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# Making Meter Evident – On the Playing of an Ambiguous Bach Melody

To disentangle meter from rhythm in a way that satisfies both theoretic rigour and musical intuition has turned out to be a difficult task. Music making has had to manage without strict definitions of these vital concepts — and it must be admitted that it has got along quite well despite deficient understanding of such a fundamental matter. While for instance very few of us are able to tell in a consistent way what the metric signs in notation stand for and what they demand, musicians know what to do, and listeners most often have a quite acute discrimination of metric differences.

But the importance of explicit and positive knowledge in art should not be underestimated and intuition is after all not impaired by being complemented by factual insight and intellectual reflection. Music performance and music instruction may benefit from sharpened analytic concepts as well as from empirically obtained knowledge of what goes on when you play and when your playing is apprehended. The present paper, dealing with the experimental investigation of a specific aspect of rhythm-as-performed as it appears in one melody, should (for the merits it may have) be regarded as a contribution to an improved understanding of musical meter.[1]

It is theoretically attractive to conceive of rhythm in broad terms as being one of the major elements or aspects of phenomenal musical structure. This view brings two important implications. Rhythm is not, as it is often reduced to be in simplified accounts, something that just concerns note values, something that grows out of the sequence of durations only. It is a complex and yet unified experience that is conditioned by all facets of the structure, and that in turn influences the other elements of the music. Further, being part of the phenomenal structure, it is not exclusively dependent on notated events — rhythm grows out of the structural relationships as apprehended, and it makes no difference whether these rhythm relevant events are indicated in the score or stem from the performance, as long as the entire information is mediated through a performance of some kind.

This position is very important since it appears that many of the problems and deficiences of rhythmic theory (and the poverty of much music theory in general) derive from "notationalism", the propensity to let the score represent the actual music. But from a phenomenological point of view scores are pre-musical: the inscriptions must be interpreted in order to acquire musical meaning. The current way of interpreting music is of course to play it, but this is not necessary — if a score is read by a competent person the reader will supply the music with the kind of vividness that goes with actual performances. Thus, musical rhythm resides in real or imagined sound events, and these are interpreted, "performed" some way or other. A satisfactory account of rhythm in music therefore seems to require that the relationship between score, performance and phenomenal structure is carefully considered.

Turning then to meter, it might be defined as the aspect of layered regularity within phenomenal rhythm. Meter has two sources in notation. Accents arise as a result of the parametric interplay within the structure, and the various structural cues for this inherent meter can be studied in the score. But meter has also a separate representation in notation (time signatures, bar-lines, beams) and the pattern that these signs designate – being in principle independent of the inherent meter of the notated pitch/time structure — makes up an additional determinant for meter.

This dual representation of meter makes for confusion since the notated metric framework may either comply with the inherent meter or disagree with it in diverse ways and to various extents. Whether compliant with the structural cues for meter or not, the notated meter decisively influences how the player (or reader) will construe the musical events; it is in fact considered to be normative for performance (imagination). While it is not clear what the player should exactly do in order to express the meter, he/she must not play in a manner that conveys an incorrect idea of the notated metric organization — many listeners have quite exacting ears and are likely to immediately detect such misrepresentations.

It should be observed that while the structural cues for meter may be studied, the inherent meter as such is not accessible — it cannot be separately apprehended since it is overlaid by the interpretative reactions induced by the metric notation, or (if no metric signs are present) by what we surmise the metric organization of the musical events to be. Inherent meter is thus either a phenomenal fact, known only as mediated by a performance (actual or imagined) and hence to some extent influenced by notated meter

or metric concepts, or a rational construct, the estimated compound effect of the interaction of accents within the pitch/time structure.

Now in the great majority of musical passages the notated meter complies with the hierarchical pattern of inherent accents as indicated by the notated pitch/time structure: disregarding slight divergencies such as halving or doubling of measure formats and the like, tonal structures most often admit of only one meaningful metric organization. When the structure is metrically unequivocal, the metric notation brings little additional information, and (since it agrees with the inherent meter) listeners are likely to infer the notated meter correctly even from a dead-pan rendition of the music. This does of course not imply that there should be no cues in performance supporting the inherent/notated meter, however. On the contrary, such cues are often of vital importance for musical expression as are various kinds of emphasis on weak metric positions, a quite feasible way of playing since the strong metric positions are safely embedded in the structure.

