

Little is known about the evolving lives of prodigious children, but it often seems to be the case that during adolescence many face a midlife crisis, the outcome of which may determine their chances for later success.

Growing Up Prodigies: The Midlife Crisis

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A child of six or eight who demonstrates prodigious musical ability is, above all, awe-inspiring. And as with all feelings of awe, there is often an accompanying feeling of fear: Where did this gift come from? How should we as parents, teachers, or neighborhood kids behave with this child? What does he or she know; how did he or she learn to play this Mozart piano concerto so movingly?

In turn, what does it feel like to be a child whose intimates treat him or her with a mixture of awe, fear, and love? What is it like to be singled out, treated as an oddity, "blessed with a gift," and simultaneously asked to carry the burden of its responsibility? What is it like to try and live up to this image? And what is it like to face becoming a grown-up prodigy?

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These are, I believe, some of the questions we need to take very seriously if we are to serve some useful purpose to the fragile evolution of children's lives who demonstrate extraordinary musical ability at an early age. I would like, here, to focus on the last of these questions, which involves the transition from childhood to adulthood, partly because it is a real-life developmental one, and partly because it is, in fact, a question that is vividly and often painfully asked by individuals themselves, even after they have somehow weathered the others. Indeed, the need to confront becoming an adult often signals a critical turning point in the evolving lives of young performers. I have termed this period of painful reappraisal the *midlife crisis*. It seems to occur in the midteens—midlife for those whose public careers may have begun at five or six.

The phenomenon is a surprisingly common one but not much talked about and certainly little studied. This is not surprising, since, at worst, the crisis results in the disappearance from public view of the extraordinary child who had once shown such promise.

One does not ordinarily meet these grown-up prodigies, because they tend to keep their pasts hidden. They carry with them a deep sense of failure, even though they sometimes achieve success in other fields, at least by ordinary standards. But once a sympathetic interest is expressed, the stories begin to emerge and, indeed, to collect. I am personally aware of about a dozen whose stories all share a similar shape. They share a saga of going through a period when their extraordinary musical capacities as performers seem to come apart, to break down. Informants talk about their earlier abilities as a kind of intimate contact with their instruments through which they could bring a piece of music to life. But with this critical period, decisions that were previously made quite spontaneously, directly in terms of actions on their instruments, become problematic, self-conscious, and seemingly without clear direction or resolution. What before were relations that were simply heard, become notes in search of connections. Technical problems simultaneously emerge—it becomes difficult to “get around on the instrument.”

While such individuals report that they worked hard, practicing many hours a day, they still, typically, report little understanding of how they did what it was that made them special. Indeed, central to the crisis seems to be the shock of needing to question just what it was they were always before able to do. Most striking, then, is the impression that these young musicians, perhaps for the first time, confront the need to self-consciously reflect on their own understanding—to reflect, for example, on performance decisions that had previously been left unquestioned, spontaneous, “intuitive.” Simultaneously, they discover that they have inadequate tools with which to pursue these new questions productively. They talk of trying to learn all over again how to build a relation between their bodies, their instruments, the printed score, and their musical “hearing.” They need to learn how to apprehend, to make sense of musical relations all over again. These are, I believe, stories of the struggle

involved in the developmental process of transition from childhood prodigiousness to extraordinary, mature excellence.

There are undoubtedly a multitude of factors contributing to this mid-life crisis. They include social, emotional, maturational, and professional career issues—doubts and questions concerning fundamental life values. After all, since childhood these prodigies have been singled out, expected to be the best, and asked to live up to these expectations. It is no wonder that, as they approach adulthood, they confront questions of *why* and *what for*. Nor is it surprising that there is a great temptation to be absorbed, to become anonymous among ordinary people.

While all of these are *crucially important questions*, I would like to propose that along with them go specific cognitive issues and that these can be rigorously studied. Further, such cognitive issues are intimately related to those mentioned above through their entangling alliance with reflection. What we may be witnessing here is the powerful effect of seeking to understand, to look *at*, the very means that were previously used to see (and hear) *with*. Such studies could, for example, illuminate crucial differences between childhood prodigiousness and later adult performance. And by thus considering extraordinary ability as an evolving enterprise, we may even shed light on the nature of learning among those children whom we refer to as normal and who, after all, sometimes also become extraordinary adults.

