

A Discussion with David Epstein

[Editor's note: David Epstein's *Shaping Time*¹ is reviewed in this issue of *Indiana Theory Review*. We invited Professor Epstein to discuss ideas set forth in that book, as well as in his earlier writings. Given the geographical distance between us, the practical way to do this was by correspondence. We therefore sent Professor Epstein questions that were prepared by various students at Indiana University. Those questions, and his responses, follow here.]

What are your current thoughts on Beyond Orpheus,² now that it has been almost twenty years since its first appearance? What kind of impact did it have on the theoretical community? Are there any aspects of it that are still relevant to your current work?

To take the second of your questions first, readers who have not gone through the experience of publishing a book may be surprised to learn how enigmatic and largely impressionistic an author's sense of the impact of his or her book may be. From my publishers I have "hard" figures about sales of the book, which went through a number of printings in its hard- and soft-cover editions. I'm told that for our relatively small community of music theorists and scholars these figures constitute sales success, though I cannot judge from these numbers how many people actually read the book, or what impact it may have had—pro or con—upon their thinking.

How else does one judge the impact of a book? Citations,

¹David Epstein, *Shaping Time: Music, the Brain, and Performance* (New York: Schirmer Books, 1995).

²David Epstein, *Beyond Orpheus: Studies in Musical Structure* (Cambridge: MIT Press, 1979).

quotations, reviews, and discussions of the book are primary ways. *Beyond Orpheus* received a good number of reviews both here and abroad, the majority of them favorable, many of them extensive. As for citations, I see them not infrequently in the course of my reading, though I am not an author who combs the literature to check upon his “citation quotient.”³

A more interesting aspect of a book is the discussion it provokes, and the research that it may stimulate. I read fairly often of dissertations based upon ideas in *Beyond Orpheus*, or that track consequences of its concepts. In much the same way, I find colleagues who want to discuss aspects of the book. From these various criteria, most of which, as mentioned earlier, are more impressionistic than “hard,” I sense that the book has had an impact upon the theoretical community.

As for the other parts of your question—what are my current thoughts about the book, and are there aspects of it that are still relevant to my current work—there are indeed aspects of it still relevant to my present work. *Shaping Time*, as I state early in its preface, is an outgrowth of *Beyond Orpheus* and rests upon many findings and assumptions of the earlier book. The importance of Schoenberg’s *Grundgestalt* as a basis for compositional unity and the “marriage” of aspects of *Grundgestalt* thinking and Schenkerian views of tonal behavior are cases in point. They seem as significant to me today as they did in the 1970s, when *Beyond Orpheus* was in gestation.

I had the feeling after completing *Beyond Orpheus* that time in music, in its many manifestations, was inadequately treated, and further, that it was inadequately understood by most of us who pursue music as performers, composers, and theorists. It was that sense, indeed frustration, that motivated the studies found in *Shaping Time*. I

³The scientific world has a publication called *The Citation Index*, which tracks citations. (The reigning champion a few years ago clocked in at some 33,000 entries.) Not a few university deans rely upon the *Index* for determining professional standings of their faculty, a bad dream we artists have so far been spared. Think how a modest contribution would figure in that world—a simple, standardized procedure for a chemistry experiment, say, that every experimenter would use, with accompanying citation. How the numbers would mount—the stuff of pace setters, indeed.

was lucky, during the early stages of those studies, to meet Prof. Ernst Pöppel, founder of the Institute for Medical Psychology at the University of Munich and an authority on temporal controls in the human nervous system. Our discussions about musical timing, and the role that the brain and the nervous system must play in structuring and shaping time in music, expanded my thinking about time and music in ways heretofore absent. Pöppel was a force in the evolution of the thinking in the later book; I am endlessly grateful to him.

In 1991 during the Mozart Bicentennial, Erich Leinsdorf conducted the New York Philharmonic in a program ordered exactly as Mozart had done two hundred years earlier. The concert began with the first one, two, or three movements of one of the composer's later symphonies. [Our memory is a little sketchy about some of the details.] The orchestra ended the concert with the final movement of the same symphony. In light of this situation, how would you justify your theory that a continuous pulse underlies the four movements in Mozart's symphonies?