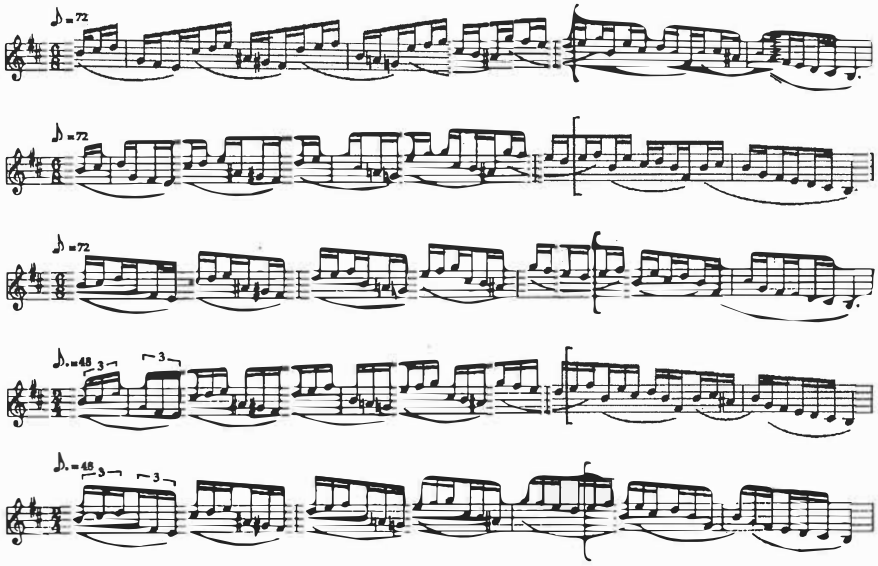
But some structures may give rise to several metric readings, readings that comply equally well with the pattern of accents indicated by the pitch/time events; such passages are metrically ambiguous, or rather potentially ambiguous since the notated meter necessarily must favour one of the alternative readings. And most often — disregarding cases in which it might be artistically desirable to keep the various readings in equilibrium — the metric notation turns out to be clearly normative for performance: one should play so as to bring out the notated meter at the expense of the other latent alternative(s). Metrically ambiguous passages are very suitable if one wants to find out how musicians supply cues for meter, and whether this additional information is sufficient to make listeners identify the intended, notated metric organization.

When musicians are asked about how they convey the meter, they are likely to say either that they leave it to the musical structure to announce its metric organization, or that they engage in "accentuation". The first reply presumably reflects the fact that expressing meter is generally a habitual and unconscious act, and that, especially in cases exhibiting unequivocal meter, the cues for meter added in performance are absorbed beyond distinction by the structural cues. (This goes for players and listeners alike.) The second answer is not very informative, and has the unfortunate effect that metric accent tends to be associated with dynamic stress and — in a depreciatory vein — with "thumping". But as good musicians know, stressing (which is of course a quite legitimate cue for metric accent in performance) is not the

only way to produce emphases that may give rise to perceived metric accents: there are several other possibilities, and all these cues for accent may interact and occur in various combinations.

Now the metric cues actually used in performance of course depend on diverse factors such as the style of the music, the tempo, the immediate musical context and its expressive properties, and the instrument played. Various musical instruments have access to certain specific resources to clarify the meter, and it may be surmised that even in cases where these means are quite restricted, they are (if cleverly used) sufficient to convey practically any metric organization. This does not imply, however, that musicians are always successful in communicating the meter they intend to express. There are pitfalls, and also the risk that a player who reads the score with empathy actually brings forth cues that understate what seems just all too obvious.

In the investigation to be reported here a J. S. Bach melody[2] or rather a fragment of a Bach melody, that lends itself to no less than five different metric readings, was played on three instruments — the piano, the harpsichord, and the organ. In order to close in a satisfactory way, the melody had to be slightly altered in some of the variants.



Example 1

In Bach's original melody (ex. I) the bar-line divides the six-note motif symmetrically into three-note rising and falling constituents, but the overall rhythmic coherence is strong. The inversion relationship between the two sub-motifs is concealed due to the metric difference — the middle second note of the rising sub-motif carries a secondary accent, while the initiating and terminating notes of the falling sub-motif have the primary and a secondary accent, respectively. The instability of the first three notes — this sub-motif is anacrustic on two levels but leads deceptively into a falling skip — forms a contrast to the rhythmic closure of the final three notes. The melody owes much of its expressivity to the tension created by the fact that the basic disagreement between the 2 x 3 motivic structure and the 3 x 2 metric subdivision is highlighted by the off-beat beginning of the motifs.

