isn't here today, clap the rhythm that you just clapped." I have chosen one of the six rhythms the children worked with and copies of a selection from the drawings of it to illustrate how the inventions typically change as children grow older.[13]

The typology has two global dimensions reflected in the labels I have assigned: one is what I have called the figural-metric distinction that is seen in the drawings labeled **F** for figural and **M** for metric; and within each of these are the characteristics related to age, development, and learning (**0; F.1 -F.2; M.1 - M.2 - M.3)**. I will argue that the figural-metric distinction refers to differing organizing aspects of music *all of which are inherent in the structure of even such simple rhythms;* it is their interaction that gives a rhythm pattern its particular coherence. It follows from this that the developmental distinctions should not be seen as representing a single linear "progression," but rather as an interacting evolution between two complementary ways of understanding or "hearing" a rhythm, each of which enriches the other.

Type 0
Drawings

[12] Taken from Bamberger, *The Mind Behind the Musical Ear* (Cambridge, Mass.: Harvard University Press, 1991), 46.
[13] The children actually used many different kinds of shapes in their inventions. However, I have chosen drawings that were similar with respect to graphic objects in order to make comparisons simpler.

Figure 2. Type 0[14]

Type 0 drawings were made only by the very youngest children, ages 3-5. These children were interviewed individually and given only this one rhythm. Initially I labeled these drawings "scribbles" and I saw them as just that—simply meaningless scribbles. But by making the assumption that, like members of another culture, there might be reason in what the children were doing, the drawings revealed an aspect of rhythm that is lost entirely in its conventional notation. The scribbles were a trace of the children's *continuous clapping motions:* the children were *re-playing their clapping using their pencils on the paper*.

Once noticing the relation between a child's actions and the trace she left behind, I saw it as live evidence for the disjunction between action and symbol—between *continuous action* and *discrete notes*. Conventional notation symbols actually represent only the momentary *stop* in the continuous motion of the performer's two hands as they collide. Putting into notational space only the stop in the continuous motion, we give credible existence only to the public, acoustic element of the event. And since we cannot, or do not "note" spontaneous, continuing motion disappearing in time, the *actions* of performing a rhythm become invisible to our glance. Making their actions visible, the youngest children's drawings "liberate" from discrete notation-space the continuousness of living performance. Nowhere do we find in the score the subtlety of the violinist's arm moving his or her bow continuously across the strings, making the discrete pitches marked by his fingers continuous as well. To escape into notation is to escape notice:

[14] I focus only on the drawing labeled "scribbles." For more on the other Type 0 drawings, see Bamberger, *The Mind Behind the Musical Ear*.

> The aspects of things that are most important for us are hidden because of their simplicity and familiarity. (One is unable to notice something—because it is always before one's eyes.) And this means: we most often fail to be struck by, once it is seen, that which is most striking and most powerful.[15]

Figural Inventions

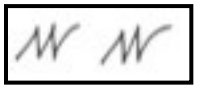


Figure 3. F.1 Drawing.

The term *figural* is used here to refer to the clarity of *groupings and boundaries* of clapped events. I have borrowed the term "figure" from music terminology where it refers to brief musical patterns that form and function as *meaningful structural entities*. A figure is a bounded musical structure perceived as organizing continuously unfolding sound as it goes on through time. *Figural,* is thus meant to characterize drawings in which one can see the child's effort to *parse* her clapped events into small, structural gestures; the boundaries of these *figures,* in turn, reflect momentary goals of motion. Grouping (or figural) structure in music has more formally been described as:

> …the most basic component of musical understanding, expressing a hierarchical organization of the piece into units such as motives, phrases, sections, etc.[16]

[15] Ludwig Wittgenstein, *The Blue and Brown Books* (New York: Harper and Row, 1960), 50.
[16] Fred Lerdahl and Ray Jackendoff, *A Generative Theory of Tonal Music* (Cambridge, Mass.: MIT Press, 1983), 13.

These structural entities as they are happening in time and motion, have also been called "temporal gestalts" in analogy with the more familiar spatial configurations or spatial gestalts. Temporal gestalts are:

> . . . distinct spans of time—internally cohesive and externally segregated from comparable time-spans immediately preceding and following it.[17]

The F.1 drawings were made typically by children aged 5-7.[18] Like those who made Type 0 drawings, these children are still playing the rhythm on the paper with their pencils. However, the process and the result were quite different from that of the youngest children. Unlike the Type 0 drawings, these children's claps are distinct and clearly seen in the up and down, undulating lines; but there is still no trace of the changes in pace, no differentiation among them save succession. The children moved their pencils first slowly (/\), then proportionately faster (/\/), a pause, the pencil suspended in the air, followed by an exact repetition of their previous actions. The trace left behind almost magically reflects back the larger and more articulated *figural* structure of the rhythm: One sees the two alike figures, their boundaries marked by the pause which is transformed into a space, an "in between."

Important move from action to symbol; from congruent motion and inscription to discrete symbol.

F.2 Drawings

[17] James Tenney and Larry Polansky, "Temporal Gestalt Perception," *Journal of Music Theory* 24, no. 2 (Autumn 1980), 205-241.
[18] However, in a recent class of adult students, this F.1 drawing appeared again.