The justification is not hard to come by. To be sure, playing movements of works out of sequence was one of many concert customs in Mozart's day and later, though this was not to the universal exclusion of presenting works serially in their entirety. However they may have been played, the composition of these works embraced mutual elements that served as unifying agents throughout the music. Insight into this fact was one of Schoenberg's major contributions to musical understanding, indeed to music theory. Space prevents discussing this matter in depth here, but it is not necessary, as this is the overriding idea pursued in detail in *Beyond Orpheus*.

My thinking about tempo continuity derives from this *Grundgestalt* notion of Schoenberg. Tempo and tempo relationships, in my view, are but one of many formative elements that unify works in the classical and ensuing eras. The great value of this sense of tempo is its usefulness for a performing artist in determining a viable tempo. One is forced to see the work as a whole, in all its elements, modifications of pulse, evolutionary patterns of design, and the like. These elements tend to fall in place when seen within a global view of how the music

may progress. A local view, by contrast, may allow all manner of tempo choices, though some of them may come upon rocky shoals as the music moves ahead.

The basis of tempo choice is intuitive, and rightly so, no matter what the composer's indications may be. Continuous pulse as a theory assists in refining that intuition, placing it within a viable overall perspective.

With regard to Leinsdorf's 1991 performance or, for that matter, this practice as pursued in Mozart's time, there is much that I would like to know that is not available, or at least not accessible, as I write this. What, for example, was Leinsdorf's tempo for the last movement, and how did it correlate with the earlier movements? To what extent did tempo memory establish for Leinsdorf a tempo range, upon which he drew when coming 'round to the final movement? It is not irrelevant that Leinsdorf strongly believed in correlated tempos and a continuous pulse. That fact alone leads me to believe that tempo relationships must have been a factor in the tempos Leinsdorf chose in the 1991 concert.⁴

In Beyond Orpheus (pp. 87–88), you posit a ratio of 2:3 between the Adagio Introduction and the ensuing Allegro in Beethoven's Symphony no. 1, first movement. You justify your assertion by noting that the composer's metronome marking for the Adagio seems impractically fast. Nevertheless, the lack of an integral ratio between the metronome markings for the two sections suggests that Beethoven intended that the Allegro begin with a new pulse. Indeed, doing so underlies the contrasts between the even and legato eighth-note rhythms of the Adagio and the dotted eighth-note and staccato eighth-note rhythms of the Allegro. When might the element of "surprise" and contrast between two tempos supersede a performer's desire to relate the two sections by a constant pulse?

There may be a misunderstanding here, caused perhaps by some lack of clarity in the chart on p. 87 of *Beyond Orpheus*. The

⁴Leinsdorf's ideas about this facet of tempo are found in his book, *The Composer's Advocate* (New Haven: Yale University Press, 1981). I discuss them on pp. 121–22 of *Shaping Time*.

misunderstanding concerns a specific tempo relationship rather than the fundamental theory of proportional relationships, so the matter is less world-shaking than it would otherwise be. To clear it up, however: I posit a 1:1 relationship between the Adagio molto and the Allegro con brio in the first movement of the Beethoven First Symphony. (Thus the eighth note in the Adagio molto equals the half note in the ensuing Allegro, as shown.) The 2:3 ratio you mention applies between movements I and II.

Before getting to the essence of your question, we should discuss two other points. First, you mention that Beethoven's 88:112 metronome indications in this movement lack an integral ratio. They are in fact close to one: $88:112 = .786$. A precise 4:3 ratio between these tempi would be .75. The difference, .036, amounts to a discrepancy of 4.8%. By the lights of the Weber Fraction, as discussed in detail in *Shaping Time* (chapter 7, and throughout the following chapters), this is a marginal difference whose perception is questionable. Second, you suggest that Beethoven's intention was that the Allegro begin with a new pulse. So the metronome markings indicate. I suggest, however, that the issue is anything but simple or clear-cut. Space doesn't allow this complex argument here, but you may want to read my discussion of the matter, particularly vis-à-vis Beethoven's metronome markings, in *Shaping Time* (pp. 196–202, and in the musical examples that follow; also p. 498 n. 3).

