STYLE AND TRADITION IN STRING QUARTET PERFORMANCE

A STUDY OF 32 RECORDINGS OF BEETHOVEN’S OP. 131 QUARTET

Volume 2

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March 2004
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Supplementary Figures

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Modal tempo

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Op. 131, ii - Allegro molto vivace

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Appendix A. Summary of Teaching Relationships in the Quartets Studied

The teacher / pupil relationships which make up the teaching ‘ancestry’ of the quartets studied here and their members are listed first in order of pupil and secondly in order of teacher. Relationships involving quartets teaching quartets, individuals teaching quartets, and individuals teaching individuals are listed separately. The relationships listed here are represented in the ‘pedagogical family tree’ chart in Volume 1, Fig. 2.2.

Sorted by pupil

Quartets taught by quartets

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### Individuals taught by individuals

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Zimbalist, Efrem
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Auer, Leopold

Sorted by teacher

Quartets teaching quartets

Amadeus
Petersen
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Appendix B. Methodology for the collection of bar by bar inter-onset intervals

The collection of an accurate data set representing the inter-onset intervals of individual bars in a recorded performance of a string quartet poses a number of methodological problems. Researchers investigating basic features of expressivity in music performance using experimental performances are able to avoid these problems by recording the sample performances, which are usually of piano repertoire, on a keyboard using MIDI technology; the basic data for note onset timings are therefore available immediately in accurate form from the resultant MIDI data set (e.g. Repp, 1994a and Shaffer, 1995).

For a study of recorded performances of a string quartet, the main difficulty is in deriving accurate timings of the onset of appropriate events from recordings in a number of media (78 rpm shellac discs, 33 rpm vinyl discs, CDs, cassettes and DAT).

Cook, in his study of two performances of the first movement of Beethoven’s Ninth Symphony (Cook, 1995), used a simple procedure involving tapping on a PC keyboard in time with the recorded performance, with the computer logging the precise timing of each keyboard tap. Cook himself recognises that these measurements (which showed an average error of around 3% on repeated tests) are not sufficiently accurate for conclusions on small transitions at the bar-to-bar level to be supported, but felt that they were adequate for ‘inferences regarding the broad shaping of tempo’ (Cook, 1995: 114).

This method is inadequate for the purposes attempted in this study, which addresses lower level tempo variation as well as broad tempo shaping. There are also a number of practical problems with this approach. Firstly, with this method there is only one opportunity to record the data accurately; it relies entirely on the ability of the researcher to depress keys in exact time with the performance. In the course of recording the data the tendency is for the researcher to anticipate the beat on the basis of the established and perceived tempo; if there is any change of tempo, it may be missed or at least minimised because of this anticipation. Secondly, there is no possibility of correcting the data. While it would be possible to alter some of the values on an intuitive basis, there would be no way of verifying the changes made.
The method chosen for this study uses MIDI technology. In it, the researcher plays the start of bar beats along with the recording on a MIDI keyboard. The MIDI keyboard is here being used merely to record a note onset, as with the key depressions in the first approach; no attempt is made to 'perform' the piece along with the recording being played back. The resultant MIDI recording is played back in synchronisation with the audio recording of the actual performance, and any discrepancies noted. These discrepancies are adjusted on the MIDI file using a PC MIDI sequencer program. The process is repeated until a satisfactory match with the real performance is obtained. By setting the MIDI configuration parameters appropriately, an accuracy of 1/1600th second can theoretically be achieved.

Those recordings on non-digital media (78 rpm shellac, 33 rpm vinyl and cassette) were transferred to DAT tape prior to this analysis. It was discovered that, due to the mechanical nature of the playback facility on these non-digital media, some minor variations in playing speed occur. These had the effect of causing the playback of the recording to become slightly out of phase with the simultaneous playback of the MIDI recording. The electronic timing mechanisms used with digital media ensured that the MIDI track could always be kept in phase with the DAT or CD recording.

This method is still open to a number of theoretical problems, and it is possible that, even though the MIDI recording is iteratively adjusted to match the performance as judged by the ear, there may still be some systematic error being introduced. While tapping in time with a performance, it is a natural tendency to anticipate beats based on the perception of an established tempo, and thus to iron out any actual delay that is present in the performance, or at least to transfer it to the following bar. Indeed, it is this kind of instance which most often needed correction after verifying the MIDI recording against the performance.

In order to test the accuracy of the method, the 1933 Léner Quartet performance of the fifth movement of the quartet was loaded onto a computer running the Sound Designer software package. This package allows the visual editing of the soundwave patterns against a time grid capable of resolution to milliseconds. By repeatedly playing the note event being timed at slow playback speeds it is possible to identify visually the onset of the note on the soundwave pattern to a high degree of accuracy and to derive a timing in
milliseconds. This method provides the highest possible degree of accuracy of measurement, although it is arguable that errors may still arise because of its dependency on the observer aurally correlating the perceived onset of the note with the visual sound wave display. However, the method is extremely labour intensive and could not be considered for a study involving thirty-two separate recordings of the entire quartet.

To compare the results obtained from this method with those obtained by the method actually adopted for the complete study, firstly the tempo map graphs for the movement derived from the two methods were overlaid. They were seen to give a very good visual match: most of the observable discrepancies occurred where there was no event on the downbeat of the bar. The onset on such bars was determined by intuitive tapping where the bar was felt to start in the MIDI method, whereas in the Sound Designer method, extrapolations were made based on the observed values of individual beats in the preceding bar. It could be argued that the MIDI method provides a more realistic measurement in these instances, as the algorithm used in the Sound Designer method was fairly crude, and has the effect of multiplying any slight discrepancy in the placement of a single beat.