While this is virgin territory, I will try to show that the relevant issues here are related to cognitive developmental concerns that we do know something about. But such study is demanding. It requires, in particular, a deep understanding of music, itself—what we could call the structure of the domain as expressed partly in theoretical knowledge but perhaps more so in a kind of epistemology of expert practice—and, at the same time, a thorough working knowledge of empirical research in cognitive development. The requisite skills are not often combined, understandably, since sophisticated musicians prefer to be just that and cognitive psychologists are rarely expert musicians. To encourage the joining of these enterprises is, in fact, one of the aims of what I will propose here.

Previous Research

In this section, I will describe previous research carried out primarily by myself and my students. While our previous studies have included adults with no music training, novice musicians (that is, those with only a few years of formal study), and expert professional musicians, our child subjects have included only those with no music training or with only minimal instruction. Still, the results of these studies suggest, I believe, intriguing possibilities for the study of what I have termed midlife crisis. (See Bamberger, 1980, 1981; Bamberger and Schön, 1979.)

The earliest studies were concerned with rhythm—in particular, with

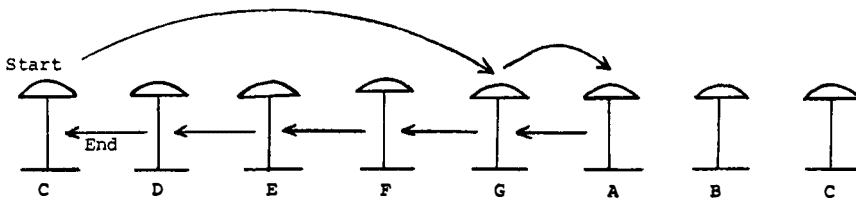
the relations between actions, such as clapping back a rhythm, and subjects' descriptions of these actions, such as paper and pencil graphics. The task, as told to the subjects, was to "put on paper something that will help you remember the rhythm tomorrow or so someone else could play it back." Subsequent studies went on to examine the cognitive processes that inform subjects' constructions of melodic coherence.

The results of these studies led to the formulation of two contrasting and distinctive strategies of representation. I have termed these *figural* and *formal*, respectively. The most striking finding was that, while musically naive subjects, both children and adults, tend to focus exclusively on figural aspects of rhythm and pitch relations and musically novice subjects tend to focus exclusively on formal aspects of pitch and time, it is only expert, professional musicians who are able to understand, make use of, and integrate both kinds of musical relations.

In general, figural strategies of representation can be distinguished from formal strategies as follows: Figural subjects tend to represent to themselves groupings of events into gestures, such as small motives or figures, rather than individual events such as claps or notes. If figural subjects are asked to attend to a singular pitch event, they assign meaning to such an event in relation to its unique situation and function within the figure of which it is a member. Further, figural strategies of representation seem to depend on the immediate sensory experience of bodily actions and the direct juxtaposition of these actions as they occur through space and time. In contrast, purely formal subjects tend to focus on separate, discrete events—that is, on each note individually. Further, they make use of what I have termed *fixed reference structures*, such as the ordered set of pitches in a scale or the hierarchy of metric units generated by specific time and pitch relations. Formal subjects assign meaning to a pitch-time event, then, according to its fixed and invariant position within these reference structures. Unlike figural subjects, formal subjects are able to compare events that are separated or "distanced" in time-space within a melody. They do so by naming, measuring relations, and thus identifying pitch and time properties as same or different in relation to previously internalized fixed reference structures. In turn, they tend to ignore the unique situation or figural function of an event within a particular melody or rhythm.

In order to make these distinctions quite clear, I will describe one kind of experimental situation in some detail. Typically, tasks have involved reconstructing a familiar tune or constructing a tune that the subject likes, using a set of pitch-making objects all of which look the same and can be freely moved about (Montessori bells). Within such task situations, subjects who are characterized as *formal* begin by mapping the mixed array of bells onto a familiar and well-internalized reference structure—that is, they order the bells in a row, with left to right going from low to high in pitch. They then proceed to find the tune *in* or *on* this constructed fixed reference (see Figure 1). Figural subjects, in contrast, build up the tune chronologically. That is, they start by finding a

Figure 1. "Twinkle, Twinkle Little Star"