The essence of your question I find very interesting, indeed rich in implications—namely, that the different tempos intended by Beethoven underlie the contrasts between the even and legato eighth-note rhythms of the Adagio and the dotted and staccato eighth-note rhythms of the Allegro. When might the element of “surprise” and contrast, you ask, supersede a performer's desire to relate the two sections by a constant pulse?

In response I suggest that these issues are not in contradiction. A faster, unrelated Allegro tempo may help denote this contrast in articulation, but I am not at all sure that this kind of emphasis is needed, nor that the essence of the contrast lies within this faster tempo.

Were the suggested M.M. 88 tempo for the Allegro impossibly

slow, you would be right beyond question. That is not the case, however. One can easily articulate the dotted and staccato qualities at this pace. In some ways it may be easier at the slower tempo, as there is more time to shape these articulations. From my podium experience, in fact, I have found M.M. 112 rather fast for achieving the very articulation that you discuss (unless the players use period instruments and play in what is advocated currently as the authentic olden style, but that is yet another issue). What often results is a blurred, if not “breathless,” performance.

The issue is more general: surprise and contrast are often achieved in the big works of the classic-romantic periods through total changes in character (articulation, tone quality, dynamics, harmonic rhythm), even when the prevailing pulse between two markedly different tempos is essentially the same. What happens in these instances, as I perceive them, is a yin and yang phenomenon. The contrasts are so great, the surprises so unexpected, that we often are unaware of the underlying unity of pulse.

If we are unaware of this unifying pulse, then why the concern to achieve it? For two reasons, as I see it. One is the remarkable beauty that we may experience on some level by the connections in character provided by pulse related this way.⁵ The second reason concerns what I might call the *propriety* of tempo—what the classic era saw as “just” tempo (*tempo giusto*). If we are guided purely by our emotions in setting a new tempo, we may (and often do) in the heat of the moment select a tempo that is too slow or fast for the best overall control and shaping of the music. Proportionally related tempos, which I find emanate from fundamental facts of neurophysiology, tend to prevent these excesses. Put otherwise, the great composers had deep perceptions in these tempo matters, perceptions that almost invariably led to tempos that fit well, that allow for the best playing, the richest emotional qualities of the music. What they perceived seems proportional in its structure.

⁵See, for example, two cases discussed in *Shaping Time*: Mozart, Symphony no. 39, mvt. 1 (pp. 14–17); and Brahms, Symphony no. 2, mvt. 3 (pp. 266–69).

In Shaping Time (pp. 5–6), you stress that meaningful statements concerning musical time must be based on extensive experience with the music, preferably in a performance setting. Therefore, can theorists write meaningfully about an idiom with which they are not familiar as performers (for example, a non-conductor writing about orchestral music)? If they cannot, what are your reservations?

I hope my statement does not sound dogmatic; it was not intended that way. That one must have extensive experience with timing aspects of a work, if meaningful statements are to ensue, seems almost axiomatic. Timing is complex; our perception of matters temporal varies over time. We best gain insights through depth of experience within the numerous worlds of musical timing (rhythm, meter, articulation, dynamics, agogics, tempo, tempo relations, rubato, etc.).

As for our experience of a work preferably being in a performance setting: Again, I hope my answer will not come across as dogmatic. People come by insights in numerous ways. Some have great sensitivities, complex insights, derived independently of performance—even of musical education or training, for that matter. Whatever the source of insight, I treasure it.

That said, I do believe that performance is a marvelous teacher for matters musical, much of which involve aspects of timing. The reason would seem obvious: music fundamentally exists when it is sound flowing through real time. Experienced otherwise, what we deal with is often a memory, or an imaginative projection, of music.

The making of music, in other words, is the cauldron in which the stuff is cooked, shaped, tried out. Performance is thereby a unique testing ground for ideas and concepts. What may work in our heads, in our inner ear, may work less well in the rehearsal room, failing in ways that the printed page cannot tell us and that our keen inner hearing may not even predict. The flaws may have to do with instruments, how they produce sound, how they articulate, whatever; it may concern perception—what is easy for us may be clumsy for others to grasp, however disparate the reasons.

