

**STRING TECHNIQUES, NOTATION SYSTEMS AND SYMBOLS
IN SELECTED 20TH CENTURY STRING QUARTETS**

by

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CONTENTS

CONTENTS	<i>i</i>
SUMMARY	<i>xiv</i>
ACKNOWLEDGEMENTS	<i>xv</i>
MOTIVATION	<i>xvi</i>
FORMAT	<i>xix</i>
INTRODUCTION	1
PART I : HISTORICAL PERSPECTIVE	
Chapter One	
MUSIC IN THE TWENTIETH CENTURY	2
A Brief History	2
Romanticism	2
Extension Process of Traditional Syntax	4
Impressionism : Neo-Classicism	4
<i>Debussy . Stravinsky . Bartók . Hindemith</i>	
12-Tone Method	5
<i>Schoenberg . Webern . Berg</i>	
Futurism	6
<i>Varèse</i>	
The <i>Avant-Garde</i>	
<i>Boulez . Stockhausen . Cage</i>	6
Post 1945 Onwards	7
Chapter Two	
THE STRING QUARTET	9
A Brief History	9
Unity and Distinction	9
Origins of the String Quartet	9
Trio Sonata - Italy and Germany	10
String Quartet : Classical	11
<i>Franz Josef Haydn (1732-1809). Wolfgang Amadeus Mozart (1750 - 1791).</i>	11
<i>Ludwig van Beethoven (1770-1827)</i>	
String Quartet : 19th century - Romantic Period	13
<i>Franz Schubert (1797-1828) . Johannes Brahms (1833-1897) .</i>	
<i>Felix Mendelssohn (1809- 1847) . Robert Schumann (1810-1856)</i>	

The 20th Century String Quartet	14
String Quartet 1900-1950	14
<i>Systematic Dissolution and Decline of Traditional Syntax</i>	
String Quartet	15
<i>Early Decades of the 20th century</i>	
Early 20th Century Compositional Innovations	16
<i>France : Claude Debussy (1862-1918)</i>	16
<i>Thematic Metamorphosis : Kaleidoscopic Textual Changes : Polytonality</i>	
<i>Germany : Schoenberg - Webern - Berg - Hindemith</i>	17
<i>Arnold Schoenberg (1874-1951) : 12-tone Method and Inclusion of Soprano Voice</i>	17
<i>Comment</i>	18
<i>Alban Berg (1885-1935) : Romantic Expressionist : 12-tone Method and Tonal Associations</i>	18
<i>Anton von Webern (1883-1945) : Pointillist and Extreme Economist</i>	18
<i>Paul Hindemith (1895-1963) : neo-Classicist - Expanded Tonality</i>	20
<i>Comment</i>	21
<i>Europe</i>	21
<i>Hungary : Béla Bartók (1881-1945) : Reconciliation of Folk and Contemporary Practices</i>	21
<i>Comment</i>	24
<i>England</i>	25
<i>America</i>	26
<i>Charles Ives (1874-1954) : Radical Thinker</i>	26
<i>Ives' Rhythmic Approach</i>	27
<i>Descriptive Titles</i>	28
<i>Comment</i>	29
<i>Henry Cowell (1897-1965) : Experimentalism</i>	29
<i>Additional American Composers of Early 20th century String Quartets</i>	30
<i>Comment</i>	30
<i>Russia : Arts and The Central Committee</i>	30
<i>Shostakovich (1906-1976) and Prokofiev (1891-1953)</i>	30
<i>Shostakovich (1906-1976)</i>	31
<i>Comment</i>	31
<i>Prokofiev (1891-1953)</i>	32
<i>Comment</i>	32
<i>Stravinsky (1882-1971)</i>	32
<i>Comment</i>	33
Comment : Neo-classicism : Serialism	34
Chapter Three	
NOTATION	37
Modification : Continuity : Change :	37
A Chronological Perspective	
A History of Notation - A History of Music	37
<i>Problems of editing Mediaeval and Early Renaissance Music</i>	38
<i>Rests</i>	39
<i>Table of Contemporary Rest Values</i>	39
<i>Interpretative Confusion : Uncertainty</i>	40
<i>A Need for Explanatory Notes in 14th and 15th Centuries</i>	
<i>Notation Systems</i>	41
<i>Western Notation - A Brief History</i>	42
<i>Comment</i>	45
<i>Comparison : Correlation and Extension</i>	46

Notational Change : Broad Chronological Categories	47
<i>The Need for New Notation : A Survey of Thoughts</i>	48
<i>Opinions - from 1990s</i>	
<i>Notating non-Standard Effects</i>	49
<i>Time/Pitch Relationships 1920s</i>	50
<i>Decline of Standard Notation - post 1945</i>	52
<i>Stylistic Upheaval - 1950s</i>	53
<i>Inherited Notation Symbols around 1945</i>	54
<i>Convention : Index of New Notation (1964)</i>	56
<i>Old Instruments - New Sounds : The String Quartet Post 1945</i>	57
Survival of the Genre post 1945	62
<i>New sounds : New Language</i>	62

PART II : INVESTIGATION

**RHYTHM : TEMPO : PITCH EXTENSIONS : RIGHT HAND TECHNIQUES : TIMBRE : REPEATS :
STAVES : SUNDRY TECHNIQUES :
SUMMARY AND CONCLUSION**

Chapter Four	
RHYTHMIC NOTATION	65
Introduction	65
Time Signatures	67
<i>Modern Innovations</i>	67
<i>Dissolution of time signatures</i>	71
<i>Contemporary Use of Unconventional time signatures</i>	71
<i>String Quartets (1900-1957) : Webern : Hindemith : Bartók : Schoenberg</i>	72
<i>Webern : String Quartets (1905-1938)</i>	72
<i>Hindemith : String Quartets Nos. 1-6 (1921-1949)</i>	73
<i>Comment</i>	75
<i>Bartók : String Quartets Nos. 1-6 (1908-1943)</i>	75
<i>Comment</i>	77
<i>Schoenberg : String Quartets Nos. 1-4 (1904/5-1936)</i>	77
<i>Use of Time Signatures : 1900-1952</i>	78
<i>Comment</i>	78
<i>Use of Time Signatures : 1950-</i>	79
<i>Comment</i>	81
<i>Unusual Time Signatures</i>	81
<i>Comment</i>	82
<i>Numerators and Denominators</i>	82
<i>Alternating Meters</i>	83
<i>Variable Meters</i>	83
<i>Comment</i>	86
<i>Quartets not listed that contain variable meter</i>	86
<i>Mixed Meters</i>	87
<i>Fractional Meters</i>	87
<i>Polymeters - combination time signatures</i>	89
<i>Comment</i>	91
<i>Dispensing of Denominator</i>	91
<i>Replacement of time signature</i>	92
<i>Comment</i>	93
Metric Modulation	94
<i>Early Proportions - Proportio</i>	97
<i>Metric modulation - common pivotal element</i>	97