In the metric variant shown in ex. II the rising sub-motif leads from secondary to main accent, forming a quite stable group ending on the top note, while the falling sub-motif is centered around a secondary accent preceded by an upbeat and followed by an afterbeat — a much less closed configuration. In ex. III the primary accent coincides with the beginning of the first sub-motif, while the top note is put out of metric focus as a secondary accent — the group is beginning-accented but its last note has a sense of latent, displaced main accent. The second sub-motif, again centered around the secondary accent of the middle note, appears to have double rhythmic function: it acts both as an afterbeat to the displaced accent and as stealthy upbeat to the accented entry of the next six-note motif.

The final variants have a less tense character since the metric subdivision conforms with the 2 x 3 motivic structure, implying that the top note is deprived of its metric and expressive importance. Both submotifs are now clearly beginning-accented; in ex. IV the first of them acts as upbeat to the second, while in ex. V the second supplies an afterbeat to the first as well as a latent anacrusis to the following primary accent. Except for the internal accentuation pattern there is an affinity between ex. I and ex. IV — both variants feature an anacrustic three-note sub-motif.

While the variation of the task, i. e., the five stimulus metric variants, was the main variable of the experimental design, the other independent variable was obviously the instrument played. On the piano you can play notes of different intensity, which is by and large impossible when you play the harpsichord and in principle not possible on the organ, and unlike the other two instruments the organ is capable of indefinitely sustained notes. Four highly professional musicians were engaged as subjects — two pianists and

two musicians proficient on all three instruments, which they also played in the experiments.

Since it is quite a delicate task to distinguish between these metric variants in close juxtaposition, it was essential that the subjects were given opportunities to practice. Thus they were given the five variants of the melody about one week before the experiment took place. The instruction asked them to play the excerpts with artistic intent while carefully observing the notational differences. It can therefore be argued that the versions played during the sessions represent highly conscious and presumably successful, but not overly demonstrative, efforts to distinguish between the variants.

All renditions were recorded on tape, and the recordings were then submitted to computerized analysis resulting in graphs from which data on internote durations, articulation silences, and relative intensities could be gained by means of visual inspection.

In order to establish whether the renderings actually conveyed the notated metric organizations effectively or indeed properly, a listening test was arranged. The order of the items was randomized, and for each version eight sensitive and musically informed listeners decided (after hearing the version as many times as needed to be certain) which of the five possible metric variants they considered to be the one played. They were requested not to guess but to leave versions that could not be determined, to indicate notes that seemed particularly effective in conveying the meter, and to state if the playing appeared demonstrative with respect to meter.

Now distinguishing between these metric variants when hearing them might be considered an even more delicate task than playing them. Therefore — and since the aim of this investigation was detailed, qualitative understanding rather than generalization and representativity — the listening test was used only to supplement the investigator's painstaking efforts to penetrate into the perceptual properties of the renderings. First he tried to positively determine the notated meter of each version in the test — it was of course completely impossible to remember the randomized sequence of all 40 versions after more than a half-year — then, using the advantage of knowing the variant played in each instance, and taking care to separate structural accents from emphases deriving from performance, he attempted to observe as many metric cues in the individual versions as possible.

Due to the melodic alterations mentioned above, and to the rounding off features in performance that are likely to turn up when you finish a melody, the study of the playing characteristics was restricted to the first 5 x 6 notes

of the melody only, and in the listening test the versions were interrupted at this point. Of these six-note groups the first one was considered to be of particular interest since early cues are likely to be important, or even decisive, for correct identification of meter. The last of the five groups used to collect performance data and listening responses breaks the melodic sequence and served to check whether the metric cues found in the performances thus far were confined to a specific melodic formulation.