This is not to say that all performers are *de facto* founts of musical knowledge. Would that this were the case. I am speaking of continually evaluated performance—performance experience reflected upon,

questioned as to its causes, effects, and values. That in no way happens automatically; it must be worked for. The ideal, obviously, is an accomplished player using keen ears to ascertain via a theoretically sophisticated mind what may be transpiring as the events flow by. That package of gifts may have been more the norm in past eras, when composers were equally accomplished performers. Specialization in our time has robbed many musicians of these polymath aptitudes.

In your writings you draw a great deal from your experience as a performer, and it is clear that much of your work is motivated by the constant search for solutions to performance problems. Do you feel that all music scholarship should necessarily have some relevance, at least indirectly, to performance? Or perhaps will it, by definition? What responsibilities, if any, do performers and scholars have in this regard? To what extent should we even separate the two roles?

Good points, some of which I have dealt with in answering the previous question. If, as I mention above, music is fundamentally music when it is in the process of being performed, then—whether by definition or by the facts of reality—musical scholarship, as it bears upon any aspect of music, is ultimately perceived in the context of performance. That being the case, it seems inescapable that scholars and performers share a common responsibility: whatever they do, think, or suggest with regard to a piece must be found believable and convincing as that piece is experienced and performed.

Should we separate the two roles, those of scholar and performer, as you ask? To a degree the question seems moot. The roles *de facto* are separated, even when assumed by the same person. The scholar “scholarizes,” the performer performs. I see your question in a somewhat different light: it concerns the mutual responsibility of the two activities. I think scholarship and theoretical research must be relevant to musical issues and will inevitably be tested via the litmus of performance. And indeed, as must be obvious from my writings, I deeply believe that performers carry a great obligation, that of fidelity to the musical work.

Obviously that fidelity may work itself out in various ways, thus the multiplicity of performances of the same work. That is to the good. I

don't buy the notion of the "definitive" performance. As Roger Sessions once said in his composition seminar at Princeton, such a definitive performance would have to be a fictitious one that combined all the significant aspects of a work, in all the significant ways these aspects had been played throughout the lifetime of the work itself. Multiple interpretations of music are therefore not only inevitable but desirable. Without it we could buy the one "definitive" CD of the piece and be done with it (and inevitably fall asleep from boredom as we hear the unchanging, predictable performance for the umpteenth time). What I object to is "mindless" performance—the mere rendering of the notes, so to speak. But a parallel crime against music may be theorizing that is ultimately irrelevant, for whatever reason(s).

In your discussion of hypermeter on middle levels, you outline two possibilities: "[e]ither hypermeasure, if initially duple, remains fundamentally duple, eventually becoming attenuated and lost to perception as the more compelling qualities of phrase 'take over,' or hypermeasure remains parallel with phrase, changing length so as ever to encapsulate the dimensions of phrase."⁶ You seem to prefer the first of the two possibilities. Are you not equating phrase with hypermeasure (I do believe that there is a distinction)? Therefore, at higher levels, would you not conclude that since there are usually no equivalent beats (for irregular phrases are the rule), there is no predictable pulse level and thus no hypermeter? Should not the analogy be between measures and hypermeasures, not measures and phrases? What do you think of Rothstein's work when he compares the separation of hypermeasures by an extended upbeat to the placement of an improvisatory lead-in between two measures, and hypermeasure irregularities in general to rubato at the measure level? What do you think of both Rothstein's and Schachter's contention that there is an underlying regular hypermeter whose hypermeasures may be manipulated in different ways to result in surface irregularities? Can their point of view not capture the musical tensions at middle levels as well as the first of your two outlined possibilities?

⁶*Shaping Time*, 34.

There are a number of intertwined issues within your question. In answering, let me try to sort them out.