The more fully developed F.2 drawings were made by children beginning at about eight years of age.[19] These older children's inventions have become more discrete, thus merging toward common practice and also more useful communication—a measure of "progress" within the figural dimension. In contrast to the children's F.1 drawings, which were still played on the paper, F.2 children are no longer simply transporting their actions directly onto paper (playing/drawing). Making distinct and differentiated big and small shapes, the shapes, in turn, show both *changes in pace and also more fine-grained inner groupings*. The continuous lines of F.1 drawings have become discrete, differentiated graphic shapes that *stand for, refer to* actions rather than being the *direct result of the actions* themselves. These are *thought actions.* In this sense, F.2 notations move away from action towards symbol.

But the F.2 drawings present an intriguing puzzle: the relation between size of shape and actually performed durations is not consistent.[20] As seen in Figure 4, Clap 5 is *drawn* with a smaller shape like the faster Events 3 and 4 that immediately precede it, but actually *performed* as an event of longer duration, like Events 1 and 2 or 6 and 7.

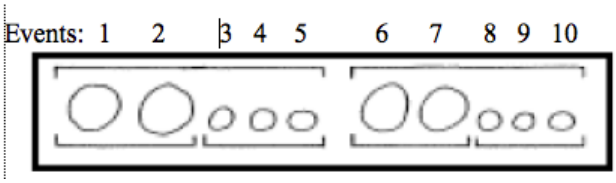


Figure 4. Figural functions.

We can account for why Event 5 is drawn as a small circle by noticing that it is the last of the inner, faster figure, 3→4→5. [21] Moreover, even though Clap 5 is "longer," like Clap 6, it is apprehended as different because it has a different *figural function.* Clap 5 functions as the *ending*

[19] F.2 drawings were commonly made by subjects up to and including musically untutored adults.
[20] "Duration" as used here, is more accurately termed "attack time"—i.e., the time from the attack of one event to the attack of the next event.

of the figure, 3→4→5, whereas Clap 6 functions as the *beginning* of the figure, 6→7. In contrast, conventional notation, always notating consistent *properties*, naturally represents Clap 5 the same as Claps 1 and 2 or 6 and 7. Once again we confront the essential tension between action and symbol and also between *property and function*.

The F.2 drawer is still, in effect, inside her performance, moving with it to the boundaries of structural goals as she re-enacts the experience. In performing a simple rhythm or even a large complex piece, the experienced performer is continuously responding to the unique *situation* of events as they occur, and also the particular *function* of an event within the figures of which it is a member. The F.2 drawing is a graphic reconstruction of experienced actions—what I have called a player's *felt path.*

As an example, a child who made a metric drawing in looking at the typical F.2 drawing said, "It's hard to play it like that. There should be a big circle there" (and he pointed to Clap 5). With his focus on properties rather than function, he played the F.2 drawing as:

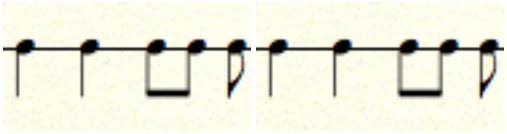


Figure 5. A property focused rendition of F.2.

The child who had made the original F.2 drawing responded with, "It doesn't matter how long that one is; you just stop and start again."

Seen in the light of conventional developmental theory and conventional notation, we would have to conclude the child's F.2 invention is inadequate, something to overcome. But as an expression of an evolving sensory organizer, the invention makes visible a living, even cherished aspect of an artist's performance: two events that are represented symbolically as sharing an

invariant property (here, duration), can be performed differently in response to their changing function within the contexts in which they occur. This is not something that we overcome, that disappears with growing maturity; rather, it can be seen as a sign of growing musical sophistication.

Soyer, the cellist in the Guaneri Quartet, in describing his own performance, gives a powerful example:

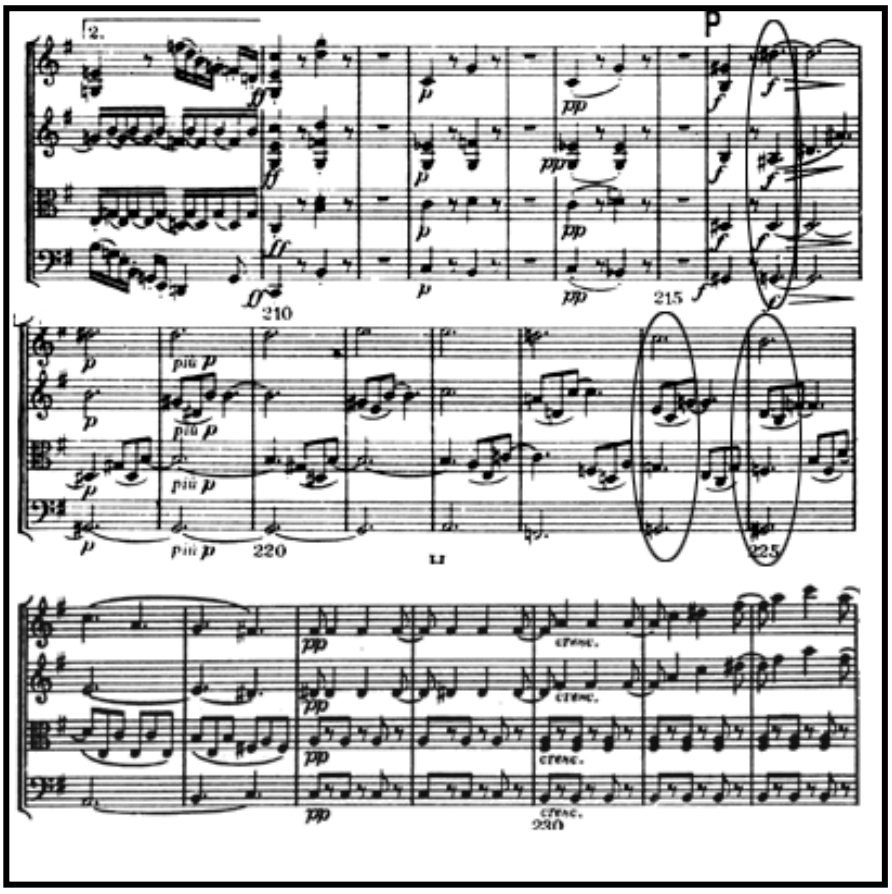


Figure 6. Beethoven, String Quartet, Op. 59, No. 2, first movement, coda.

> Soyer: [. . .] The passage begins in the key of G-sharp minor; the G natural in bar 215 is clearly a simplified way of writing F double-sharp, which, as the leading note, has an upwards attraction towards the tonic G sharp. For this reason I'd avoid using the open G-string and would play the passage on the C string. When G

> natural comes again [bar 223], *its harmonic function is altered* [emphasis mine]; it's now the fifth degree of C major and thus not sharpened. The subsequent G sharp [bar 224] is no longer the tonic but acts as the leading note in A minor and should be sharpened. This is the explanation from the harmonic standpoint, but your hearing once sensitized to such things, will often be able to put you there quite of itself without your needing to think it out.[22]

Metric Inventions

Comparing the metric drawings, M.1, M.2, and M.3, with the figural drawings, the focus of attention has obviously changed. One might see these drawings as "progressing" as they become closer and closer to conventional notation if looking only within the three metric drawings. However, as a group, I now see them as another contribution to the *accumulating palette of useful and provocative sensory organizers.*

M.1 Drawings

As with the F.1 drawings made by the 6-7-year-old children, one really needs to have been there in order to understand what the children have left behind as "product." As we watched the children who made M.1 drawings correctly clapping the rhythm to themselves, we saw them also slowly and laboriously *counting up each clap* as it went by—ten claps in all. It was as if they were trying to "extract" from their continuous motions each separate and discrete clap sound.

1 2 3 4 5 6 7 8 9 10

[22] Quoted in David Blum, *The Art of Quartet Playing: The Guarneri Quartet in Conversation With David Blum* (New York: Alfred A. Knopf, 1986), 33.

Figure 7. An M.1 drawing.

With the count-up in mind and ignoring the changes in pace they actually clapped, the children carefully drew a row of ten separate, ungrouped and undifferentiated circles. Each of their claps thus became an item in a *count-up*, with the clapping translated into a line-up of all-alike shapes going left to right across the page.

The drawings seem to be a first emergent attempt to homogenize time and motion so as to hold it still. Perhaps this was in the service of making action events become externally "noteable." While the count-up drawings suggest a primitive form of metric, the critical feature of a metric notation, *an invariant unit of measure generated by the varied durations*, is not yet realized.

In contrasting the earliest figural and metric drawings (F.1 and M.1), we see, even in these early drawings, the emergence of the potential tension between meter and rhythm: M.1 drawings show the child's focus on differentiating clap from clapping, counting them up to form the beginnings of *discrete units*. In contrast, F.1 drawings show the child's focus on differentiating within and bounding his or her continuous clapping motions so as to form the beginnings of *figures*. Thus we have on one hand, *rhythm* as the figural response to motion and to situated function, and on the other, *meter* as a search for the stability of calculated, measured, and *noteable* invariance. Both become critical elements in the cumulating *palette of sensory organizers.* Hasty captures the essence:

> The notion of time *meter* evokes is that of classical scientific doctrine—a homogeneous, evenly flowing time that serves as a receptacle for events while remaining unaffected by the events it comes to contain. It is a conception of time modeled on number. . . .

> The *rhythmic* process of event formation is that of repetition transformed into novelty. . . .[23]

Dewey uses quite different terms to suggest a similar contrast but without the advantage of the more tangible and practical case of music:

> Temporal quality is however not to be confused with temporal order. . . . Order is a matter of relation, of definition, dating, placing, and describing. Temporal order is a matter of science; temporal quality is an immediate trait of every occurrence whether in or out of consciousness. Every event as such is passing into other things, in such a way that a later occurrence is an integral part of the *character or nature* of present existence.[24]

M.2 Drawings

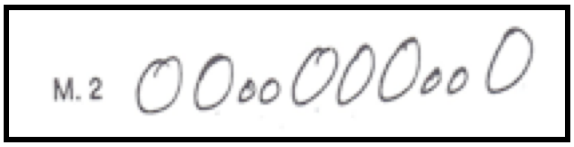


Figure 8. An M.2 drawing.