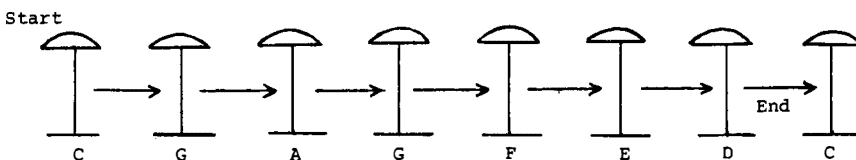
Formal Reference Structure

possible first bell-pitch with which to begin the tune, then search for the next, adding it to their cumulative row of bells. They continue, next-next-next, until they have a row of bells whose "path" is the same as that of the tune (see Figure 2). Playing along, straight ahead, on the completed bell path results, then, in an action path that plays the intended tune. We have called these bell paths *one-purpose machines*, since they are intended for and, indeed, are effective for the performance of just one tune. This is in contrast to formal tune builders, who make an *all-purpose machine*—that is, a fixed reference scale, in terms of which many tunes may be found and played.

Formal subjects, must, of course, move forward and backward on their fixed reference scale in order to play the tune, using the same bell as an instantiation of every occurrence of its pitch in a given melody. Further, formal subjects can, through their fixed reference, compare one tune with another, relating each of its (and their) movements to one another through their single, all-purpose machine. Figural subjects, in contrast, will not only build a new bell path for each new tune but, within each bell path, will often use a new object (a new bell) for each pitch event in the tune, not realizing that a later pitch is the same (in pitch property) as one that has already occurred earlier (see Figure 2).

We have given the name *felt path* to these cumulating actions of figural tune builders in their construction of tunes. That is, subjects appear to feel their way along (next-next-next), responding to the results of each action with another, until they have built up a kind of enacted description of the whole. A

Figure 2. "Twinkle, Twinkle Little Star"



Figural Bell Path

felt path, then, becomes a kind of evolving *reference entity*: Through direct actions on objects (bells) and a continuing reflective interaction with their results, vague, often tacit internal strategies shape spatial-temporal external coherence. The outcome of the process is a reference entity in that it functions to hold still progressive actions and decisions made *enroute*.

It is in this sense, then, that figural, felt-path tune builders are said to be necessarily responsive to immediately present context and to the unique function of events along the course of an evolving, felt-path construction. Once an event has passed, it is gone; where you are does not include where you have been: "The past is consumed in the present and the present is living only because it brings forth the future" (Joyce, 1960, p. 251). In contrast, formal tune builders, guided by their internalized reference structures, name and fix the properties of pitch and time in terms of the unique position of such events within these reference structures. As a result, formal subjects can compare and measure events that are separated in time and space through the relating of these events to the reference structure, rather than through the inner functional relations of these events as they occur within the ongoing melody itself.

The distinction between an external reference entity constructed on the spot and a previously acquired and internalized reference structure is crucial here. While a reference structure in the simplest case of a scale can be externalized in spatial, static form (for example, the ordering of the bells from low to high or the ordering of the white keys on the piano keyboard), reference structures in more developed forms are complex, internal mental networks of relations. Such complex mental reference structures are expressible only in symbolic form; or, putting it differently, they give meaning to the conventional symbols associated with practice in the domain.

For example, on the most basic level, the names of pitches or their positions on the staff designate particular places on an instrument. But the names of pitches may also refer, symbolically, to "places" within a mental reference structure along with specifying the distance between them—that is, intervallic pitch relations. Further, the reference structure may assign possible harmonic functions for these pitches within a tonal network, as, for example, tonic or dominant. With more complex reference structures, tonal networks are, themselves, represented in certain relations to one another—that is, a network of networks in which tonalities are thought of and heard as more closely related or more distant. In turn, the same chord (let's say, F-A-C) may play different roles, have a different function in several different tonalities, in this way becoming a common node interconnecting the networks. (For example, F-A-C can be the tonic in the key of F or the dominant in the key of B-flat.) The degree of richness and complexity of internal reference structures strongly determines just what kinds of things and relations an individual can point to or even attend to. Further, internal reference structures strongly influence just what an individual takes to be givens in the domain—what Quine calls an individual's "ontological commitment" (1960).