First of all, I am not at all equating hypermeasure with phrase. Quite the opposite. I prefer the first of the alternatives that I describe, as you rightly perceive. Thus I make a strong distinction between hypermeasure time frames, which in their ongoing duple structure are often discrepant with phrase lengths, since phrases are frequently irregular. Two things follow from this: (1) a conflict between the boundaries of hypermeasures and those of phrases and (2) a conflict of accents between the two domains, for as I discuss in *Shaping Time* (pp. 28–40 and elsewhere in chapter 2), meter and phrase have their own intrinsic species of accents. In this context, it is relevant to continue the passage that you quote from *Shaping Time*: “The choice [of how we construe such passages] seems not to lie in any intrinsic properties of hypermeasures, but rather in the perceptions and cognitive strategies by which we make sense of structure on these levels.”⁷

When you ask, therefore, “should not the analogy be between measures and hypermeasures, not measures and phrases?” I am puzzled, for I see no analogy in what I have said, nor one that is intended. What I have drawn are not analogies but domains, or continua—specifically, two of them: one metric, composed of evenly spaced beats; the other that of rhythm, which on its tertiary level is phrase. The evenly spaced beats of meter on consecutively higher levels form measures and ultimately hypermeasures; pulse, the parallel phenomenon in the rhythmic domain, progressively forms motives and phrases as the levels of organization move consecutively higher.

To go further with your question, when you ask, “. . . at higher levels, would you not conclude that since there are usually no equivalent beats (for irregular phrases are the rule), there is no predictable pulse level and thus no hypermeter?” I find that your question seems to misunderstand the theory I have put forth. For one thing, I make a clear distinction between “beat” as the basic-level manifestation of meter and “pulse” as the fundamental-level

⁷Ibid.

manifestation of rhythm.⁸ Your question intermingles these phenomena.

Nor do I suggest that “there is . . . thus no hypermeter.” The critical question is not the existence of hypermeter (which I recognize) but how broadly does hypermeter extend—on how many levels, and thus to what ultimate durations? There are those, Wallace Berry among them, who suggest that hypermeter (or “deep meter,” as Berry and Kramer put it) extends throughout a work and can be perceived as such. I take these estimable musicians at their word, though I personally cannot perceive hypermetric frames on these levels. I note, however (*Shaping Time*, chapter 2, esp. p. 493 n. 37), that Berry’s discussion of the dynamic, interchanging character of meter, as we move from surface to deeper levels, is close to what other writers see as rhythmic phenomena.

I further discuss in chapter 2 of *Shaping Time* the fact that hypermeter, if it is to be scaled to ever higher levels, thus ever longer durational spans, must scale all its elements, not just the span alone. Lerdahl and Jackendoff, and Schachter as well, deal with these points.⁹ Higher levels subsume lower ones; lower levels nest within higher ones. Thus, “by virtue of scaling, the initial ‘beat’ on each successively greater span should cover proportionately larger segments of time. Yet this beat, with its beginning-accent weight, must be felt as a single unit, rather than a collection of bars, if the proposition is to hold. It is doubtful,” I suggest, “whether this is feasible at spans beyond 16 bars, if at that length itself.” Thus, “if measurement is a primary role of meter,” which I suggest in earlier passages is a fact of metrical life, “and if hypermeasure is a species of meter, then we may question just what is measured at macro levels—beyond spans of time per se.”¹⁰

With respect to Rothstein’s work, which I greatly admire and discuss in this same chapter of my recent book, I find his extended upbeat concept, to which you refer, to be convincing. However, this

⁸Details concerning critical qualitative distinctions between these domains are discussed throughout chapter 2 of *Shaping Time*; see esp. pp. 29–40.

⁹See my précis of their discussions in *Shaping Time*, 45–47 and associated notes.

¹⁰*Ibid.*, 45.

seems to deal with a phrase phenomenon more than with hypermeasure, at least as I view the latter term. As for his comparison of hypermeasure irregularities with rubato, I have no well-formed opinion beyond the thought that mixing terms and modes (hypermeasure irregularity, rubato), each of which have relatively clear-cut meanings, may not lend greater clarity to these issues.