Turning now to the outcome, the physical properties of the versions were ascertained by means of comparisons within overlapping two-note units, ensuring that all relationships between consecutive events were taken into account. Recurrent patterns as regards relative internote durations (Dii), articulation, including differences with respect to "effective" sounding duration (Dio), and relative intensities (A) are given for each version below the notations of the metric configuration of the variants — cf. columns I–V in tables 1–2; only the first six-note group is notated, but the patterns apply to all five groups studied. The letters L and S refer to tones having long and short internote (or effective) durations, and I and W stand for intense and weak tones, respectively. Slurs and dots are used to show the articulation. Parentheses indicate that the patterning in question occurred in a minority of the cases. In addition crescendo/decrescendo signs, accent signs, and tenuto signs are used to mark properties that, besides being clearly observable in the registrations, were also quite conspicuous to the ear — parentheses signify comparatively less pregnant effects.

The results of the listening test are given in the top left corner of the boxes for each of the 40 versions. A frequency ratio of, say, 4/8 means that four judgements out of eight obtained were correct. If the mistakes showed any tendency towards a certain other variant, this variant is also stated — the variants are labelled by roman numerals (I–V). The pianists are called P1 and P2, and the two multi-instrumentalist subjects are designated as P/H/O 3 and P/H/O 4, according to the instrument played.

In current musical parlance "accent" and "stress" are often confounded, and that stress (dynamic emphasis) is used as a means for conveying metric accent can be seen from the data of several of the piano versions; cf. P2: 1, IV–V, P3: I–II, P4: III. But phenomenal accent has further physical correlates than stress.

Some of the piano renditions (P1: III, V, P3: IV–V, P4: I–V) and particularly several of the versions played on the harpsichord and the organ (C3: II, C4: I–V, 03: I–II, 04: I–V) show that long Dii-values, indeed conspicuous