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Barlines	98
<i>Barlines in the 20th century</i>	98
<i>Irregular Placement of Barline</i>	99
<i>Irregular Barlines and Polymeters</i>	99
<i>Contemporary use of Modified Barlines and Polymer</i>	100
<i>Irregular Dotted Barlines</i>	101
<i>Dotted Barlines : Secondary Pulsation Indicators</i>	101
<i>Dotted Barlines : Motivic Emphasis</i>	102
<i>Extended Dotted Barlines : Ensemble Orientation</i>	103
<i>Dotted Barlines : Subdivision of Irregular Meter</i>	104
<i>Further examples of displacement of Barline</i>	104
<i>Comment</i>	107
Beaming	107
<i>Changing concepts of Beaming - the Reasons</i>	107
<i>Early use of Beaming and Slurs : 1900 -</i>	109
<i>Functional Variations to traditional beaming</i>	109
<i>Beaming to accentuate ostinato pattern</i>	109
<i>Ostinato across barline</i>	110
<i>Beaming across barline/chromatically rising ostinato pattern</i>	111
<i>Double Ostinati patterns</i>	111
<i>Imitative ostinati in inversion</i>	112
<i>Non-functional use of Ostinati</i>	112
<i>Beaming incorporating Rests</i>	114
<i>Beaming and Sequences : Melodic and Rhythmic</i>	115
<i>Beaming of indicators of metric division changed to indicators of rhythmic groupings</i>	118
<i>Beaming and Elimination of Accent</i>	119
<i>Asynchronous/Arhythmic Group Beaming : Elimination of Pulse</i>	120
<i>Deceptive beaming of Multiple Note-Groupings</i>	122
<i>Beaming to indicate phrases</i>	124
<i>Traditional syntax - other uses</i>	126
<i>Comment</i>	126
Duration	128
<i>Demise of Conventional Symbols</i>	130
<i>Rhythmic Plurality</i>	132
<i>Comment</i>	136
<i>New Rhythmic Symbols and Meanings</i>	137
Proportionate Notation	137
<i>Proportional Spacing with Conventional Notation</i>	138
<i>Spatial Notation : Traditional notation : single notes</i>	139
<i>New Duration Symbols and Extended Beams</i>	147
<i>American Innovation</i>	147
<i>Proportional Spacing and Beaming</i>	149
<i>Extended Beaming and noteheads</i>	149
<i>Beaming without noteheads</i>	150
<i>Beaming with noteheads and stems : separate and joined</i>	152
<i>Indicating short duration at end of beamed noteheads</i>	153
<i>Beamed Notehead Extension for Continuous Pitch</i>	154
<i>Legato/Non legato</i>	155
<i>Vertical Lines as Connectors</i>	156
<i>Duration and Slurs</i>	157
<i>Beamed Spatial Notation : Advantages and Disadvantages</i>	158
Spatial Notation and Superimposed Numbers	161
<i>Proportional Notation and Superimposed Indicators</i>	162
<i>Comment</i>	162
<i>Modification of Traditional Indicators in Contemporary Irregular Indicators</i>	165

<i>Clarifying Notes and/or Numbers</i>	165
<i>Use of Small Figures</i>	165
<i>Addition of Clarifying Notes and/or Numbers</i>	169
<i>Double figure equations - numerals only</i>	169
<i>Equations - double numerals coupled to note values</i>	170
<i>Single numerals and notes values</i>	171
<i>Single numbers indicating inconsistent groupings without note values</i>	172
<i>Double figure ratios/beaming across barline</i>	173
<i>Comment</i>	174
Summary : Rhythmic Notation	175
<i>Extensions and Additions to Rhythmic Notation</i>	176
<i>Time Signatures</i>	176
<i>Numerator and Denominator</i>	176
<i>Irregular Rhythms</i>	176
<i>Beaming</i>	176
<i>Metric Modulation</i>	177
<i>New Principles - Notation of Approximate Values</i>	177
<i>Proportionate Notation</i>	177
<i>Extended Beams</i>	177
Chapter Five	
TEMPO	
Metronome markings and Qualifying words	179
Descriptive Words and Metronome Marks	180
<i>Debussy. Webern. Schoenberg. Hindemith</i>	180
<i>Contemporary Composers : Tempo and Mood Indicators</i>	184
Tempo and Frame Notation	186
Descriptive Words and Tempo Markings	187
<i>Contemporary Usages : European and American</i>	187
<i>Comment</i>	189
<i>Metronome Markings : Extensions and Modifications to Functions</i>	189
<i>Tempo : Units per seconds</i>	189
Horizontal Lines	191
<i>Horizontal Line : Basic Time Unit per Second : Indicated by Dotted Horizontal Line</i>	191
<i>Horizontal Lines : Variable Units per Seconds</i>	192
<i>Horizontal Lines : Exclusive use Time Units per Second Within a Composition</i>	193
<i>Two Unlike Notation Systems Controlled by Time Unit</i>	194
<i>Horizontal Line : Constant Time Unit : Note Equal to Time Unit per Second</i>	195
<i>Proposed Square Brackets</i>	197
<i>Proposed Rounded Brackets</i>	197
<i>Other Tempo Requirements</i>	197
<i>Horizontal Line : Constant Time Unit</i>	198
Varied Tempo Indicators within a Composition	199
<i>Holliger : String Quartet (1973)</i>	199
<i>Time Unit : Total Line in Seconds</i>	200
<i>Tempo choice between Two Time Units</i>	201
<i>Tempo choice between Two Metronome Speeds</i>	201
<i>Time Units for Portion of the Line</i>	202
<i>Sectionalised Time Units : Repeated in a Single Line</i>	202
<i>Combination of Tempo Indicators in a Single Line :</i>	203

<i>Metronome Marks and Time Units</i>	
<i>Tempo in Words</i>	203
<i>Constant Set of Units per Bar: Regulated by Metronome Mark</i>	203
<i>Comment</i>	203
<i>Gielen : Streichquartett, "Un vieux souvenir" (1983)</i>	204
<i>Mixed tempi markings</i>	
<i>Various time units marked separately in a single line</i>	204
<i>A variety of horizontal time units within a single bar</i>	204
<i>Combinations of beamed time units and standard note values</i>	204
<i>Perpendicular markings controlling an irregular selection of separate units per bar</i>	204
<i>Selection of irregular groupings - different time signatures</i>	205
<i>Separate metronome tempi withing one bar</i>	205
<i>Horizontal line incorporating long time unit per line</i>	206
<i>Irregular selection of quaver note groupings, regulated by metronome mark</i>	206
Horizontal Line : Total Page in Time Unit per Seconds	206
Vertical Lines	207
<i>Vertical for Separate and Larger Units</i>	207
Choice of Tempo, Words and Traditional Symbols	210
<i>Traditional Tempi Indicators and Total Duration of Playing Time</i>	211
<i>Comment</i>	211
Time Units Equated to Note Shapes	212
<i>Comment</i>	214
Tempo: Additional Categories	214
Accelerando and Ritardando	215
<i>Accelerando or Ritardando controlled by Beams</i>	215
<i>Speed Changes indicated within Beamed Symbols</i>	
<i>Distinction between two Aspects of Accelerandi within a Single Quartet</i>	216
<i>Accelerando and Ritardando in Proportional Spacing</i>	216
<i>Accelerando and Ritardando in Proportional Spacing : Beaming and Arrows</i>	217
<i>Accelerando and Ritardando Combined within Beaming</i>	218
<i>Accelerando or Ritardando controlled by use of Successive Metronome Marks</i>	218
<i>Accelerando or Ritardando controlled by Words Metronome marks and Slanting Horizontal Arrows</i>	219
<i>Accelerando or Rallentando Using Metronome Marks, Words and Proportional Spacing</i>	220
<i>Accelerando controlled by Metronome Marks and Horizontal Arrows</i>	220
<i>Accelerando or Ritardando controlled by Words and Slanting Horizontal Arrows</i>	220
<i>Accelerando or Ritardando controlled by Metronome Markings and Words</i>	220
<i>Accelerando and Ritardando : Further Procedures</i>	221
<i>Fluctuating Accelerando and Ritardando Controlled by Metronome Marks</i>	221
<i>Accelerando and Ritardando : Conflict of Changing Tempi within a Single bar</i>	222
As Fast As Possible	223
Unique Symbols within an Overlapping of Techniques	