I agree with Rothstein's and Schachter's contention, which you cite, to the extent that there is an underlying regular meter in tonal music. Whether this can be extended to a regular underlying hypermeter (and to what durational levels) seems to me an open question. You make the interesting point that surface irregularities, which they note in connection with hypermeters, may capture musical tensions at middle levels; so do the first of the outlined possibilities in my system. Do these two approaches share some common theoretical ground? Intuitively I suspect that they do. It would be interesting to pursue this.

The studies in parts 3 and 4 of Shaping Time seem to argue not only for the existence but also for the aesthetic "necessity" of mechanisms of control over tempo—mechanisms explainable in terms of the models you propose. Do you feel that similar mechanisms and models, as yet undiscovered, must exist in other "discretionary" parameters of performance, such as dynamics, timbre, vibrato, ornamentation, etc.? Are there things that must be left to the unexplainable realms of intuition, experience, and tradition, or is everything potentially "modelable"?

This is a most salient question, particularly in this era, when scientific inquiry into so many heretofore unexplored areas is ever increasing, and when modeling is such a large part of scientific thinking. The question bundles a number of discrete issues, which I prefer to deal with separately.

To take the first one first, do I feel that similar mechanisms and models, as yet undiscovered, must exist in other "discretionary" parameters of performance, such as dynamics, timbre, vibrato, ornamentation, etc.? There are two key qualifiers in this question: (1) "as yet undiscovered" and (2) "must" exist. With regard to the first

one, clearly the reasonable answer to this, from any empirical perspective, must be “perhaps”; i.e., it is possible. Who knows what may lie in future discoveries? To deny the possibility of these mechanisms or models, to rule out *a priori* their conceivable discovery, would be foolish. That does not mean, however, that I believe they exist, only that we must wait and see.

As for point 2—that these as yet undiscovered mechanisms/models “must” exist—no, I do not at all believe that they “must” exist. Some, in fact, by virtue of the “discretionary” status that you have (in my view, rightly) granted them, are by that status not imperative. Timbre, vibrato, dynamics seem to help outline, define, sometimes enrich other mechanisms, such as accent, stress, harmony, melodic contour, etc. Perhaps a case can be made (or will be made in the future) that ornamentation (if we can see these “discretionary” elements in this light) in its many forms—visual, aural, linguistic, etc.—is a deeply embedded aspect of human consciousness, thus inevitable as part of human practice—in this case, in the context of musical composition and performance.

“Are there things that must be left to the unexplainable realms of intuition, experience, and tradition, or is everything potentially ‘modelable’?” Again, discrete issues are bundled together in this question. Are experience and tradition unexplainable? Certainly what historians, cognitive psychologists, neuroscientists, physicists, chemists, novelists, and anthropologists do is to “explain” experience and tradition, in some manner at least. As for intuition, this seems to me one of the least defined of terms. Often it is used as a more concise, more objective or “modern” substitute for “feeling,” or “emotion.” From all that I can gather, through my studies and from my sense of things in the worlds of the social and physical sciences, intuition is a complex phenomenon that involves lightning-quick thought (“ratiocination,” to be stuffily academic about it) that is somehow melded with affect. Affect seems to serve as a kind of filter, sorting the relevant from the irrelevant in this melding process. But then affect is itself coming to be understood as a mode of thought, certainly of

intelligence.¹¹ If it is, then what, precisely, are we saying in this question?

Is everything potentially modelable? Again, a catchword: “potentially.” Who is to say, with respect to the future? My intuition tells me there are aspects of human nature that are beyond highly quantified and predictable modeling and will probably remain so. Some practitioners of artificial intelligence research might snort at that view, and, if I point out their relative failure to date to capture these qualities, would respond that it is only a matter of time. We’ll see.

In Shaping Time, you ask your readers to accept an unusual and at times seemingly arbitrary mix of science and art, of empirical testing and aesthetic judgment. Careful quantitative studies mingle with numerous personal choices: which performances are ideal, which tempi are “commonly heard,” what durational units serve as ground beats for rubato study or as segments for measuring accelerations and ritards, how best to analyze cross-cultural tempo data in each case, or whether “scientific” testing should even be attempted at all (as in chapter 8). What are your reactions and feelings about this, now that the book is out? Are there things you would do differently if you could start over, from fifteen years ago? Could (or should) the proportional tempo studies of Western music (as in chapter 8) eventually be buttressed by more quantitative evidence? What are the most important things to consider in evaluating the success of such a mixed scientific/artistic approach?