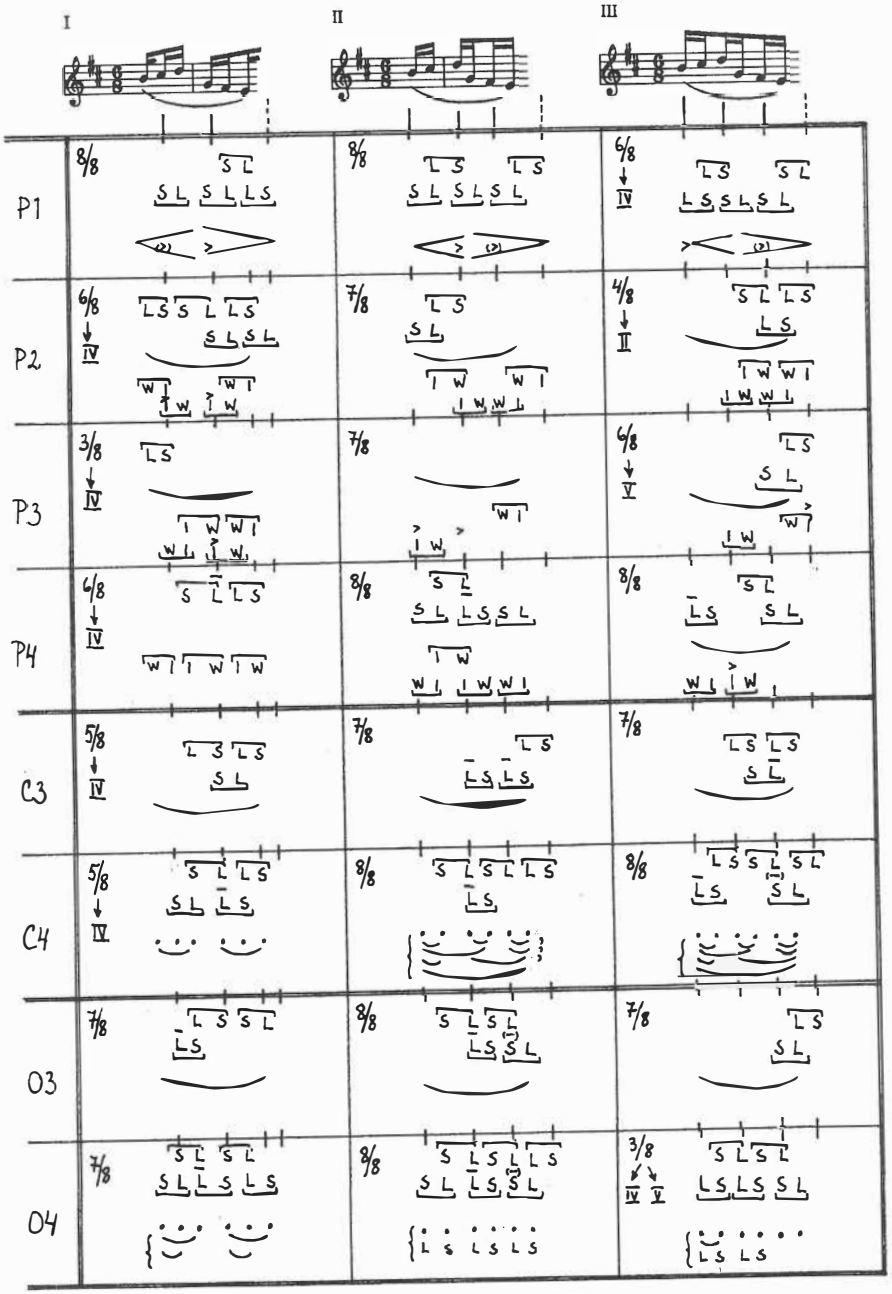



Table I

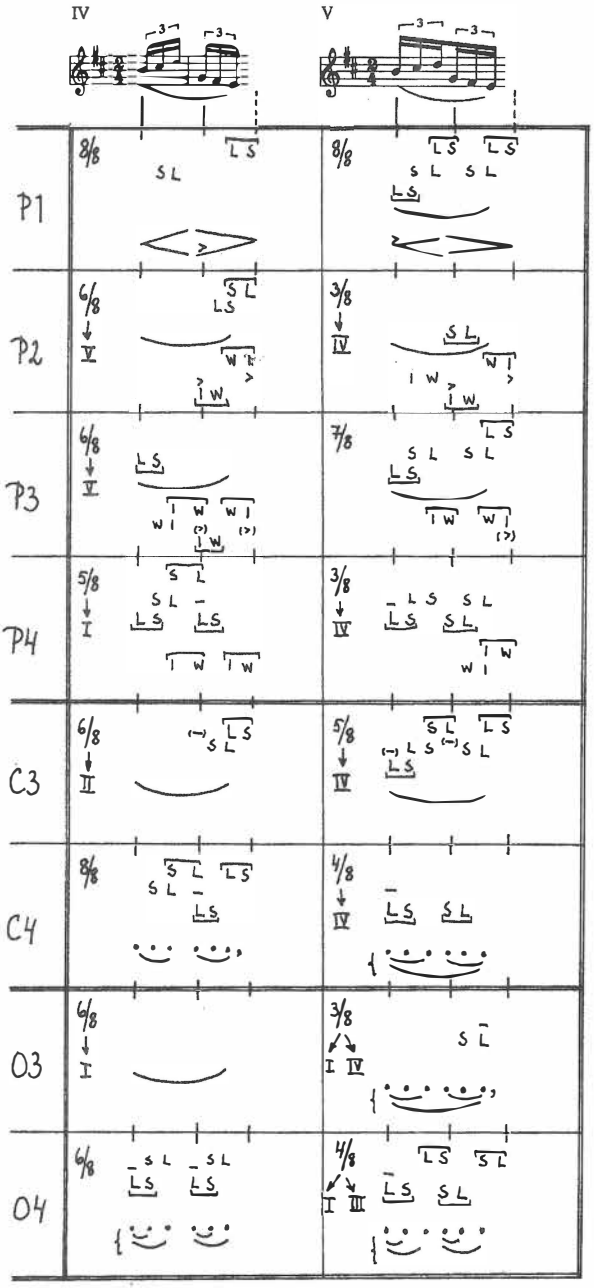



Table II

tenuto prolongations, can be substituted for sudden increments in intensity, and also that shortened Dii-values are correlated with accented positions; cf. P1: I–II, P2: I–II, V, P4: II, V, C4: I, V, O4: I–II, V. This may at first seem peculiar, but the decisive character of SL internote duration patterning (when properly applied) may work well as a cue for accent. On the piano it appears that SL Dii patterning can be combined with both IW (P2: I) and WI (P4: II) stress patterns; in the latter case, however, the primary accent is marked by an LS/IW combination.