The strategies for constructing external reference entities are thus quite different in kind from strategies invoked by those who have already acquired and internalized such mental reference structures:

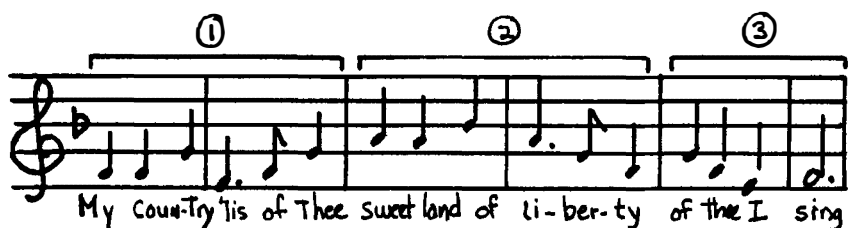
- A reference entity is unique to a particular task—for example, constructing this particular tune
- It exists as a concrete object in space, not as a mental construct
- It functions as a way of holding still found relations
- It serves to define the very terms of the task that only gradually emerge through reflective interaction between players and materials.

The differences between figural and formal strategies as described here could be seen as similar to Piaget's (1960) characterization of earlier and later stages of development. That is, *qualities that are associated with the behavior of young children seem to reappear in the figural strategies of older children and even adults when they are confronted with a specific problem in a domain that is new to them. In turn, Piaget's characterization of older children's behavior (concrete operations) seems similar to the strategies of adults with sufficient musical training to read standard music notation (SMN).* Concrete operations are "marked, for example, by the point at which temporal relations are merged in the notion of a single time, or the point at which elements of a complex are conceived as constituting an unvarying whole, or the inequalities characterizing a system of relations are serialized in a single scale, and so on" (Piaget, 1960, p. 139).

However, I have argued (Bamberger, 1980) that figural strategies, with their associated reference entities, and formal strategies, with their associated mental reference structures, while responsive to different aspects of music, *are both inherent in the structure of even simple rhythms or common tunes as well as much more complex compositions.* It is the interaction of these two kinds of relations—unique figural function in contrast to measured time and pitch—that give a rhythm or melody its particular character.

Thus, two events that can be named the same with respect to pitch may sound quite different, depending on their relation to the metric structure in which they occur. Consider, for example, the tune "America":

Figure 3.



The endings of the first two figures (*thee* and *-ty*) coincide with endings of metric units. But the end of the third figure (*sing*) coincides with the *beginning* of a

metric unit. The differences in the interaction between figural boundaries and metric boundaries here influence the feeling of the events that mark figural endings: The first two figures, seemingly paradoxically, feel less ended when they coincide with metric endings; the third figure feels more ended because it coincides with a metric beginning. But it so happens that the second and third figures end on the same pitch! This same pitch functions differently and is sung differently in each situation as a result of its position in the metric structure (this, along with differences in the duration of each, how it is approached, and so forth). Thus, if you were to say that these two events were not the same, you would be right in every respect except pitch. But, if you were a figural listener, you might well say they were different in pitch as well. You would be responding to the global feel of the events, as a result of all these interacting dimensions. If you were a formal listener, you might respond in terms of your internalized reference structure through which you could place, name, and hold steady the invariant pitch property of the two events, separating pitch from the various other dimensions that determine their unique figural functions. Thus, to identify these two events as the same would be to focus on just one dimension and to set aside the others that give these events their particular, situational meanings and their particular feelings.

It seems, then, that you need to be able to do both—that is, place and measure and, in addition, respond to interacting dimensions as these generate unique, figural functions. Indeed, I would argue that it is the continuing development of transactions between figural and formal strategies of representation that is necessary to what could be termed fully developed musicality.

The problem is that, while musicians do use figural strategies, they tend to do so tacitly. Figural strategies, for example, often account for what musicians refer to as “playing musically,” or “actively shaping a phrase,” or even “playing with feeling.” But figural strategies that help to guide musical performance and even musical apprehension (as expressed in the phrase “having a musical ear”) are seen to be spontaneous, on-the-spot moves between the performer-listener and the music that he or she is shaping. Understandably, this leaves such figural strategies mysterious, magical, labeled intuitive, attributed to innate talent, and even valued as such. To probe for their cognitive underpinnings is, in turn, often taken to be if not impossible, at least immoral. It is as if figural and formal ways of understanding and constructing coherence were opaque to one another—the first mysterious and indescribable, the second supposedly objective and uniformly expressible in a symbolic notation.