A salient and perspicacious question. My response must deal initially with the underlying premise of *Shaping Time*.

To begin with your beginning, indeed the book is a mix of science and art, and thereby a mixture of empirical testing and aesthetic judgment. Fundamentally, however, this is a book addressed to musicians. Science enters the picture, but from the standpoint that we, as professional musicians, should consider basic aspects of our neurobiology, for they affect the way we make music—or may best make it.

¹¹On this see D. Goleman, *Emotional Intelligence* (New York: Bantam Books, 1995).

That musicians are the main intended audience must be evident from the book—in its graphs, musical examples, terminology, references and citations, all of which require musical sophistication to be understood. Scientists have evinced interest in the book, but that interest seems to stem largely from the evidence presented therein, which broadens scientific perspectives upon neurobiological processes.

This underlying premise, I hope, lends coherence to the book's format. The performances selected for study, for example, on which you comment, are those that seem relevant to the musical argument. Likewise with other issues that you raise: durational units selected to serve as ground beats for *rubato* study, units that serve as segments for measuring accelerandos and ritards, determinations of how best to analyze cross-cultural tempo data—all of these arise from the same concern.

You speak of these as “personal” choices. Are not all choices personal? Choice, moreover, is intrinsic to any study, scientific study included. Subjectivity in science may be offset by rules of evidence, randomizing techniques, double-blind protocols and other methods of the experimental canon, but it is well recognized by now that there is no total objectivity in science. (Indeed, even the design of an experiment, in terms of the methodologies outlined above, involves choice.) Einsteinian physics and Heisenbergian quantum theory, to cite but two major developments in our century, have made clear this impossibility of total scientific objectivity.

Much of what I have done in *Shaping Time* involves modeling, one of the chief poles that constitute scientific research (the other being empirical studies). Intuition is a prime aspect of modeling: paradigm, experimental design, and criteria for evidence all involve their share of choice, of perspective, from which the personal element cannot be completely excised.

The development of scientific interest in music, and the cross-disciplinary studies that have resulted over the fifteen years during which this book took shape, have a bearing upon the design of *Shaping Time*. *Music Perception*, perhaps the most widely read interdisciplinary journal in music, is only thirteen years old. Numerous other cross-disciplinary journals of this kind, not to mention a plethora of

interdisciplinary books, have come out during this same period. Are there things I would do differently, you ask, if I could start over?

Perhaps so, particularly as a consequence of these developments. Some of the scientific information that I provide in my study may not be as new now as it was when the book was written, or at least not to readers sophisticated in these cross-disciplines. That's the danger of writing any large study today: it may be (quasi-)obsolescent by the time it appears, as is our new computer virtually as we exit the computer store. On the other hand, music theorists literate in matters cognitive and neurobiological are still a small fraction of our specialized world. And they are not my only hoped-for audience. I would like ultimately to reach performers as well as theorists.

As for the matter of "commonly heard" tempos, used as a criterion in chapter 8, or whether "scientific" testing should even be attempted at all in that chapter, as you ask: That is a sticky issue. No matter what grounds were chosen for these studies of tempo relations, I believe there could not be total satisfaction on the part of all readers. "Commonly heard tempos" were an issue in point, one that I dealt with in note 23 of chapter 8, to wit:

It would be methodologically neat, in our discussion of tempos in Beethoven, Schumann, and other composers, to compile examples of recorded performances and to offer their tempos as proof of the proportional tempo argument advocated here. It would also be unrealistic; for different tempos abound in performances of these works, as suggested earlier with Toscanini's fast tempos and Klemperer's slow ones occupying extreme ends of the Beethoven tempo spectrum. To select such an approach would leave us with the fruitless (and unprovable) argument of advocating performer *x* as a "true" advocate of the music, and damning performer *y* as musical infidel.¹²