Turning to the articulation factor, the slurring together of two (or three) notes is a very effective cue since sub-motifs thus identified give rise to rhythmic groups that suggest metric formats and demarcations. Several of the harpsichord and organ versions clearly exemplify the use of slurs to indicate meter: cf. C4: I–V, 03: V, 04: I, IV–V. (It turns out that slurring can be applied to LS as well as to SL Dii patterns.) Looking finally at Dio values within passages of non-legato playing, the versions 04: II–III indicate that LS Dio relationships are correlated with the meter in much the same way as LS Dii patterns.

While the pianists sometimes did use Dii patterning in an orderly way reflecting the meter, it seems that harpsichordists and organists (deprived of the A factor) resorted to it more systematically and also more pregnantly: cf. the number of tenuto signs in the versions played on these instruments. Subject 4 — using durational inequality most boldly — applied conspicuously lengthened Dii-values also when playing the piano. P1 played legato throughout, while subject 4 (and also 03 in variant V) obviously felt it necessary to make use of articulation in order to render the metric distinctions clearly — an interesting and not unexpected transgression of the given notations.

The notated meter could generally be fairly well identified, but the listeners testified that it was often quite difficult — an opinion that the author, having worked persistently to decode the versions, can confirm. In some cases the players' metric intentions could not be established beyond doubt, and it is of course possible that these versions did not come off quite well, that there was actually something inadequate or contradictory about them. The most frequent mistake was to confound variants I and IV (or V), but also IV and V were mixed up. In the former cases too little emphasis in terms of stress and/or duration was apparently given to the second and the first note, respectively; in the latter the secondary accent on the fourth note in renderings of variant V seemed more decisive than the main accent, a

manner of playing that suggested the related variant IV. Another possible source of confusion was probably the fact that in variants II and III the highest note is more or less accented, while in variants I, IV, and V it is certainly unaccented according to notation but introduces a leap downwards — a fact that may supply a reason for emphasis and give rise to tones heard as cues for accent.

But notated meter is not the only thing you want to express, even in an experiment like this. The metric organization is certainly an essential part of the phenomenal musical structure, but there is more to a melody than that, more things that must be reflected in performance. And this Bach melody is deeply expressive indeed, and it certainly demands expressivity from the player. Thus some traits especially in the versions of subject 2, being generally prone to make a moderate use of systematic metric cues, is apparently due to from musical considerations other than conveying the metric organization of the variants. And turning to the final six-note motif at the very culmination of the expansive melodic arch and at a stage, when the metric framework is likely to have been settled in the minds of most listeners, many versions featured new properties, superimposed on and often levelling out the so far prevailing metric patterning: an element of even loudness, equal duration, and portato playing emerged in many of the recordings.

To close this article a succinct account for the outcome of the entire project referred to in the introduction may be of interest — the present melody was but one of 48 Bach melodies studied, melodies that not only featured various kinds metric ambiguity, but also exemplified conflicts between notated and inherent meter as well as unequivocal metric organizations.

It thus turns out that professional musicians — even when playing an instrument like the organ that does not produce tones of different intensity (or the side drum that only admits of sounds of the same short duration) — can express the notated rhythm in a way that is correctly understood by listeners. Indeed, metric cues seem to be an integrated part of musical expression, since effective such cues were found even in unequivocal melodies in which the metric organization does not need to be confirmed by the performance.

Among the three performance factors that are relevant for expressing the notated meter, the results indicate that articulation, and especially slurring, is a frequently used and quite decisive cue for meter. Though slurring and articulation patterns in general actually represent drastic interventions on

the part of the performer, they were seldom heard as conspicuous metric cues by the subjects in the listening test — the articulation seems to belong to the structure of the music. In comparison with the harpsichord and particularly the organ players, the pianists, having access to intensity differences to bring out the meter, made a more sparse use of articulation patterns to clarify the metric organization.

Turning to Dio patterning, a special case of articulation, lengthening of metrically strong notes in passages of detached playing emerges as a much less drastic method of conveying metric accent than articulation slurs, but it seems, when properly applied, to be quite effective. A relatively long Dio value (and it must not be conspicuous as such) is a strong cue for accent, and LS and LSS Dio patterns spell out duple and triple metric units almost as well as two-note and three-note slurs, respectively.

Musicians are however also apt to use slurs to keep rhythmic groups, melodic motifs, and phrases together, irrespective of whether these units occur in phase with the meter or not. The listening test shows that renderings featuring off-beat slurs may give rise to metric confusion if the cues for accent suggested by the slurs are not properly counter-balanced by other cues (deriving from the musical structure or from the playing) that maintain the accented positions of the notated metric framework.