Unique Symbols within an Overlapping of Techniques

Duration : Bowing : Repetition	223
<i>As Fast as Possible</i>	
<i>Contemporary Standard Symbols</i>	224
Fermata : Pause	225
<i>General Categories</i>	226
<i>Symbols for Definite Duration</i>	227
<i>Symbols for Indefinite Duration</i>	230
<i>Symbols for Indefinite/Definite Duration</i>	231
<i>(Individual symbols for various pauses and/or holds)</i>	
<i>Symbols for Indefinite Duration : (medium pauses and/or holds)</i>	233
<i>Symbols for Indefinite Duration : (short pauses and/or holds)</i>	233
<i>Symbols for Indefinite Duration : (variation of the same sign)</i>	235
<i>Comment : Fermata</i>	235
General Comment : Tempo	235
Chapter Six	
PITCH	237
Microtones : A Brief History	237
Microtonality in the Early 20th century	237
Tuning Systems in Western Music	240
<i>Contemporary Opinions on Tuning Systems and Microtonal Notation</i>	241
<i>Table 1 : Comparative Tuning Systems</i>	241
<i>Contemporary Opinions on Tuning Systems and Microtonal Notation</i>	242
<i>Views of Six contemporary Microtonal American Composers</i>	243
<i>Microtonal Notation in Selected Contemporary Quartets</i>	245
<i>Table 2 : 20th Century Microtonal Quartets : Chronological use</i>	246
<i>of New Notation</i>	
<i>Indefinite Pitch Adjustment</i>	251
<i>Comment</i>	252
<i>Table 3 : 1/4 Tone and 3/4 Tone Higher</i>	252
<i>Comment : Notation Sharpened Microtones</i>	254
<i>Table 4 : Modifications of Traditional Symbols</i>	254
<i>Comment</i>	255
<i>Table 5 : 1/4 Tone and 3/4 Tone Lower</i>	255
<i>Comment : Notation Flattened Microtones</i>	257
<i>Table 6 : Flattened Microtones</i>	257
<i>General Comment : Notation Inconsistencies</i>	257
Accidentals	259
<i>Altered Use in the Early Decades of the 20th Century</i>	259
<i>Dissolution of Harmonic Function and Contemporary use of Accidentals</i>	261
<i>Accidentals : Traditional affecting only Preceding Notes</i>	261
<i>Performance Notes : Are They Necessary ?</i>	261
<i>Performance Notes</i>	262
<i>Contemporary vs. Traditional : Adding and Cancelling Accidentals</i>	263
<i>Inconsistent use of Contemporary Principles in Cancelling Accidentals</i>	265
<i>Accidentals should not be rewritten for Repeated Notes unless one or</i>	266
<i>more Different Pitches Intervene</i>	
<i>Proliferation of Accidentals without Adhering to any Practice</i>	269
<i>In Spatial Notation the Accidental is often placed above the Note so as not</i>	270
<i>to Alter the Spatial Relationships</i>	
<i>New/Specific Symbols</i>	272
<i>Score Prefixed by Instructions</i>	274

Final Comment	274
Chapter Seven	
PITCH EXTENSIONS	277
Outer Boundaries of Pitch : Highest	277
<i>Highest Indefinite Pitch</i>	277
<i>Comment</i>	278
Glissandi and Portamenti	278
<i>Glissandi</i>	280
<i>Note-to Note Glissandi : Contemporary use in Different Combinations</i>	280
<i>Note to harmonic Glissando</i>	290
<i>Harmonic-to-harmonic Glissando</i>	291
<i>From a Note to a Small note-head</i>	294
<i>Note to Open-Ended Glissando</i>	295
<i>Open-Ended Glissando</i>	296
<i>Glissando Open-ended with Arrow</i>	297
<i>Contoured Glissando</i>	298
<i>Articulated/Chromatic Glissando</i>	306
<i>Glissando Col legno : tratto - battuto</i>	307
<i>Pizzicato Glissando</i>	310
<i>Double Stops Glissando</i>	314
<i>Triple Stops Glissando</i>	319
<i>Glissando Turning the Pegs</i>	320
<i>Use of Individual Symbols for Glissando and/or Special Effects</i>	322
<i>Composite Glissando</i>	331
<i>Final Comment</i>	333
Scordatura	335
<i>Definition and Application</i>	335
<i>Scordatura in String Quartets of 20th Century</i>	336
Comment	342
<i>Conclusions may be drawn as follows</i>	343
Chapter Eight	
RIGHT HAND TECHNIQUES	345
Expanding String Techniques and Notation	345
<i>Early String Playing</i>	345
<i>Idiomatic Compositions</i>	346
Contemporary String Playing	347
Right Hand Techniques : Bowing	349
Tone Colour	349
Sul Ponticello	349
<i>Bowing : On or Near the Bridge</i>	349
<i>New Notation</i>	349
<i>20th Century use of Sul Ponticello : Positions Around the Bridge</i>	350
<i>Traditional Sul Ponticello : 1900-1959</i>	350
<i>Pousseur : Qualitative Notation</i>	351
<i>Ponticello : New Sounds and Symbols</i>	359
<i>New Sounds Near and On the Bridge</i>	359
<i>Comment</i>	374
Contemporary Bowing Techniques and Symbols	376
Position of Bow - Modern Innovations	376
<i>Bowing : Behind the Bridge</i>	376
<i>Other Contemporary Bowing Positions</i>	382

<i>Bowing : in Relation to Tailpiece</i>	389
Style of Bowing	398
<i>Bowing : Pressure - Creating Noise Factor</i>	398
<i>Bowing : Transition - from One Manner of Playing to Another</i>	422
<i>Gradual Transition or Immediate Change</i>	422
<i>Bowing : Unusual Movements</i>	432
<i>Lachenmann : Unusual Bowing Movements and Holding Positions</i>	446
<i>Lachenmann : Unusual Bowing Movements : Graphic Direction : Irregular Motions</i>	450
<i>Bowing : Sul Tasto</i>	456
<i>Bowing : Sul Tasto : New Sounds and/or Symbols</i>	457
<i>Comment</i>	465
<i>Bowing Sul Tasto - 20th Century Composers</i>	465
<i>Percussive Effects</i>	466
<i>Penderecki : Threnody to the Victims of Hiroshima (1961)</i>	466
<i>Percussive Effects</i>	
<i>Use of Percussive Sounds : Early decades of 20th century</i>	467
<i>Percussive Sounds : Contemporary Extensions</i>	467
<i>Percussive Effects : Produced with the Bow</i>	468
<i>Percussive Effects : With Hands</i>	468
<i>Percussive Effects : Composite Sounds</i>	503
<i>Percussive Effects : Use of Unorthodox Items</i>	504
<i>Comment</i>	506
General Comment	507
Chapter Nine	
PIZZICATO	508
A Brief History	508
Contemporary use of Pizzicato : 1900 - 1950	509
<i>Table : Contemporary use of Pizzicato : 1900 - 1950</i>	509
<i>Bartók : Introduction of Percussive Pizzicati</i>	510
<i>New Technique : New Symbol</i>	
<i>Factors Common to Traditional and Contemporary Pizzicati</i>	512
<i>Traditional Execution</i>	512
<i>General Categories</i>	512
<i>Location : Contact Point</i>	512
<i>Traditional</i>	512
<i>Mode of Attack</i>	513
<i>Traditional</i>	513
<i>Direction</i>	513
<i>Traditional</i>	513
<i>Duration</i>	513
<i>Pizzicato : Contemporary Extensions</i>	513
<i>Pizzicato Mode of Attack : Bartók Snap</i>	514
<i>With Fingernail</i>	520
<i>Using a Plectrum</i>	523
<i>Left Hand</i>	530
<i>With Nut of Bow</i>	533
<i>New Symbols/New Notation</i>	537
<i>Pizzicato : Direction</i>	544
<i>Arpeggio</i>	544
<i>Direction and Mode of Attack</i>	545
<i>Direction and Tempo</i>	547
<i>Direction : Strumming Pizzicato Chords</i>	547
<i>Direction : Pizzicato - Alternating Arpeggios</i>	548
<i>Pizzicato Duration</i>	548