Thus I sought other musical grounds upon which to base this argument, aware at the time that they, as any grounds, were subject to

¹²*Shaping Time*, 528.

criticism:

We have chosen a different approach. Recognizing that most of us probably have a generalized sense of appropriate tempos for this literature, gained in part from our experience of hearing these works, we have designated these tempos as “commonly heard” in examples where such tempos are discrepant from composers’ metronome markings. This places the burden of tempo judgment where it properly lies—upon our intuitions, our musical perceptions, our experience with the music. Historical information, words of wisdom by distinguished musicians may help to verify our perceptions. They cannot and should not serve as substitutes for intuition and personal experience of the music.¹³

That said, I do believe that follow-up quantitative studies should be made of the proportional tempo matters in chapter 8, as you ask. The evidence in that chapter, as well as a clearly defined hypothesis, should help shape such studies. In view of the problems outlined in my note 23 (above), it will take well-designed studies to avoid the kinds of judgments I indicate. That will require a mode of expertise I do not have, but which no doubt exists in the scientific community.

Lastly, you ask perhaps the ultimate of ultimate questions: What are the most important things to consider in evaluating the success of such a mixed scientific/artistic approach? My answer may surprise you in its seemingly unscientific nature: ultimately I think such a study must provoke a believable, gut-instinctive musical response. As indicated elsewhere in these comments, we are dealing with a mixture of scientific and artistic argument. Part of the fallout of this approach is that no one basis of evaluation will suffice. The most sophisticated quantitative proofs may fall short of credibility, if the grounds upon which they are based seem musically wrong. Alternatively, purely musical arguments, if unsupported by evidence—be it musico-structural evidence and/or the quantitative data of “science”—can equally fail to convince.

¹³Ibid., 528–29.

Fundamentally this is a musical study of musical phenomena. I intuit thereby that an argument which fails to elicit a convincing musical response is ultimately doomed. Scientific evidence may make such a response all the more powerful, but it will never replace it. I haven't given up on intuition—not at all.

Shaping Time would probably conform well to most people's idea of a "cross-disciplinary" study. Do you think that at least some study in disciplines outside of music is necessary for any musician hoping to probe some musical issue deeply and comprehensively? Do you have advice or warnings for young scholars who contemplate this kind of research?

Your first question has two critical aspects: "deeply" and "comprehensively." My answer hangs on both points. Clearly one can probe some musical issues deeply while remaining within a purely musical context. Most of our received theoretical literature has developed from that perspective. "Comprehensively" is another matter, particularly in our time. Breadth of coverage in this age seems virtually to demand evaluation from multiple perspectives. Almost by definition this involves knowledge beyond the purely musical. Therein lies any "advice or warnings" that I might offer young scholars, though I question whether my singular experience is grounds enough for such oracular statements.

From the experience of developing this book, I have found interdisciplinary study tremendously stimulating and exciting in the endless ways that it opens new points of view and new insights. The speed with which such studies are proliferating suggests that others are similarly convinced.

There is a price attached, obviously—one connected with the depth of knowledge required in fields not one's own. Given a generally broad education, of the liberal arts variety that regrettably seems to be going out of fashion, I think one has a base from which to delve into new fields. It helps to have a colleague in these new fields, hopefully one equally interested in the cross-disciplinary adventure, who can guide, advise, share ideas, and generally help in finding one's way.

Ultimately these cross-disciplinary studies require expertise in each

of their component fields. The knowledge revolution has gone so far so quickly that it is unrealistic for anyone to expect not only similar levels of knowledge in other fields but, equally important, similar levels of professional judgment (and thereby, to hark back to an earlier question, of professional choice).

This has to be, therefore, a shared enterprise. That is not always an easy thing to attain, nor is it always successful. It seems the way of the future, however. My experience convinces me that it is a significant and rewarding way. Hopefully we are developing a new generation of scholars, performers and theorists whose training benefits from breadth as well as depth. Hopefully they will be prepared for the scope of these big questions, and energized by their challenge.