It follows from these findings that the traditional view of developmental change (for example, stages of development) should not be seen as simply a linear progression, at least in the musical domain: Figural strategies should not be seen as something to go beyond, to overcome, to be replaced by those representations that characterize formal thought. Rather, I would argue, it is

the interacting evolution between two complementary ways of understanding, each enriching the other, that characterizes fully developed musical intelligence. Thus, I have concluded from these studies that what may well characterize the expert listener-performer is the capacity to retain and play with the tension between formal understanding, where the focus is on the *invariant* particularity of pitch and time properties with respect to fixed reference structures, and figural ways of understanding, where the response is to the particularity of an event resulting from its contextually embedded function in a unique reference entity.

Implications for Midlife Crisis

In this section, I return to the evolving lives of extraordinary young musicians and to my opening questions. To them I now add: What are the implications of the distinctions between figural and formal strategies of representation in accounting for the breakdown of prodigious capacities during midadulthood? My speculations (and they can be no more than that) will rest on the following arguments:

- An integration of figural and formal strategies of representation is necessary to fully developed musical intelligence — that is, mature artistry
- Prodigious musical ability can be seen as an expression of extraordinarily highly developed figural strategies for representing and constructing musical coherence
- Formal constructions and associated mental reference structures are, for musical prodigies, relatively impoverished, separate from, and even incongruent with their operative figural strategies
- The breakdown of musical capacities results, at least in part, from the need to confront these incongruences
- In order for effective integration to take place, both figural and formal strategies of representation must undergo development and change
- If such development and change does occur, it is precipitated by the individual's courage and determination to search for effective tools with which to reflect on musical understanding in the face of pervasive doubts concerning most of life's fundamental values, including musical ones.

In describing her passage through disarray, one of my informants said, "It was as if I had to be inside and outside at the same time." What did she mean? Consider the following possible scenario: Early prodigious performance is the expression of abnormally highly developed, extraordinary figural capacities. Closely linked to action (like the "smart fingers" of a talented mechanic), apprehension is through the intimacy of instrument and hand; a pas-

sage, even an entire composition, is internalized, memorized, as a particular felt path, a kinesthetically encoded sequence of actions with each action-figure calling up and entraining the next. What exists for these performers is immediately present coherence along this path; comparisons across figures, more global coherence are elusive. Formal aspects of musical coherence are familiar—the score, units of analysis associated with music theory—but these are about something else, separate, outside of the operative, action-based, inside representation of a piece. To reinforce, emphasis in teaching is on the development of technical skills—that is, action knowledge; musical decisions (phrasing, dynamics, even fingering) are proscribed, given beforehand, or acquired by imitating the teacher's example. The result is that, while exhibiting extraordinary capacities for realizing a composition, young performers acquire only limited means for externalizing, reflecting on, thinking about what they know how to do so well. Why should it be otherwise?

Because there comes an emerging need in midadolescence to ask why, to find out for themselves, to take responsibility for their own decisions, their own learning and making of coherence. Growing up prodigies find themselves at a loss, without adequate tools for making the move into going it alone. Before, a score encountered for the first time was simply a set of directions, transparent to actions, a map for where the fingers should go. In the flux of pervasive doubts and with the need for personal independence and understanding, the score becomes something to look *at*—a possible source of answers but also a source of puzzlement, a code to be interpreted in order to find and construct an apprehended coherence that can guide actions. In short, the adolescent's need to reflect results, at first, in chaos. The current state of figural knowledge is open to question but is as yet left uninformed, untouched by the more formal relations that can be named, measured, fixed. What used to be is in disarray; what can be described and looked at answers different questions. The objects of figural representation and the objects of formal representation have no common ground. How, then, can one be “inside and outside at the same time”?

The struggle becomes one of building new entities that will converge in a single “ontological commitment.” In the figural, felt-path representations of childhood, musical dimensions were productively fused in reciprocal interaction forming unique, structural functions and feelings projected at one particular moment. In the face of reflective questioning, however, fused dimensions and figural groupings come apart into starkly separate properties. And with analysis, felt paths break apart, too: A figure approached from one direction is recognized as the figure previously approached from another. But, as in coming upon a familiar landmark in a new way, the conjunction of familiarity with strangeness is, at first, disorienting. Then, as with the two places, the two figures become one, gaining new meaning as they become embedded in a more complete network that can include them both. A passage that was understood to be, and played as if it were, something new, is discovered to be a “return”—

albeit transfigured—to the very opening of the piece. A new coherence is constructed, now on a more global level. At the same time, the idea, *return*, as an object symbolically represented in mental reference structures, is expanded; *return* may be the result of all that has gone before and is thus transfigured, not merely the same thing once again.