<i>Glissando : Portamento</i>	549
<i>Tremolo</i>	553
<i>Tremolo : Composite symbol - Combined with Glissando</i>	554
<i>Acciaccatura : Appoggiatura : Damping the Strings</i>	557
<i>Pizzicato : Contact Point</i>	560
<i>Behind the Bridge</i>	560
<i>Over the fingerboard</i>	564
<i>Pizzicato : Changing Positions</i>	567
<i>Pizzicato : Harmonics</i>	567
<i>Pizzicato : Highest Possible Note</i>	569
<i>Pizzicato : Unusual Aspects</i>	572
Comment	575
<i>Pizzicato : Mode of Attack :</i>	575
<i>Pizzicato : The Bartók Snap and Fingernail</i>	575
<i>Pizzicato : Bartók Snap : Original or Modified Symbols and Technique</i>	575
<i>Pizzicato : Bartók Snap : Modified Technique and/or New Symbol</i>	577
<i>Pizzicato : Bartók Snap : Two or Three Fingers</i>	577
<i>Pizzicato : Bartók Snap : in Glissando</i>	577
<i>Pizzicato : Bartók Snap and added Percussive Sound</i>	577
<i>Pizzicato : Bartók Snap in Proportional Notation</i>	578
<i>Pizzicato : Fingernail</i>	578
<i>List of Contemporary Innovations</i>	578
<i>'Buzz' or 'Rattling' Pizzicato</i>	578
<i>Pizzicato : all chitarra : alla mandolin - with/without Plectrum</i>	578
<i>Contemporary Scores : Pizzicato Arpeggio - Various Aspects</i>	579
<i>Pizzicato : Left Hand</i>	580
<i>Pizzicato/Arco : Simultaneous use</i>	580
<i>Pizzicato : With Nut of Bow</i>	580
<i>Pizzicato : Traditional Technique - New Symbol/New Notational System</i>	580
<i>Pizzicato : New Notation System and/or Modified Stave</i>	580
<i>Pizzicato : Within Proportional and/or Time Units</i>	581
<i>Pizzicato : Vertical Beaming or Horizontal Beaming</i>	581
<i>Direction</i>	
<i>Pizzicato Arpeggios</i>	581
<i>Pizzicato Arpeggio Chords Arrows</i>	581
<i>Pizzicato : Strumming</i>	582
<i>Duration</i>	582
<i>Pizzicato : Various aspects of Duration</i>	582
<i>Pizzicato : Tremolo</i>	582
<i>Pizzicato : Acciaccatura : Appoggiatura : Damping the Strings</i>	582
<i>Contact Point</i>	583
<i>Pizzicato : Behind Bridge</i>	583
<i>Pizzicato : Over Fingerboard</i>	583
<i>Pizzicato : Changing Positions</i>	583
<i>Pizzicato : Harmonics - Specific Sound</i>	583
<i>Pizzicato : Highest Possible Note/s</i>	584
<i>Unusual Aspects</i>	584
<i>Pizzicato : Repeated</i>	584
<i>Pizzicato : Beamed</i>	584
<i>Pizzicato : Aperiodic Sequences</i>	584
<i>Pizzicato : Quarter Tones/Microtones</i>	584
Comment	585
<i>Mode of Attack</i>	585
<i>Direction</i>	586
<i>Duration</i>	586
<i>Contact Points</i>	586

Chapter Ten	
REPETITION SIGNS	588
20th Century Innovations : Functions of Repeats	588
Repetition : New Signs and Indicators	591
<i>Repetition : Frame Notation</i>	591
<i>Repetition : Other Indicators</i>	600
<i>Modified use of Traditional Double Bars</i>	600
<i>Horizontal Arrows and Words</i>	604
<i>Graphic Arrows in Glissando</i>	605
<i>Dot Notation Analogous to Density</i>	606
<i>Series of Dots and Dashes</i>	607
<i>Wavy Lines</i>	607
<i>Composers Using Wavy Lines</i>	608
<i>Repeated Elements in Words</i>	608
<i>Controlled Elements : Legno Battuto</i>	609
<i>Repeated Headless Notes</i>	610
<i>Composer Using Controlled Repeated Headless Notes</i>	610
<i>Dots/Dots and Dashes</i>	611
<i>Extended Beam</i>	613
<i>Composers Using Controlled Elements : Extended Line</i>	614
<i>Miscellaneous</i>	616
Comment	622
<i>Repetition : Frames</i>	622
<i>Repetition : Modified use of Double Bars</i>	623
<i>Repetition : Use of Multiple Signs</i>	623
<i>Repetition : Arrows</i>	623
<i>Horizontal Arrows and Words</i>	623
<i>Graphic Arrows</i>	623
<i>Repetition : Words</i>	623
<i>Dots/Dashes</i>	624
<i>Repetition : Wavy Line</i>	624
<i>Repetition : Headless Notes</i>	624
<i>Repetition : Headless Notes Joined Through All Staves by Single</i>	624
<i>Vertical Lines</i>	
<i>Repetition : Beamed</i>	625
<i>Repetition : Extended Lines and Arrows to Following Line</i>	625
<i>Repetition : Traditional Notation - Inexact</i>	625
<i>Repetition : By Numbers</i>	625
<i>Repetition : Ritardando : Controlled Metronome Markings</i>	626
<i>Repetition : Obscure Instructions</i>	626
<i>Comment</i>	626
Chapter Eleven	627
STAVE	
From 9th Century - A Brief History	627
Clefs : Guido d'Arezzo (c995 - 1050)	629
The Stave - A 20th Century Approach	630
<i>Modification of Staves - post 1950</i>	633
<i>Standard Five-line Stave</i>	633
<i>Fragmented Stave</i>	634
<i>Composer using Fragmented Stave</i>	637
<i>Combination of Fragmented and Discontinued Staves : Theatrical Additions</i>	637

<i>Assortment of Staves</i>	638
<i>Composer Using Modified Tablature Notation</i>	642
<i>New Notation System</i>	644
<i>Radical Approach to Stave and Clef</i>	644
<i>Score Structure</i>	645
<i>Equitone</i>	649
<i>Graphic Notation</i>	652
<i>Individual Approach to Stave Modification</i>	653
<i>Individual Five-line Stave Above or Below : Different Functions</i>	655
<i>Additions to Five-line Stave : 1-5 Set System</i>	660
<i>Tablature Notation</i>	663
<i>Additional Five-line Stave : Double Stave Applying to Players</i>	664
<i>Additional Five-line Stave : Border Staves for Composer</i>	665
<i>Double Stave : Upper Stave Substitute Clef</i>	667
Comment	667
List of Stave and Clef Modifications : Post 1950s	668
<i>Fragmented Stave</i>	668
<i>Combination of Fragmented and Discontinued Staves : Theatrical Additions</i>	668
<i>Assortment of Staves</i>	668
<i>Single Line Staves : Linked to Selection of String Techniques</i>	669
<i>Converging into Single Five-Line Stave and Vice Versa</i>	669
<i>New Notation</i>	669
<i>Radical Approach to Stave and Clef</i>	669
<i>Equitone</i>	669
<i>Graphic Notation</i>	670
<i>Brief use of Additional Lines</i>	670
<i>Clarity</i>	670
<i>Action Outside String Playing</i>	670
<i>Additional Five-line Staves Above or Below</i>	670
<i>Relating to Right Hand and Left Hand Techniques</i>	670
<i>Relating to Pitch on Separate Strings</i>	670
<i>1-5 Set System</i>	670
<i>Relating to Composer and Players Respectively</i>	671
<i>Unique Bowing Symbols in Upper Set of Double Five-line Staves</i>	671
<i>Tablature or Modification of Tablature Notation</i>	671
Chapter Twelve	
VIBRATO	672
A Brief Discussion	672
<i>Vibrato : 18th & 19th Centuries</i>	672
<i>Vibrato : 20th Century</i>	673
<i>Written Instructions in the Score</i>	674
<i>Vibrato : Contemporary Usage and Notation</i>	676
<i>Vibrato : With Bow</i>	680
<i>Vibrato : 20th Century Categories</i>	680
<i>Vibrato : Written Speed Indicators - without Accompanying Symbols</i>	681
<i>Vibrato : Word/Initial Speed Indicators - without Accompanying Symbols</i>	682
<i>Vibrato : Wavy Symbol and Words</i>	682
<i>Vibrato : Symbol and Words</i>	682
<i>Vibrato Symbol - Indicating another Instruction</i>	682
<i>Vibrato : Various Widths of Wavy Symbol indicating Changing Speeds</i>	683
<i>Vibrato : Senza Vibrato - Throughout the Whole Score</i>	683