With the M.2 drawings, this tension grows more serious. The children who made M.2 drawings were about the same age as those who made F.2 drawings. However, in contrast to both M.1 and F.2 drawings, each clapped event is consistent with respect to duration. And this is irrespective of where it falls in the course of the rhythm pattern, and irrespective of its figural membership and function. Rather than going along the temporal felt path of the rhythm, these

[23] Hasty, *Meter as Rhythm*, 7, 10.
[24] John Dewey, *Experience and Nature* (New York: Dover Publications, 1958), 110.

children step off the path to compare events with respect to duration, even events that are distanced from one another in their order of occurrence. And as in all metric notations, the figural groups that are so clear in both F.1 and F.2 drawings *have disappeared entirely* in M.2 drawings.

The contrast between F.2 and M.2 drawings can best be understood by considering the meaning of "group" or "go together" in each. An F.2 group is a *figure*—events go together as *a sequence of unique, necessarily contiguous and functionally bounded events.* An M.2 group is a *class*—its members are single events that go together because they *share a particular property,* here, the property *same relative duration.* It is this focus on *classifying* events in contrast to a focus on situation and function of actions within figures that most particularly distinguishes F.2 from M.2 drawings. In terms of consistency and the greater objectivity of classification, the M.2 drawings take on strong value within traditional developmental theory, but also in the cumulating palette of sensory organizers. William James has doubts about the very value of classification, however:

> When, for example, we think that we have rationally explained the connection of the facts A and B by classing both under their common attribute x, it is obvious that we have really explained only so much of these items as *IS* x. . . .
>
> We are thus led to the conclusion that the simple classification of things is, on the one hand, the best possible theoretic philosophy, but is, on the other, a most miserable and inadequate substitute for the fullness of the truth. It is a monstrous abridgment of life, which, like all abridgments is got by the absolute loss and casting out of real matter.[25]

[25] James, "The Sentiment of Rationality," 67.

Before going on, I would like to sympathize with readers who may feel, by this time, a little like they are in Alice's Wonderland, where the most ordinary things seem to come to life in confusing ways. And this is even worse when we are naming things—what do we give names to and what do the names mean? Or as Humpty Dumpty and Alice put it in *Through the Looking Glass*:

> "Don't stand there chattering to yourself like that" Humpty Dumpty said, looking at her for the first time, "but tell me your name and business."
>
> "My name is Alice, but..."
>
> "It's a stupid name enough!" Humpty Dumpty interrupted impatiently. "What does it mean?"
>
> "Must a name mean something?" Alice asked doubtfully.
>
> "Of course it must," Humpty Dumpty said with a short laugh: "my name means the shape I am—and a good handsome shape it is, too. With a name like yours, you might be any shape, almost."[26]

M.3 Drawings

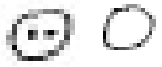
The shift in focus found in M.2 drawings is further developed in M.3 drawings.

Figure 9. An M.3 drawing.

While M.2 drawings classify events with respect to their *relative* duration (longer or shorter), M.3 drawings show *how much* longer or shorter. The underlying beat in the M.3

[26] Lewis Carroll, *Alice's Adventures in Wonderland and Through the Looking Glass* (New York: Penguin, 1960), 28.

drawings is represented by the larger circles—eight beats in all. The shorter (2:1) durations are represented by the two smaller circles inside the larger circles. As the child who made the M.3 drawing said of Events 3 and 4, “You can see there’s two for one, there.”

Indeed, the M.3 drawing comes very close to conventional notation. The notated rhythm,  , is equivalent to the child’s  . However, the child's invention has the advantage of consistently showing the beat, the regularly occurring  , and the varied performed events in relation to it  . M.3 children have invented what might be called the beginnings of a formal symbol system.

But notice that just as M.1 children lose the marking of the large figural boundary found in F.1 in their singular focus on counting, so M.2 and M.3 children, in their focus on measuring, obscure figural boundaries as well as the changing function of events in response to context. Thus metric graphics, like standard notation, leave the performer with the problem of “putting in the interpretation”—that is, finding the figures, the *phrasing* now hidden in the carefully denoted metric units.

Neither standard notation nor the children’s inventions adequately captures the many faces of a fully apprehended or performed rhythm. For practicing musicians, it is these multiple views that create the generative tension and the complexity that continues to inform and influence a performer's developing "hearing" and its projection in sound and time.

Coming full circle, I argue that the children’s spontaneous inventions provide evidence that the typology illustrates a *palette of useful and provocative sensory organizers.* In turn, rather than assuming that progress, as described by Piaget and others, means *giving up* characteristics

associated with earlier stages of development, progress means appropriating the array of sensory organizers made visible by the children's inventions, using them as vehicles when, where, and in ways that the particular (often unique) situation demands.