To provide a more objective comparison, a number of statistical measures were taken for the two sets of data for two sections of the movement: these are one occurrence of the scherzo section (bars 167-234) and one of the trio section (bars 235-332). The results obtained are given below:

<table>
<thead>
<tr>
<th>Scherzo</th>
<th>Sound Designer</th>
<th>MIDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean metronome marking</td>
<td>100.11</td>
<td>100.00</td>
</tr>
<tr>
<td>Mode metronome marking</td>
<td>108</td>
<td>109</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>19.53</td>
<td>19.11</td>
</tr>
<tr>
<td>Variance</td>
<td>381.54</td>
<td>365.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trio</th>
<th>Sound Designer</th>
<th>MIDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean metronome marking</td>
<td>101.89</td>
<td>101.84</td>
</tr>
<tr>
<td>Mode metronome marking</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>4.81</td>
<td>4.64</td>
</tr>
<tr>
<td>Variance</td>
<td>23.13</td>
<td>21.56</td>
</tr>
</tbody>
</table>

This table shows that the figures for mean and mode metronome marking are extremely close, while those for standard deviation and variance differ by between 2% and 6%.
The fact that this is one of the fastest movements in the quartet implies that these discrepancies are likely to be the worst case: any errors in placing the timing of the onset of an event are likely to be absolute rather than relative, and would therefore have proportionately less effect in slower movements, where the significant events are more widely spaced. The conclusion is that the chosen method is sufficiently accurate for analysing tempo and tempo variance at the bar-to-bar level.
Appendix C. Contents of Accompanying CD

1. iv, 162 - 177, Busch
2. iv, 162 - 177, Léner 1933
3. iv, 1 - 16, Gewandhaus
4. iv, 1 - 16, Budapest 1943
5. iv, 187 - 194, Yale
6. iv, 187 - 194, Mosaïques
7. v, 45 - 66, Yale
8. v, 45 - 66, Mosaïques
9. i, 72 - 94, Schneiderhan
10. i, 72 - 94, Hollywood
11. i, 72 - 94, Pascal
12. i, 45 - 72, Smetana
13. i, 45 - 72, Lindsay
14. i, 45 - 72, Léner 1933
15. vii, 367-388, Léner 1924
16. vii, 367-388, Capet
17. vii, 367-388, Medici
18. vii, 367-388, Orford
19. vii, 184-199, Talich
20. vii, 184-199, Gewandhaus
21. vi, Busch
22. vi, Yale
23. vi, Léner 1924
24. i, 20 - 24, Rosé
25. i, 20 - 24, Calvet
26. i, 70 - 79, Calvet
27. i, 70 - 79, Rosé
28. i, 98 - 113, Busch
29. i, 98 - 113, Capet
30. i, 98 - 113, Rosé
31. i, 98 - 113, Gewandhaus
32. i, 98 - 113, Léner 1933
33. i, 98 - 113, Léner 1924
34. i, 98 - 113, Calvet
35. i, 98 - 113, Medici
36. i, 98 - 113, New Budapest
37. i, 98 - 113, Schneiderhan
38. i, 81 - 83, Busch
39. vi, London
40. vi, Léner 1933
41. vi, Gewandhaus
42. vi, Busch
43. i, 1-4, Rosé
44. i, 1-4, Schneiderhan
45. i, 1-4, Amadeus
46. i, 1-4, Vlach
47. i, 1-4, Léner 1933
48. i, 1-4, Hungarian 1953
49. i, 1-16, Italiano
50. i, 1-16, Orford
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Zoltán Székely, Alexandre Moskowsky, Dénes Koromzay, Vilmos Palotai

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79
Lindsay Quartet, 1983? [ASV, LP, ACA 1014]
   Peter Cropper, Ronald Birks, Roger Bigley, Bernard Gregor-Smith

London Quartet, 1925 [Vocalion, 78, K05138/41]
   [heavily cut; the following passages missing:
    mvt 1 - second half, from bar 83 to end
    mvt 4 - variation 5
       variation 6, bars 203-210
       coda, bars 242-271
    mvt 5 - repeat, bars 20-67
       bars 163-328
       bars 499-500
    mvt 7 - bars 124-159]

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   Paul Robertson, David Matthews, Ivo-Jan van der Werff, Anthony Lewis

Mosaïques Quartet, 7 February 1995, Pebble Mill Studio, Birmingham [off-air recording of live broadcast, BBC Radio 3]
   Erich Hőbarth, Andrea Bischof, Anita Mitterer, Christophe Coin

New Budapest Quartet, November 1990 [Hyperion, CD, CDA66405]
   András Kiss, Ferenc Balogh, László Bársy, Károly Botvay

Orford Quartet, May 1985, Emmanuel Presbyterian Church [Delos, CD, DE3036]
   Andrew Dawes, Kenneth Perkins, Terence Helmer, Denis Brott

Pascal Quartet, 1951? [Nixa, LP, CLP1211]
   Jacques Dumont, Maurice Crut, Leon Pascal, Robert Salles

Petersen Quartet, March 1994, Friedenskirche der Stephanus-Stiftung, Berlin-Weissensee [Capriccio, CD, 10 510]
   Conrad Muck, Gernot Süssmuth, Friedemann Weigle, Hans-Jakob Eschenburg

Prazak Quartet, February 1991, Evangelic Church, Korunni 60, Prague [Nuova Era, CD, 7044]
   Vaclav Remes, Vlastimil Holek, Josef Kluson, Michal Kanka

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   Arnold Rosé, Paul Fischer, Anton Ruzicka, Anton Walter [?]

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   Jiří Novák, Lubomír Kostecký, Milan Škampa, Antonín Kohout

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   Sándor Végh, Sándor Zöldy, Georges Janzer, Paul Szabo
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