Comment	683
Chapter Thirteen	
SUMMARY AND CONCLUSION	685
Introduction	
Correlation Between Early Notation and 20th Century Usage	685
<i>Comment</i>	685
Notational Changes c1900 - 1990	686
Rhythm : Duration : Tempo	687
<i>Comment</i>	690
Pitch and Pitch Extensions	691
<i>Key Signatures : Accidentals : Staves and other Related Aspects</i>	691
<i>Comment</i>	691
<i>Pizzicato</i>	694
<i>Comment</i>	695
Modern Bowing Techniques	696
<i>Comment</i>	696
General Aspects of Notation	698
Concluding Comment	699
	700
BIBLIOGRAPHY	703
SCORES	710
SELECTIVE DISCOGRAPHY	717
20TH CENTURY COMPOSERS : CHRONOLOGICAL LIST	719
GLOSSARY OF CONTEMPORARY TERMS	721
Appendix One	
MUSIC IN THE TWENTIETH CENTURY - A BRIEF HISTORY	726

SUMMARY

This thesis sets out to investigate new notation symbols, systems, and string techniques in some one hundred 20th century string quartets, selected from a variety of composers. The analysis includes compositions that have, through contemporary aesthetic ideals, extended musical and technical resources and stimulated the development of compositional methods in such a way as to influence later works in the *genre*.

The thesis divided into two parts : History and Research

Part One is a brief history of 20th century music, and includes the development of the string quartet from earliest times up to the mid-century. Part Two researches string techniques and notation from the turn of the century up to 1990.

The historical perspective demonstrates that after World War II, with the emergence of the electronic age and a changing social and intellectual climate, traditional concepts were being challenged. Composers facing the dilemma affecting music in general, and the string quartet in particular, had to adapt to radically developing techniques and styles. Sounds and syntax of a different type were initially, but unsuccessfully, sought to unify the divergent thinking of the time. Ultimately, the developmental paths took shape from the problem itself and different approaches emerged to master the multi-faceted dimensions available to composers.

Part Two investigates music syntax from the viewpoint of recording new symbols, notation systems and string techniques. Quartets of the first half of the century show that both the dissolution and the extension of traditional processes were contained, importantly, within the continued use of conventional notation. The impact and significance of these quartets within the context of 20th century development cannot be ignored. However, the quartets researched post-1960 demonstrate that composers have enlarged all parameters of the *genre* through the extension of traditional resources and by radical innovation.

This research demonstrates that the emergence of new symbols and string techniques in the second half of the century has been largely on an arbitrary basis. Nevertheless, a broad classification of these elements is undertaken.

Key Terms :

Twentieth century : Contemporary composers : String Quartets : Music syntax : New notation systems : New symbols : Extension to - Rhythm ; Pitch ; *Timbre* : Contemporary bowing techniques Innovative use of staves and clefs.

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MOTIVATION

The early memories of my childhood were of a household filled with music. My love for classical music was nurtured in several ways by members of my family - many of whom were fine musicians. At an early age I began to play both the piano and violin. My interest in chamber music was developed when, while still at school, I participated in group playing - in string and piano trios, string quartets and in chamber orchestras. These activities continued after school when, as a student at the Royal College of Music, London, my horizons were greatly expanded with exposure to the concerts and recitals of international artists, including violinists such as Josef Szigeti, Yehudi Menuhin, Jascha Heifetz, Nathan Milstein and Isaac Stern.

Later, when studying for the final year of the B. Musicology degree at the University of South Africa, with the course structured on music developments of the 20th century and the changing sounds and 'styles' of music, I came across a remark on the harmonic definition of the first movement of Paul Hindemith's **Third String Quartet**, in Arnold Whittall's **Music Since the First World War** (London : J.M. Dent & Sons, Ltd., 1975, pp71-72) which stated :

The work begins with a *fugato* which can, in retrospect, be seen to hint a Fsharp at cadence points, but which, in its own terms (the terms imposed by the contradictory direction of the two phrases of the *fugato* theme itself), has no clear tonal centre at all.

This statement seemed contrary to the approach we had pursued in our B. Mus. studies and on investigating the harmonic structure of this movement further for my Hons. B. Musicology degree, I came to a different conclusion, based on the established premise that no matter how expanded and complex the harmonic material, composers in the early decades of the 20th century began to employ various compositional devices to determine tonality when functional harmony ceased to become the only determining tonal factor. Further, tonality does not exist as an absolute and through the application of a different 'set' of rules from those applied before the 20th century, clear directives emerged to determine the tonal centre of the opening *fugato* in question.

This study of a single movement of Paul Hindemith's **Third Quartet** was followed by a M. Musicology dissertation on **Twentieth Century Compositional Techniques In The String Quartets of Paul Hindemith (1895 - 1963)**, and thereafter my attention turned to the important and more recent developments in the string quartet post-1950. Various questions arose that constantly demanded answers.

- Just how were composers to reconcile the dichotomy of contemporary musical philosophies with the anachronism of composing for instruments refined to the highest point of development by the great string makers of Cremona, Italy, from c1600-1750?
- How too, were the developments in traditional notation to accommodate the wide spectrum of new sounds and techniques in the *genre* of the string quartet arising from the expanding possibilities in the emerging field of electronics?
- Would the contemporary composer's fascination with technique and compositional complexity in the years following the Second World-War to be so over-powering as to sweep aside all borders that had previously defined the *genre*?
- Would chamber music be recognized by musical material alone and be able to exist independent of the innovative aspects being sought to extend the parameters of the *genre*?
- Would the introduction of 'alien' sound and techniques precipitate a crisis in the *genre*?

Arising from my initial research and reading of the literature on contemporary developments post-World War 2, it seemed that a focus on developments in notation and string technique might provide some answers to the questions. The following are significant publications which have had an important bearing on my research :

- Cole, H. **Sounds and Signs, Aspects of Musical Notation**, London : Oxford University Press, 1974.
- **Interface, Journal of New Music Research**, editors Herman Sabbe, Kurt Stone *et al*, Amsterdam: Swets & Zeitlinger B.V., 1975.
- Karkoschka, Erhard. **Notation in New Music**, London :Universal Edition Ltd., 1972.
- Risatti, H. **New Music Vocabulary, A Guide to Notational Signs for Contemporary Music**, Urbana Chicago London: University of Illinois Press, 1975.
- Stone, K. **Music Notation in the Twentieth Century, A Practical Guide**, New York : W.W. Norton & Co., 1980.

- Mony, W.A. **Avant-Garde String Techniques : 1950-1975**. Unpublished Ph.D. Thesis, University of the Witwatersrand, Johannesburg, 1982. [The first important investigation of its kind in South Africa.]

This thesis does not set out to answer the questions set out above, but to demonstrate at the close of the century the means by which composers throughout the decades of the 20th century have come to terms with the problems encountered in composing music that could not be accommodated by, and that merited something more flexible than, the five-line stave, the use of clefs, accidentals, barlines, standard time signatures and chromatic accidentals.

Finally, on the complexity and variety of techniques and symbols found in the contemporary quartets under investigation, I endorse the words of the art historian Kenneth Clark, (1903-1983), who is quoted as saying that :

.... students could easily be interested in the art of their own time but that they would need a certain perspective if they were to unravel its puzzles.