In this way, a particular event, dependent for its meaning on the unique reference entity in which it occurs, begins to influence formal reference structures: The limited specificity of formal objects expands to include more complex networks of relations. The scale as a representation of a tonality expands to include a network of interrelated functions. These dynamic relations, in turn, illuminate unique moments in a specific piece at a specific moment. The generating of a tonality by the particular confluence of metric accent and pitch intervals may be made congruent with kinesthetically represented “handling,” a surprising sonority that was before unexplained may be realized as an unexpected harmonic function; a return may be performed with a different gesture. Concretely experienced, unique reference entities are informed by (and, in turn, reciprocally inform) reference structures. The very notions of *same* and *different* are transformed, and with them, their apprehension in real time. Out of a struggle for reason may, perhaps, come a transforming evolution where inside and outside, figural and formal, converge. As Wolff points out in *The Teaching of Artur Schnabel* (1972): “The mature performer works for those rare inspirations when his conception of the score becomes one with its physical realization in performance. At such moments, technique is more than just the disciplined functioning of the body at the command of the ear: It grows into a physical activity which in turn may stimulate the imagination. As Schnabel put it, ‘If all goes well, the conception materializes and the materialization redissolves into conception’” (p. 22). This is, I believe, one story of the passage from childhood prodigiousness to mature, independent artistry.

But the scenario I have proposed must be only part of the story. Inasmuch as musical-cognitive factors contribute to this period of chaos, they do so only as a single thread in the complex fabric of the evolving lives of growing up prodigies. I want to suggest, however, that the issues raised in this story, the tensions and incongruences between figural and formal strategies of representation and the struggle to redefine the entities and relations associated with them, mirror those that characterize other aspects of this tangled web—that is, personal, interpersonal, and even maturational factors.

While I can only posit these interconnections here, they suggest the need for bringing together fields of study that have largely remained isolated from one another. For example, psychoanalytically oriented literature, along with biography and autobiography, abounds with accounts of personal crises of midadolescence. But little attempt has been made to connect these with the cognitive, domain-specific factors that I have tried to focus on.

What seems to unite all aspects of midadolescent life is the search for independent identity. With it, self-conscious awareness of fundamental as-

sumptions emerges, coupled with the need for means with which productively to disentangle, reflect on, and reconstruct in a new way capacities, values, and ways of seeing that before had been taken for granted: "We are thus most aware of our identity when we are just about to gain it, and when we (with that specific startle which motion pictures call a 'double take') are somewhat surprised to make its acquaintance; or again when we are just about to enter a crisis and feel the encroachment of identity confusion" (Erikson, 1968, p. 165).

For growing up prodigies, children who have since childhood been in public view, the rocky path toward independence seems fraught with special tensions. My informants each tell of a childhood in which they were singled out, isolated from their peers but at the same time made dependent by the intimate care and guidance of mentors—teachers, parents—and a self-image acquired through them. They tell of the need to succeed now in their own terms—along with a fear of ignominious failure—the feeling of being abandoned ("kicked out," as one informant put it) and simultaneously wanting to abandon—to find musical and personal identity of their own—and the desire to stand apart, separate and unique, special, while at the same time seeking ways to join with others or even *one* other:

His thinking was a dust of doubt and self-mistrust, lit up at moments by the lightnings of intuition, but lightnings of so clear a splendor that in those moments the world perished about his feet as if it had been fire consumed: And thereafter his tongue grew heavy and he met the eyes of others with unanswering eyes, for he felt that the spirit of beauty had folded him round like a mantle and that in reverie at least he had been acquainted with nobility. But, when this brief pride of silence upheld him no longer, he was glad to find himself still in the midst of common lives, passing on his way amid the squalor and noise and sloth of the city fearlessly and with a light heart (Joyce, 1960, pp. 176–177).

The merging of social, personal, and career issues with the specifically musical concerns discussed earlier in this chapter is perhaps most clearly reflected in the need for productive means with which to reason and reflect—to take apart feelings, even entities (figures) that before seemed inviolable, to re-group, and to justify. At the same time, there is the sense that available intellectual tools given from the "outside"—words that name, measure, and assign value, theories that analyze—are incongruent with, unable to explain, disconnected from spontaneous inner needs and capacities such as immediately present, sentient feelings and actions. "He found himself glancing from one casual word to another on his right and left in stolid wonder that they had been so silently emptied on instantaneous sense until every mean shop legend bound his mind like the words of a spell and his soul shriveled up sighing with age as he walked on in a lane among heaps of dead language" (Joyce, 1960, p. 178). The image that comes to mind is a window that one has always looked

through and that gave shape and coherence to objects and relations—transparent to action. At this critical turning point, the window becomes something to look *at*. But in all its fine-grained detail, it reflects different entities, answers different questions.