PART III

VARIETIES OF "FASTNESS"

I turn again to "now" and the exclusion of time in our analytic and notational discourse. The examples that follow again illustrate that if, in observing children, we can assume the stance of an anthropologist entering a new culture, we may encounter our own internalized assumptions. We may, for instance, reveal and make explicit, aspects of our own experience of time and music that previously remained tacit.

The linguist B. L. Whorf sets the stage for this discussion of time and "fastness" in his seminal study of the Hopi Indians. Whorf compares the meanings implicit in our ways of speaking of time with the meanings given to time implicit in the language of the Hopi. He says:

> Instead of our linguistically promoted objectification of that datum of consciousness we call "time," the Hopi language has not laid down any pattern that would cloak the subjective "becoming later" that is the essence of time.[27]

An 8-year-old child, as if echoing both Whorf and Hasty, put it this way in response to a question about the "sameness" of a repeated musical event. She said: "But it will never be the same because it's *later*."

[27] Benjamin Lee Whorf, *Language, Thought, and Reality*, ed. John B. Carroll (Cambridge, Mass.: MIT Press, 1956), 140.

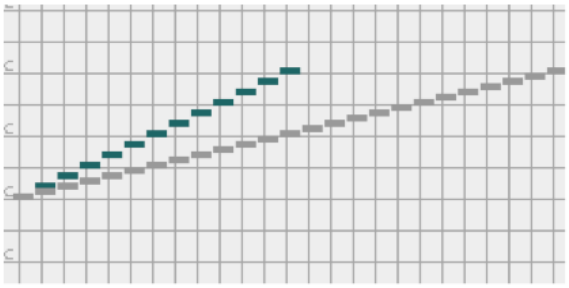
EXAMPLE III.1. FORMAL FASTNESS

DISTANCE/TIME

It was through finding reason in the children's inventions that my attention was alerted to the following question: What are the means that composers use to generate the effect of "going faster" within the unfolding of a musical composition? Are these means in some ways related to the figural/metric or the property/function tensions?

The triggering situation was this: Working with a group of 8–9 year olds, I played a two-octave chromatic scale starting on middle C. After a brief pause, I played *at the same* t*empo*, a whole-tone scale, also over two octaves starting on middle C. I asked the children what the difference was. I was, of course, expecting something like, the second one, the whole-tone scale, had bigger steps. But to my surprise, the children all agreed that the second example was "*faster*!" I was puzzled; how could this be since I had kept the beat, the *tempo,* the same for both the chromatic and the whole-tone scales?

Later in the day I played the same examples for a group of college music students and reported the children's view. The students responded simply that the children were just wrong—the beat stayed the same. But taking the advice of the anthropologist, Geertz, I urged the group to let the children's view "vex" us: Let's assume that there is reason in the children's view and go in search of it.



TIME

Whole tone Chromatic

Figure 10. Chromatic and whole-tone scales.

To help, I translated the scales as I had played them into static, graphic space. Looking at the graphics, the children's "hearing" suddenly made perfect sense; it was a simple instance of the classical definition of "faster": the whole-tone scale goes the same *distance* as the chromatic scale but in *half the time!*

But what if I play the chromatic scale twice as fast as the whole-tone scale? They now come out together not only in pitch-space but in time.

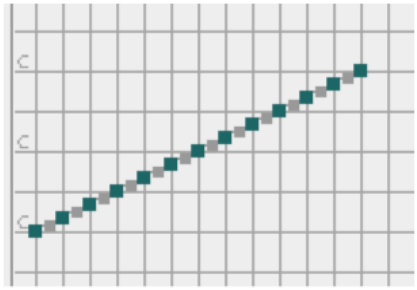


Figure 11. They now come out together.

What does twice as fast mean, here? It means that now there are two chromatic events for each whole-tone event—or that each chromatic event is “half way” between each whole-tone event in both space and time. Thus, the total time is now equivalent because the chromatic scale is both

twice the number of events (frequency) as the whole-tone scale and also half the duration—"size" in space compensates for "size" in time.

With this in mind, I designed an activity to follow that was initially meant as an opportunity for children to explore relations among time, space, and motion. However, it turned into an exploration of how children would respond to confronting an emergent paradox. What follows is an analysis of a moment of learning that occurred in an environment that encouraged children to confront such complexities rather than eschewing them.

Equidistant lines had been drawn on the floor in preparation for participating in an activity that we described to the children as follows::

> You are going to walk in pairs. One person is going to step along each of the lines drawn on the floor in time with a drumbeat. The other person will go along taking two steps for each drumbeat, two steps for each line, and also two steps for each of the other person's steps. *The two people have to come out together at the end of the lines.*

Sidney, one of the 9-year-old participants, chose to carry out his version of the experiment with Jeanne. Rose, another child, watched closely.

Sidney made a variation on the original directions.

> **SI: I skip a beat. You're here on my first beat. And then you take another one. And by the time you're here, I'll be here.**

Figure 12. ". . . **by the time you're here, I'll be here.**"

J: So two beats are going to go by for each of yours. But we have to end up together.