(Secreste, M. **Kenneth Clark, A Biography**, London : Weidenfeld & Nicholson, 1984, p. 181)

FORMAT

The following brief explanations outline the structure of the thesis as a whole and are given in order to assist in understanding the approach to the investigation and to clarify various aspects of detail.

Part One - History : Part Two - Research

Part One is a brief history of 20th century music, and includes the development of the string quartet from earliest times up to the mid-century. Part Two researches string techniques and notation from the turn of the century up to 1990. The chapters follow a chronological development of the techniques under discussion and, in each, the examples maintain a similar descriptive pattern, namely, the composer, the score, date and the separate elements or technical features of the symbol for discussion. These are illustrated, explained and discussed briefly. The inferior reproductive quality of certain musical examples may be attributed to the poor condition of the originals.

Appendix 1 contains an extended discussion on the syntactical changes of music in the 20th century.

Scores :

Ninety primary string quartet scores, fifteen secondary scores as well as the two volumes of the Beethoven Piano Sonatas; a single volume of Mozart's last Ten String Quartets; Bach's Two and Three Part Inventions and the two volumes of his Preludes and Fugues for Pianoforte have been consulted.

The primary string quartet scores have been selected, firstly for their relevance to the music development in the first half of the century, and secondly for the significance of quartets, post the 1950s, in the research of 20th century techniques and new notation. For example :

- The Impressionistic Debussy, String Quartet, Op. 10, for the pivotal role it played between 19th century Romanticism and developments in the 20th century with the emphasis placed primarily on tone colour and harmonic instability.
- The six neo-Classical quartets of Bartók and Hindemith, respectively, which demonstrate that functional harmony ceased to be the only factor to determine tonality and that the traditional syntax of the past was undergoing a process of dissolution.

- The quartets of the Second-Viennese School of Schoenberg, Webern and Berg that present the lack of harmonic function and negation of chord progression through the use of the 12-tone method, and radically changed the fundamentals of 300 hundred years of western music.
- Cage's String Quartet in Four Parts (1949), for reflecting the elimination of purpose and arrival and for the *senza vibrato* stipulation - throughout the quartet - which added an innovative style of playing to the *genre*.
- The quartets post 1950 that incorporated new techniques, symbols and new notation systems. Certain scores of well-known contemporary composers such as those, amongst others, by Carter, Brown, Pousseur, Ligeti, Berio, Lutoslawski, Penderecki, Karkoschka, Henze, were singled out, initially, for the composers' known interests in extending the existing musical syntax through the exploration of new techniques and symbols and also by radical innovation in both disciplines.

The availability of other contemporary scores from the various publishing houses revealed a further selection of interesting works which are included in this investigation. However, the locating of these scores proved to be difficult.

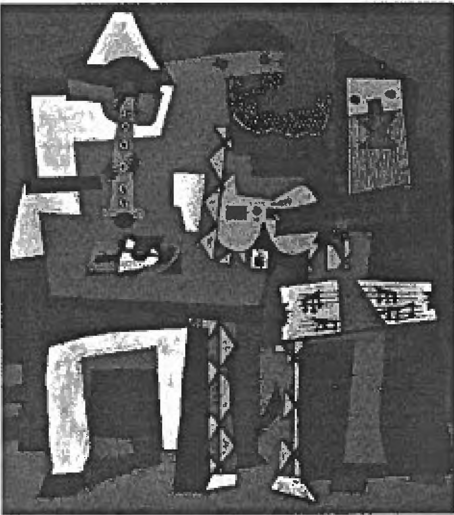
The secondary music scores were selected for their relevance to the sections dealing with both the historical aspects and contemporary developments of music in general.

Examples :

- The examples are set out in two formats, each designed to suit the respective illustrations and explanations.
- The examples are given as a 'reading' score where possible. However, in certain instances only the particular instrument illustrating the specific technique and the corresponding symbol is shown.
- Generally, each example represents a composer's specific notation for a particular technique and, as far as possible, no duplicate symbols are illustrated.
- Examples are reproduced from the original score in order to provide a comprehensive overall picture of the diversity of notation found in the *genre* of the 20th century string quartet.

- New symbols, for which computer software was not available, are hand reproduced from the scores or performance notes. The symbols from these two sources do not always correlate.
- Explanations of specific instructions and techniques are given as follows, firstly in the language as found in the score and secondly, where relevant, as the English translation which usually accompanies the score. Any inaccuracies of translations are given *verbatim* from the translation in the score. Direct quotes from the scores are always in 10 point size typeface.
- If a symbol is not readily detected in the given example, a large circle is drawn around the relevant symbol to clarify the technique under discussion.
- The instruments are named as described in the score *e.g.* either Violin 2, or Violin II.
- The word 'bar', when given in inverted commas, refers to those bars containing an irregular number of beats which do not subscribe to any metrical regularity of beats within the structure of the work as a whole.
- World War II refers to the war 1939-1945.

INTRODUCTION



*Pablo Picasso (1881 - 1973)
Three Musicians. 1921*

*Music was chaste and modest so long as
it was played on simpler instruments, but
since it has come to be played in a
variety of manners and confusedly, it has
lost the mode of gravity and virtue and
fallen almost to baseness.*

Boethius (c480 - 524)

INTRODUCTION

At the turn of the 19th century the world was left with a legacy of music that the writer Paul Henry Lang calls '.... fatigued romanticism.'¹

By the early decades of the 20th century, dynamic revisions of aesthetic ideals and technical resources emerged and continued into the second half of the 20th century to produce the most revolutionary period in the history of music. There exists today a plurality of many opposing conceptual musical developments, the extent of which have at no other time flourished so diversely side by side.

Broadly, they include:

- serial and aleatory music
- sound elements and silence
- traditional instruments and electronic instruments
- the continued use of tonality

These collective developments have extended the organised concepts of three hundred years of Western music - from the 16th - 19th centuries - far beyond the traditionally conceived syntax of harmony, melody, rhythm texture and structure. The musical material of the 20th century has produced new ideas with few, if any, precedents in the music of the past. During the early decades of the 20th century, composers' scepticism about the value and effectiveness of existing systems of the musical language in general, resulted in a proliferation of experimental ideas. Compelled to enlarge the sound spectrum and content in all parameters through the extension of traditional resources and by radical innovation, composers had to explore new techniques and notational symbols as the existing musical syntax failed not only to reflect current influences and changes and the circumstances that produced them, but also to incorporate the developing needs of ethnomusicologists and avant-garde composers. In the second half of the century the limitations of conventional notations became one of the main focuses of composers and players alike.

¹ Lang, P. H. Music in Western Civilisation. London: Dent, 1942, p. 960. (Hereafter, Lang, Western Music)

Part 1: Historical Perspective

1

MUSIC IN THE TWENTIETH CENTURY



Arnold Schoenberg (1874 - 1952)

*I am being forced in this direction I
am obeying an inner compulsion that is
stronger than any upbringing.*

Arnold Schoenberg

PART I: HISTORICAL PERSPECTIVE

Chapter One

MUSIC IN THE TWENTIETH CENTURY

A Brief History

Romanticism

The stylistic relationship that existed between Classicism and Romanticism continued as an organic and logical development from one period into the next, and differed in great contrast to the divergent styles that emerged in the music of the 20th century. Blume says:

The Romantic era never coined a divergent and independent style; ... it remodelled and developed the Classic style... Only in the fundamental unity of Classicism and Romanticism can be perceived the fundamental unity of the historical period that lasted from about the 1760's ... until the first decades of the 20th century. ²

During the latter half of the nineteenth century there were isolated stirrings of discontentment with Romanticism, but not until the early 1900s did the disillusionment with the ideals and characteristics of Romanticism become widespread which, when generalised, include the following:

- an interest in the strange and mysterious
- an emphasis on enthusiasm and emotion
- an emphasis on faith rather than on pure reason
- an emphasis on the idea of the artist as a genius set apart from the rest of society, rather than as a mere craftsman ³

In the early 1900s Man as a splendid creature who loved, suffered, struggled, triumphed gloriously over adversity and retained his nobility, even in defeat, was regarded with scepticism.⁴

² Blume, F., *Classic and Romantic Music: A Comprehensive Survey*. Translated by M.D.H. Norton, London: Faber, 1970, pp. 125, 130-131. (Hereafter, Blume, *Classic and Romantic*)

³ *The Open University, Romanticism*, Course 202 Units 33-34, Buckinghamshire: Re Open University p. 18. (Hereafter *Open University, Romanticism*)

⁴ *Funk and Wagnalls Standard Reference Encyclopedia* Ed. in Chief J.L. Morse Melbourne: Wilke and Co. Freud, Vol 11, p.3815.