Future resolution can be neither a return to what was nor a simple “fix-up.” As in other creative acts, the process is one of evolution and transformation, of almost literally coming to see in a new way. And as Gruber (1981) has pointed out with respect to new insight in science, *the apparent moment of insight is more often a culmination of just such internally worked over mutual transformations of both inner and outer ways of knowing and seeing*. What I have characterized as the figural-formal transaction is, I believe, one way that such evolutions or revolutions take place.

Conclusions

I have tried to conjoin in this chapter the results of empirical research and the stories of extraordinary young musicians as a way of explicating some aspects of the critical passage from musical prodigiousness to adult artistry. From the research, I have argued that the coherence-making structures of music are, themselves, dependent on an interaction between qualitatively different kinds of relations: those I have called figural, dependent on the unique situation of an event within a passage where it occurs; and those I have called formal, instantiations of properties and procedures common to much of the music of our culture, usually expressed in the symbolisms of notation and theory. I have concluded that it is the capacity to make use of, understand, and integrate both figural and formal aspects of musical coherence that characterizes fully developed musical intelligence (Bamberger, 1981; Bamberger and Schön, 1979).

In turn, I have suggested that those who demonstrate extraordinary musical ability as children are expressing extraordinary figural capacities in their internal representations and performance of music. This includes remarkably highly developed capacities for apprehending and projecting musical coherence and feelings through their body sense in relation to their instrument—that is, what I have called felt path representations.

I have also proposed that *chaos*, and even the breakdown of early capacities *is* at least *influenced by the adolescent's emerging need to reflect* on what he or she has until now taken for granted. This need leads to a confrontation between figural understandings that have worked so well in the past and formal understandings as expressed symbolically in notations and other categories of analysis. Through this initial confrontation, the units of perception and action associated with figural strategies come apart, but the units of analysis that name, measure, and fix seem inappropriate to building a new coherence. I have argued, however, that if an individual can face the risk of confronting the incongruences between these two ways of knowing that have tended to re-

main opaque to one another, the entities and relations characterizing each may mutually transform. The result is the possibility for making *multiple representations*. This means developing the possibility of focusing now on one aspect of a passage, now on another, experimenting with and making choices between possible and even impossible interpretations or, as musicians like to say, hearing a passage first one way then another as attention is shifted among and across dimensions. Artur Schnabel embodied this process in his belief that "Practicing was experiment rather than drill" (Wolff, 1972, p. 173).

It follows from this account that, when a musically prodigious child plays, for example, a Mozart violin concerto, he or she is internally representing that composition in a way quite different from what he or she will do as an adult artist. At the same time, it follows that we must distinguish between precocious and prodigious musical abilities: The child who plays so movingly that one is "brought to tears" is doing so not in a way that others will achieve at a later age but doing so in a way that others will rarely, if ever, achieve at all!

Finally, I have tried to suggest that midlife crisis is the result of a confluence of factors, interrelated in their expression of a need for independent identity. I have taken this to mean a quest for means with which to reflect productively on music-making decisions as well as decisions relating to social, personal, and professional commitments, values, and ideologies, such that ways of knowing can coexist in mutual transaction. As Erikson describes it (1968): "An optimal sense of identity. . . is experienced merely as a sense of psychosocial well-being. Its most obvious concomitants are a feeling of being at home in one's body, a sense of 'knowing where one is going,' and an inner assuredness of anticipated recognition from those who count" (p. 165).

Implications for Future Research

In my initial comments, I urged that research be directed toward real world, useful purposes. In that spirit, now, I would like to suggest three areas of potential study.

First, **experiments** designed to provide insight into the transformations in internal representation that may occur as children move from early prodigious ability to adult artistry. Such studies might also explicate further the distinctions between figural and formal strategies of representation, as well as their changing role in the course of musical development.