Following Sidney's special instructions to Jeanne, the walk along the lines developed as follows: Sidney and Jeanne start together on the first line. Jeanne moves ahead, stepping on each line together with the drumbeat (chromatic scale). Sidney waiting a moment, moves ahead by *skipping every other beat and then jumping ahead over every other line* (whole-tone scale).

So while Sidney was momentarily standing still on the first line, Jeanne, following the drumbeat, was moving ahead to the next line. Sidney then leaped ahead, skipping over the line Jeanne was now on, and landed together with her on the next line and on the same beat. Even though Jeanne was actually taking twice as many steps as Sidney, they ended up together at the same time on the last of the lines.

Figure 13. Ending up together.

As they arrived, Jeanne posed questions that intentionally created a puzzle:

J: So who was going faster?

Rose You.

Sid: You.

J: But we ended up together.

Rose But you were still going faster.

J: What if. . . [brief pause]

Sid No, we were going the same *pace*. . .

Rose: She took more steps, though. . .

Si: … *because when I was going faster she was going slower; and when she was going slower, I was going faster.*

In response to my question, "So who was going faster?" both Rose and Sidney agree that Jeanne was going faster. My next comment, "But we ended up together," intentionally presented them with a problem: How could I be going faster than Sidney if we both started together and arrived together at the end? Sid, after a moment's reflection, engages the problem and countering both himself and Rose says, "*No, we were going the same pace***.**" But Rose continues to focus on more steps, "She [Jeanne] took more steps, though." Engaging the paradoxical problem, Sidney changes his view of our walk and offers an explanation for his new view. He explains: "Because when I was going faster she was going slower; and when she was going slower, I was going faster."

At the outset, Sidney's instructions had been local, discrete, and pointing to relevant

places: “You’re here . . . and then you take another one. . . and by that time, I’ll be here.” But presented with the paradox, it was as if watching himself and our interactions from a distance: he sees our walk as continuous and interactive, a relational scheme of compensating movements. But despite my question, "Who was going *faster*?" Sidney uses the term same *pace*—a more continuous and more malleable expression.[28] And, on the way, Sidney has intuitively reconstructed a basic physics principle—*average velocity*. This is an explanation from experience in contrast to explanations in terms of discrete proportional measures of time and pitch-space.

Rose, continuing to focus on more steps (*She took more steps, though*) is still describing "faster" as "frequency"—i.e., more steps per unit time. Out of the paradox comes emergent distinction.

EXAMPLE III.2

FREQUENCY

With Rose's sense of faster (more events per unit time or frequency), I recognized a familiar meaning for musically "going faster." An example is seen in Figures 14a and 14b, excerpts from the beginning of Vivaldi's "Winter” movement of the *The Four Seasons*. While a clear and abrupt change in *frequency* occurs, the *tempo* (rate of the beat) stays the same. This *faster* is clearly seen in the notation. I've noticed, however, that beginning music students, in listening, often fail to distinguish frequency from a change in *tempo*—more events per unit (beat) is taken to be a faster *tempo*.

[28] It is probably relevant that Sidney was a serious hockey player. And as in all sports, "pace," with its connotation of flexible change, is probably the more useful term as compared with faster (for instance, "Change your pace as you approach the goal").

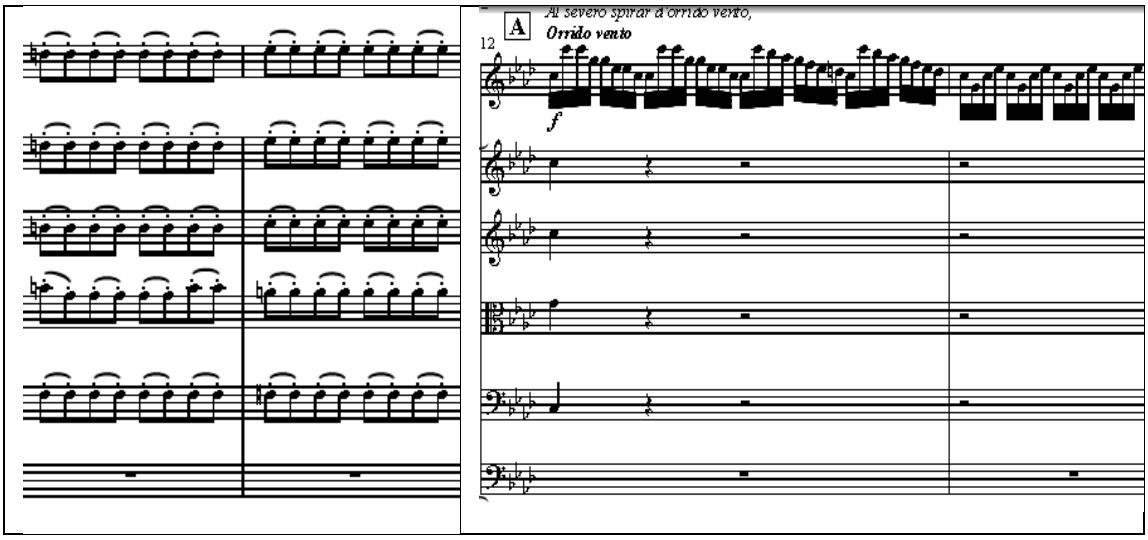


Figure 14a. Vivaldi, “Winter,” mm. 9–10. Figure 14b. Vivaldi, “Winter,” mm. 12–13.