The Austrian physician and founder of psychoanalysis, Sigmund Freud (1856-1939), created an entirely new approach to the understanding of human personality by his demonstration of the existence and force of the unconscious.

According to Freud's psychological theory, the 'splendid creature' was helpless on the clutch of his anxieties and subservient to the animalistic demands of his *id*. Thus shorn of his dignity and nobility, man was but a species of animal, with only the saving grace of intellect to recommend him. There was no place for subjectivity in the new thinking processes and objective evidence largely outweighed passionate, emotional openness, and for music to enter the mainstream of 20th century philosophies, it had to renounce Romantic ideals. The period of musical Romanticism was nearing its end. And, as always, when a period of art approaches its end, there are the symptoms : lassitude or exhaustion, and exaggeration.⁵

In 1914 Arnaldo Bonaventura said in his Introduction to the *Manuale di storia della musica* (1914): 'The study of the history of music, to be truly profitable, and successful, cannot remain isolated, but must be correlated with history in general, and the other arts in particular'⁶

At the beginning of the 20th century numerous composers - as well as thinkers in other art disciplines- questioned the fundamental art language of the West and experimented with many different innovations with a realisation that the continued use of redundant romantic techniques would lead only to stagnation. Artists and musicians thought alike, and members of *Der Blaue Reiter* group, such as the artist Russian/German Vasily Kandinsky (1866-1944) and contemporary musicians of the 2nd Viennese School - Arnold Schoenberg (1874-1951), his pupils Anton Webern (1883-1945) and Alban Berg (1885-1935), determined that the creative artist renounce personal gratification and devote himself to the expression of higher truths.

The predicament of where to go, and how to go on, forced the major composers in the first twenty-five years of the twentieth century to evolve styles and procedures that worked in different ways from those of the 18th and 19th centuries and thus express the 20th century idiom of meaningful music. These composers included, amongst others, Paul Hindemith (1895-1964), Béla Bartók (1881-1945), Igor Stravinsky (1881-1971) and Edgard Varèse (1883-1935), and the above mentioned members of the 2nd Viennese School.

⁵ Einstein, A. *Music the Romantic Era*, London: J.M. Dent and Sons Ltd., reprint 1978, p.360. (Hereafter, Einstein, *Romantic Era*)

⁶ Allen, W.D., *Philosophies of Music History*, A Study of General Histories of Music 1600-1900, New York: Dover Publications, Inc., 1962, p.135. (Hereafter, Allen, *Philosophies*)

Extension Process of Traditional Syntax

To understand the accelerating awareness of the limitations of the basic materials of Western music and its notation, post-World War II, it is important to explore the syntactical 'extension' process to music which took place in the early decades of the 20th century. These extensions, says the anthropologist Edward T. Hall in *Beyond Culture*, '.... often permit man to solve problems in satisfying ways, to evolve and adapt at great speed ... it permits man to examine and perfect that which is inside his head.'⁷

An examination of the developmental extensions to sound from the 19th century through to the last decades of this century will show that the systematic dissolution and decline of the traditional components - functional harmony; rhythm; *timbre*; texture and form of the language of music - led irrevocably to the emergence of a new approach to sound and silence.

Impressionism: neo-Classicism

Debussy: Stravinsky: Bartok: Hindemith

Debussy's Impressionistic approach to composition and the approaches of the neo-Classicians, Stravinsky, Bartók and Hindemith in particular, show a reorganisation of the elements of music to develop a language that extended tonality where '.... contemporary techniques represent additions to and expansions of previous practices and not replacements for them.'⁸ Thus the role of tonality changed radically in the 1920s, and its once dominant unifying force diminished. The many influences that led to the gradual weakening and breaking down of the major/minor tonal system manifests itself in various ways; some of which include:

- traditional syntax loosely applied
- revived emphasis on contrapuntal procedures resulting in a freedom in forming vertical and linear simultaneities
- contrasts between stability and tension obscured as the 'decorative' dissonances of previous centuries now became consonances
- the melodic line not controlled by harmonic chord functions
- each voice in a texture functioning without reference to other voices
- preference for the horizontal over the vertical resulting in a texture of dissonant counterpoint
- use of non-triadic structures

⁷ Hall, Edward T., *Beyond Culture*. 1st edition, Garden City, New York: Anchor Press, 1976, p.25. (Hereafter, Hall, *Beyond Culture*)

⁸ Dallin, *Techniques of Twentieth Century Composition*. Dubuque, Iowa: W.M.C. Brown Companies, 1964. 2nd Edition.p.14. (Hereafter, Dallin, *Techniques*)

Functional harmony ceased to be the only factor to determine tonality and there emerged a *dictum* that any pitch, chord or key structure could follow any other and the relatively predictable syntax of the past went through a process of dissolution.

12-Tone Method

Schoenberg: Webern: Berg

Schoenberg's 12-tone system probably had the greatest impact on musical organisation of all the 20th century innovations from 1920s up to the present time, as it constituted a basically new approach to composition. At first it attracted composers within Schoenberg's immediate sphere of influence - mainly Webern and Berg - and was, after 1945, to become the most important compositional technique used by younger composers who found it impossible to ignore, but almost invariably sought to adapt the 'method' to their own purposes. These adaptations of the late 1950s onwards led to the period known as Post-Serialist.

While the neo-Classicist's approach was to loosen the grip tonality held within the formal structure of a composition, Schoenberg's 12-tone revolutionary method arose from a situation in which tonal structures - the relationships between keys and the harmony which expressed them - no longer seemed to him to represent the living language of music. By 'rescuing' music from 19th century 'stagnation' in devising the 12-tone method, Schoenberg found that with the loss of tonality came the loss of the means through which musical forms were defined - tonality, modulation and resolution. The loss of this structural organisation remained a constant difficulty for Schoenberg as form was for him, basically, what it had been for the 19th century composers - an ideal set of proportions and shapes which transcended style and language. This later raised the critical disapproval of the post-war serialists, in particular Boulez, who remained ever critical that Schoenberg applied new rules to the construction of forms and textures in the old manner.

Naturally, conflicts arose particularly in the continuing analogous associations of the 12-tone method with 1st-movement-sonata-form. Any attempts to apply the tonal principles of this structure to the 12-tone method was severely criticised and justifiably seen, by Boulez, to be a self-destructive endeavour. Furthermore, Schoenberg's strongly held views about the lack of harmonic function and negation of chord progression in 12-tone music strengthened the futility of such an association when he wrote: '.... such progressions do not derive from roots, harmony is not under discussion and evaluation of structural functions cannot be considered. They are vertical projections of the basic set,

or parts of it, and their combination is justified by its logic,'⁹ - a principle that particularly negates the sonata-form structure. This denial of the principle of tonality is the quintessential difference between the musical philosophy of the neo-classicists and that of the serialists.