Stressing strong metric positions certainly gives rise to emphases that make for phenomenal accents, but highly effective as this device is, its usefulness for expressing the metric organisation in a patent way is restricted because dynamic intensifications also tend to be used for various other purposes, such as indicating the beginning of rhythmic groups, or underscoring tones of structural prominence or heigthened emotional content. Thus the intensity cueing for meter often present in the piano and drum versions was sometimes temporarily obscured by irregular stresses or indeed entirely suppressed by more or less consistent off-beat dynamic emphases, causing perceptual confusion if no other cues clarifying the metric organization were present.

The Dii differences found in the material (most often quite small but amounting to substantial and clearly audible inequalities in some organ versions) were generally great enough to be of perceptual significance, and these inter-note duration proportions often matched the strong/weak positions of the notated meter in a consistent way. But how and to what extent Dii patterns express (or confirm) the meter is somewhat uncertain. Except when quite conspicuous inequalities are involved, the Dii patterning seems

to be a comparatively weak cue for meter, but even moderately pregnant Dii patterns may no doubt, if they are consistently applied, contribute to a sense of a regular train of phenomenal accents.

But what significance does the Dii factor have in practice, and how is it used? Regular sequences of LS Dii patterns were rather frequent in the material, and so were also sequences of SL patterns. While it may be taken for granted that the former kind of Dii patterning supports the meter, it is not necessarily true that the latter counteracts it — the identification scores of versions featuring sequences of SL Dii patterns were not affected to any appreciable extent, and therefore it might be concluded that "negative inequality" is at least compatible with the notated meter, or even that it, in its way, does express the meter, giving it a certain sprightly character. It could further be observed that prominent upbeat notes were often announced by means of (frequently stressed) long Dii values.

This brings us to the relationships between metric cues and more generally to the phenomenal character of specific rhythms. Inter-note timing, articulation and stressing may of course be combined so as to reinforce each other in the "natural" way. And instances of LS Dii and/or Dio patterning and IW stress profiles were frequent in the versions — but more interesting are the diverging combinations also present in the material. It thus turns out that short Dii and/or Dio values may go with dynamic intensification, and that this combination — quite common in variants where the notated meter was counterindicated by structural features, i. e., for instance at pre-syncopation notes — both gives a peculiar, decisive character to the dynamic emphasis and makes the short Dii and Dio durations musically understandable as cues for accent. As an extension of this it seems that SL Dii patterns may after all express, and characterize, meter, provided that this "negative" inter-note patterning is supported by stresses — or indeed perhaps without such a support, provided that the structure does not invite to improper locations of the accents.[3]

## Remarks

1 The work accounted for here is part of a more comprehensive research project reported on elsewhere; cf. Edlund, Bengt, "Representation of Meter in Performance. A Study of Bach Melodies", "Playing Bach on the Piano, the Harpsichord, the Organ, and the Side Drum. A Study on the Expression of Musical Meter", and "The Tyranny of the Bar-lines. Encoding Notated Meter in Performance" in Friberg, A. et al (eds.), *SMAC 93*, Proceedings of the Stockholm Music Acoustics Conference, (Stockholm 1994) pp. 84–88. The reader is referred to these articles for a more thor-

ough discussion of theoretic issues, for details as to experimental procedures and analysis of data, and for specific findings as regards other Bach melodies.

2 The melody is taken from Cantata No. 128 (Auf Christi Himmelfahrt allein) BWV 128, where it appears in mm. 11–14 of the oboe d'amore solo part of the penultimate piece. The phrasing, however, derives from Max Reger, who used this melody as theme for his op. 81, "Variations and Fugue on a Theme by J.S. Bach".

3 The work on this paper has been supported by a grant from Swedish Council for Research in the Humanities and Social Sciences.

## Summary

After making distinctions between phenomenal, inherent, and notated meter, and defining the concept of metric ambiguity, a Bach melody allowing of five different metric readings is analyzed. These metric variants were played on the piano, the harpsichord, and the organ by professional musicians, and the performances were then studied with respect to physical cues for meter and judged with respect to the emerging meter by a group of listeners. The outcome of this experiment as well as of a broader investigation comprising 48 Bach melodies is presented.