(A good example of faster in the conventional sense of tempo or an *increase in the rate of the beat*, is the Bartok *Sonata for Two Pianos and Percussion,* first movement, mm. 21–32. The passage is marked *poco a poco accelerando e sempre piu agitato.*)

EXAMPLE III.3

FIGURALLY FASTER

Once I became alert to possible varieties of "getting faster," specifically figural types emerged. For example, Haydn gives a distinct feeling of getting faster as he moves into the B section of the Minuet, Op. 76, No. 5. By truncating the little cadential figure heard repeatedly in the preceding A section, he creates a perception of “speeding up.” That is, by shortening the figural grouping, Haydn effectively speeds up the repetition of groupings. In turn, accents occur more frequently, which also shifts the meter from triple to duple (Figure 15). However, Haydn continues to notate bar lines to show triple meter. I'll call the sense of speeding up by shortening of the motive, *figurally faster*.

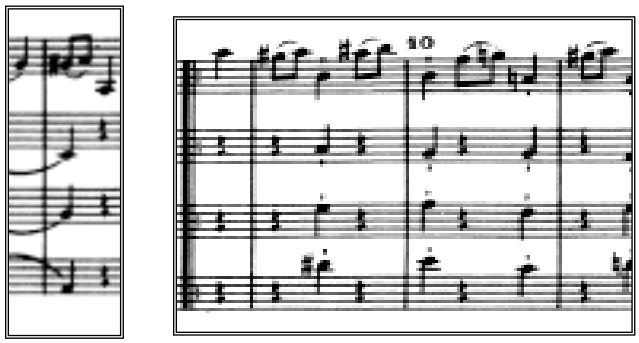


Figure 15a. Cadential figure. Figure 15b. Truncated figure; shift to duple meter.

As the passage goes onward, building toward the return of the A section in m. 12, Haydn further shortens the cadential motive making the eighth-note motion continuous (mm. 14–15). (See Figure 16). The resulting "faster motion" comes to a rather sudden slow-down with the return of the A section and triple meter in mm. 16–17.

Thus *figural faster*, together with an increase in frequency, serves Haydn as an effective compositional means helping to generate what we hear as the *structural functions* of the Minuet. The contrasting B section, beginning with the truncated cadential motive (mm. 9–11), followed by the continuing build-up of temporal intensity (mm. 12–13; mm. 14–15)—deposits us (as it were) neatly into the return of A (see Fig.16).

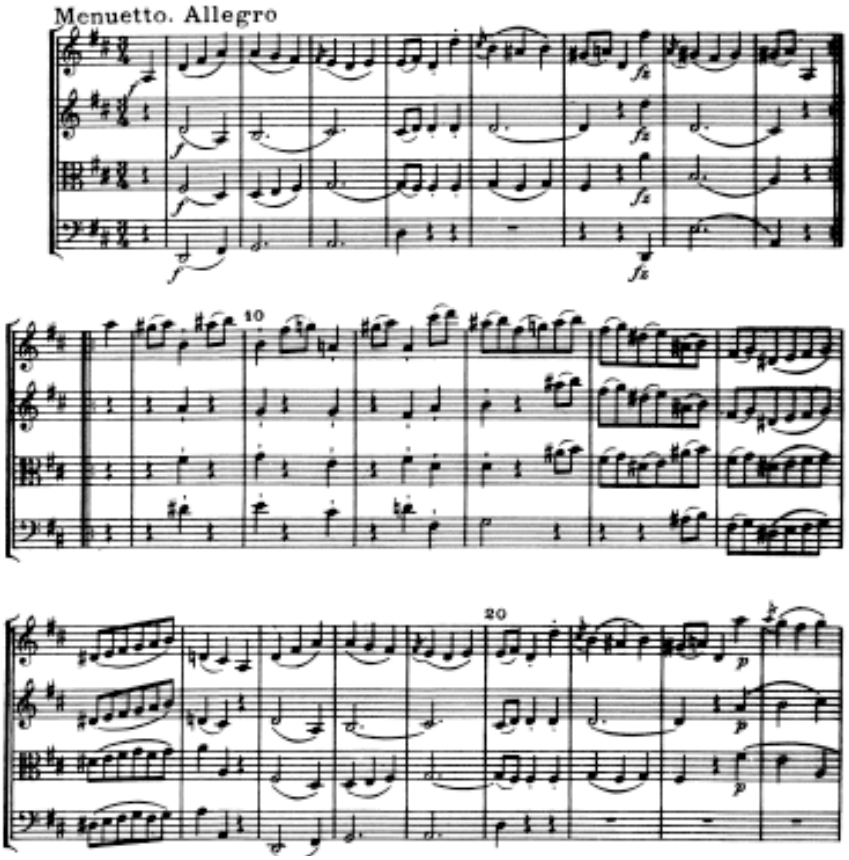


Figure 16. Haydn, String Quartet, Op. 76, No. 5, Minuetto.