Can we, for example, tease apart the influence of age in contrast to that of training? Consider, for instance, bell tasks similar to those described earlier in the chapter. Will young children who read music and are already acclaimed performers use felt path strategies to build a reference entity (as would their untrained peers), thus reflecting hypothesized figural representations? Will they build a reference structure reflecting more formal internal representation? Or will their behavior suggest conflicts in strategies when they are thrust into this unfamiliar musical medium? Will older subjects behave in significantly different ways from young children?

Can we devise experimental situations to study the interactions between “body feel” and symbolic descriptions at different ages? Subjects might be asked, for instance, to work in an environment where they are once removed from a kinesthetic relation to an instrument and where the notation system is analogous but different from standard notation. Consider, here, an interactive computer-generated music environment in which pitch and time relations are played as a result of subjects’ purely symbolic input. In addition, the referents of the notation system are at a different level of analysis—for example, figures instead of notes. If subjects are asked, then, to make a coherent melody built up from varying sets of melodic figures (small, structural entities), will we observe significant differences among subjects at different ages—differences in the construction strategies they use, in the tunes they build, in the kinds of difficulties they confront? Will we be able to relate these differences to aspects of figural-formal strategies of representation? (See Bamberger, 1977.)

I would propose, particularly, that experimental situations be designed so as to lead subjects into a mode of active experimentation. It is my argument here that we will gain useful insights into shifts in mental representation through close observations of subjects in action—that is, as they work in task situations where they are asked to actually *make* coherent musical objects in contrast to being asked for simple, verbal responses within the constraints of ready-made stimuli. At best, such tasks would encourage subjects actually to learn. In turn, the subjects’ current capacities to learn will best demonstrate the limits of their implicit “theories” of the domain as well as their capacities for transformations in representation. Observation and analysis in these dynamic situations may well teach us the most about these extraordinary individuals; and through such studies we may even find better ways to ease the trajectory through midlife crises.

A second group of studies might focus specifically on the period of midlife crisis. Here, a series of in-depth case studies would seem appropriate. Cases might include individuals who passed through this critical period successfully as well as those who failed to do so. This work would necessarily involve researchers from disciplines that usually remain isolated from one another—clinicians, developmental-cognitive psychologists, as well as professional musicians. A primary concern would be to gain insight into the interactions between those particular emotional, interpersonal, maturational, and cognitive-musical factors that contribute to this period of flux and disarray.

Finally, I would propose research having to do specifically with teaching. Such studies are both more difficult to imagine and more problematic because of their tampering effect. Two sorts of directions, however, are worth trying.

First, potentially interesting phenomena might be generated by videotaping and analyzing actual student-teacher interactions during lessons. We might imagine, for example, developing a kind of typology of kinds of instruction—for instance, those concerning technical skills (“Hold the bow closer to the

frog," "Lower your wrist when passing your thumb under"); those that suggest a mood or character to the student ("Think of yourself as just floating on a cloud here," "This passage needs to be played with real tenderness"); and especially those that point toward helping the student view technical tools as means towards expressive feeling ("To make that spot sound more lively, change your bow on the third beat"). It would be important in the analysis to look for a developing repertoire of learning strategies that the teacher is helping the student to internalize—that is, situations to which the student can apply similar strategies. What, indeed is the nature of his or her developing ontological commitment? What are the "things" that make up the performer's universe?

From these studies a second, more challenging group of studies might emerge. These would seek to develop means for helping students reflect on their own practice more effectively, both in the sense of their day-to-day work (practicing) and also in the sense of the practice of their profession. It would be important to find approaches that bring felt path, figural representations into closer relation with symbolically represented reference structures. Such research would necessarily involve serious studies in music theory. The purpose of such studies would be to develop modes of description that are more dynamic, more process-oriented and kinesthetic in their orientation towards musical structure itself; this, of course, in the service of anticipating and allaying figural-formal confrontations that, as I have suggested, may contribute to the midlife crisis.

It should be obvious that any of these proposals requires, above all, **removing the barriers that have traditionally separated researchers both within related disciplines as well as across disciplines**. Thus, it would seem imperative to recruit and train a new, interdisciplinary cadre of researchers dedicated to the study of real world issues in the evolving lives of extraordinarily gifted musicians. In this way we might at least imagine a "network of enterprise" that would lend support and courage to growing up prodigies as they face the "dust and doubt of self-mistrust" that seems inevitably to accompany the evolution from youthful promise to adult artistry and even beyond. . .

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