And, of course, many examples of *figurally faster* occur in the works of Bach, perhaps most noticeably in the compositions for solo cello and solo violin. Looking at the score, one often *sees* continuous 16th notes. But attending to the figural grouping, the constant 16th-note motion gives way to moments that project a sense of speeding up and slowing down within it. Figure 17 shows an example from the Gigue of the Bach Partita No. 2, for solo violin.

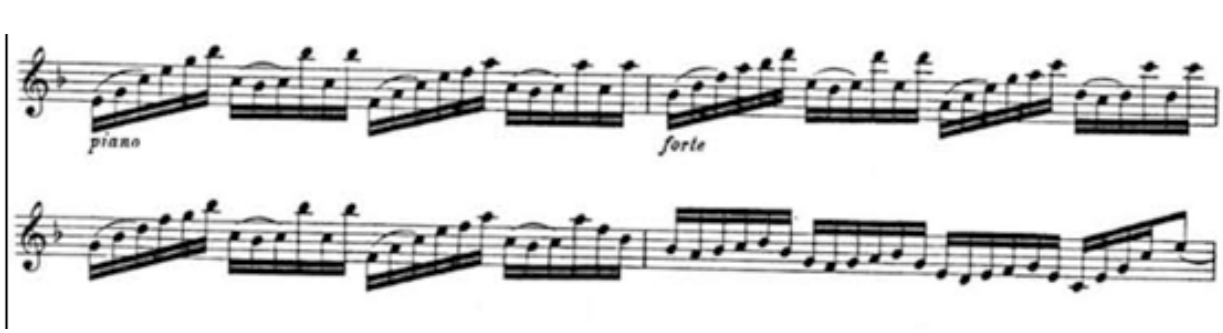


Figure 17. J. S. Bach, Partita No. 2, Gigue. *Figurally faster* and also a quicker passage through pitch space.

Notice that in mm. 1–3 of this excerpt, the sequential figure is always two beats long. However, in the fourth measure of the excerpt, the sequential figure lasts only one beat, thus half the time of the preceding figures. This results in the figural rhythm becoming twice as fast—from a two-beat figural grouping to a one-beat figural grouping. Moreover, the *rate of passage* through the pitch-space is also quickened in the fourth measure: in bars 2 and 3, the sequential figures move stepwise through a pitch space of a perfect fourth in seven beats—**Bb** (E), **A** (D); **G** (C), **F**. While in the fourth measure the sequential figures skip through a greater pitch space—a minor seventh––in just four beats—**Bb-G-E-C.** And yet, this sense of *figural faster* is hidden from view since the rate of surface events, the notated 16th notes, remain the same throughout.

The example of quickening the rate of passage through pitch space recalls the children's hearing of the whole-tone scale as "faster" than the chromatic scale. And it was that surprising event that set off my hunt for examples where composers might have used similar means for uniquely-generating structural functions.

PART IV

CODA

In the musical examples discussed in Part III, I have tried to exploit further my re-thinking of the developmental typology. In particular, the examples of *figural faster* are meant to provide further evidence for the children's figural inventions, as a legitimate type in a *palette of continuing useful and provocative sensory organizers.* But I also proposed that the typology

predicts the potential emergence of an essential tension as we move back and forth between continuous but disappearing *action* and discrete, static *symbol*.

Noticing alternative modes of "getting faster" illustrates but a single instance of this generative tension between action and symbol. *Figural faster* is shaping time in an internal, structural way, unique to a particular situation and moment. For instance, in the Haydn and Bach excerpts, transformation of germinal motives generating *figural faster* served as a means towards creating a particular structural function. In the Haydn, the function was building up for the "let down" into the return. In the Bach, *figural faster* was a means for structurally moving onward after rhythmically slower melodic motion.

The tension implicit in the typology itself was seen starkly in the children's metric M.2 and M.3 inventions, in contrast to the figural F.2 inventions. On one hand, the metric drawings show notational availability and certitude of invariant properties (as in the notes specified in a score). On the other hand, the figural inventions show the unique *situation* of properties as they occur, and in particular, the *function* of those properties as events within the figures of which they are members. I argue, then, that the typology reveals a musical tension experienced by performer and composer as they, too, learn to move creatively between the stable invariance of properties as represented in conventional notation, and the passing presence of figural functions created towards the goal of uniquely shaping time.

Finally, it was through adopting the stance of the anthropologist that the broader significance of the typology emerged: making the assumption that whatever performances were found in the children's culture, no matter how strange or surprising, they were making sense to the inhabitants of that culture. So the challenge became mutual and reciprocal: confronting our own deeply internalized assumptions, our sensory organizers, we not only come to understand

the sense-making of the other, but we liberate for reflection, intuitions and know-how that we use and believe in, but rarely if ever make quite so explicit. In such moments, our worldly musical experience seems to be sharing the philosophical enigmas of Aristotle, James, and Wittgenstein. And Piaget comes back into favor when he proposes:

> Rhythm characterizes the functions that are at the junction between organic and mental life.[29]

[29] Piaget, *The Psychology of Intelligence* (Totowa, N.J.: Littlefield, Adams, & Co, 1960), 69.

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