Futurism

Varèse

Varèse' music is characterised by its sound masses in which rhythm, *timbre*, and dynamic intensity are the focal points - the 'harmony' remains static and 'melody' has no traditional meaning. Whittall calls Varèse '.... a poet of the Wasteland, the pioneer who, of all modern masters, now seems most significantly to bridge the gap between Debussy and Stockhausen himself.'¹⁰ He comments further, '.... his ultimate pessimism reflect[ed] the turmoil and tragedy inherent in the civilised life during the first half of the century.'¹¹

The Avant-Garde

Boulez: Stockhausen: Cage

The post war *avant-garde* styles have only tenuous connections with historical precedents and, in some cases, depart radically from the basic concepts of the past. Electronic technology made available all manner of extraordinary, new and unfamiliar sound sources which gave rise to a range of compositional approaches; from the extremes of total organisation found in Boulez' Structures I to the opposing, unpredictable aleatoric writing of relaxed or relinquished control; of chance and random selection or of total non-intention as invoked in Cage's piano work 4'33". These post-war techniques radically changed the composer's role and thus redefined it, with the Europeans of the early 1950s (Boulez and Stockhausen in particular) and the American Cage (and his followers) playing a dynamic role in creating the far-reaching and rapid musical developments post 1945. Stockhausen learned from his experience with *musique concrète* that he would need means other than the mere transformation of electronic sound to develop a new musical architecture, without recourse to or the refashioning of the old. This demanded new material, and it was in the synthesis of electronic waves and sine tones that he found his way. His composition *Gesang der Jünglinge* (1956) was a solution to the particular problem of synthesising electronic and man made sounds, and in so doing he achieved a compelling unity of material and design that reflected the ideals of that time in music history.

⁹ Schoenberg, A., Structural Forms of Harmony, 2nd new ed., London: 1969, p.194. (Hereafter, Schoenberg, Forms)

¹⁰ Whittall, A. Music since the First World War, London: J.M. Deut & Sons, 1977, p.263. (Hereafter, Whittall, Music since)

¹¹ *Ibid.*, p. 263.

The categorising of 20th century techniques that are designated 'avant-garde', 'aleatory', 'experimental', 'post-serial' or 'minimalist', act only as signposts, as contemporary borders have become less defined and musical composition now exists in a vast multi-dimensional space of infinite possibilities. This plurality can be seen today to perpetuate the endeavours of the 1920s composers, who needed to create a 'new order' from the chaotic transition of the years between 1907-1923. Gutman wrote in 1930:

The bewildered musician was contracted with a complete chaos of voices. Each man shouted his own, deep, personal anguish into the world, and was astounded to hear how feebly his voice carried.¹²

Post 1945 Onwards

What were considered in the late 1940s and early 1950s to be the shared aims and objectives of post-war music developed by both the European and American composers, were in the 1960s soon discarded for a situation of differences and complexities of all kinds :

- density
- events
- relationships among the sounds of a composition
- successiveness and simultaneity
- interpretation
- exactness and ambiguity

Thus the sentiment expressed by Gutman, of the 1930s 'musicians' being 'confronted with a complete chaos of voices,'¹³ was again evident.

The extraordinary fact is, that in almost all instances (with the exception of Bartók's modified and new *timbral* symbols), the complexities of pre-electronic music were achieved with the use of conventional notation. However, inordinate and diverse developments were soon to create new and different problems - not only in the performance of music but in the need, as an urgent necessity, for a radically new approach to notational symbols to extend the sound possibilities opened up by electronic experimentation. In the 1960s composers were anxious to extend the parameters of sound, both electronically and on conventional instruments, and for the latter, they found many gifted performers willing to use their instruments in unprecedented ways. New instrumental techniques emerged and a large variety of new notational symbols unfolded to describe them. Included in these

¹² Gutman, H. Young Germany, 1930, in *Modern Music*, VII, No.2, 1930. p.3. (Hereafter, Gutman, *Modern Music*)

¹³ *Ibid.*, p3.

adaptations are the graphic notations of Feldman and Brown which were to loom significantly in the ensuing musical decades as notational inventions commanding widespread attention and support.

A whole new array of sounds, techniques and symbols confront musicians today and this thesis proposes to examine, in a selection of 20th century compositions in the *genre* of the string quartet, the resultant separate and individualistic characteristics that continue to transcend what are thought to be the limits of musical expression.

2

THE STRING QUARTET



Béla Bartók (1881 - 1945)

Chamber music has always, so far as the application of the musical elements is concerned, been the preferred medium for technical audacity.

Paul Hindemith

Chapter Two THE STRING QUARTET

A Brief History

Unity and Distinction

An investigation into the *genre* of the string quartet in the 20th century should include those works that extend musical resources and stimulate the development of methods of composition and aesthetic thought in such a way, that the consequences of the new techniques and new notations have an inspiring influence on later works. However, what unites and distinguishes the *genre* throughout the centuries must first be discussed, so as to adequately understand the gradual development from early chamber works, through compositions of the 18th and 19th centuries, to the radically changing syntax contained in the compositions of the 20th century. This approach is important for an understanding of the development of the personal styles that emerged within a given period, especially in the early decades of the 20th century, as these styles are of paramount importance to the composers post World War II. Any 'imitation' Bartók or Stravinsky, Schoenberg or Webern generated a musical reviewing and criticism, forcing composers along new roads, encouraging an open-minded attitude to sound and silence, and thus bringing about the discovery and development of a whole new musical syntax.

Origins of the String Quartet

Paul Griffiths comments in the Introduction to his book, *The String Quartet*, that to search for the origins of the string quartet is '...as vain as to search for the origins of man, and for similar reasons.'¹⁴ Apel also states that to try and place the beginnings of the string quartet in the 16th or early part of the 17th centuries is '... a misguided effort.'¹⁵ Certain sonatas by Alessandro Scarlatti (1659-1725) bear the description *per due violini, violetta, e violin-cello*, but Apel remarks further that the actual history '... does not begin much before 1750'¹⁶ despite earlier references to four stringed compositions, as for example that of the Italian singer and composer Gregorio Allegri (c1582-1652), composed as a chamber work ... with the designation "*duoi violini, alto e basso di viola*",¹⁷ which was reproduced by Athanasius Kircher in his *Musurgia* of 1650, an example of which appears below:

¹⁴ Griffiths, *The String Quartet*, Great Britain, Thames & Hudson, 1983, p. 7. (Hereafter, Griffiths, *The String Quartet*)

¹⁵ Apel, *Harvard*, p. 810.

¹⁶ *Ibid.*, p. 810.

¹⁷ *Ibid.*, p. 810.

Example 1. Early Composition for Four Stringed Instruments
 Allegri, 'duoi violini, alto e basso di viola' (1650 published)



It is generally accepted that the musical terminology of the Baroque and early Classical periods is both inaccurate and inconsistent and makes chamber music of this time impossible to define concisely. To appreciate the full achievement reached in the *genre* of the string quartet by the Classical Viennese composers - in particular Haydn, Mozart and Beethoven - it is necessary to have a brief look at the music itself, from the early part of the 18th century.

Trio Sonata - Italy and Germany

The trio-sonata, written for two melody instruments - usually violins, but sometimes flutes or oboes - and a harpsichord using a figured bass supported by a stringed bass, was the popular form of chamber music and flourished in Italy. Arcangelo Corelli (1653-1713), Pietro Antonio Locatelli (1695-1764), Tomaso Antonio Vitali (1663-1745) and Giovanni Legrenzi (1626-1690) all composed trio-sonatas with a composite structure of a sequence of dance movements loosely strung together in varying *tempi*, using a diverse combination of instruments. Gradually, with the encroachment of the newer *galant* style - the elegant style of the *rococo* - there emerged a pattern of three movements, two in fairly quick *tempo* flanking a slower one.

In Northern Germany the polyphonic combination of instruments forming the 'quartet sonata' was used by Georg Philipp Telemann (1681-1767), Johann Joachim Quantz (1697-1773) and their contemporaries on the principles of the trio-sonata. Regarded as genuine chamber music, this combination of instruments drew on the contrapuntal compositional skills of the composers of the period, however, the cello or gamba was irrevocably tied to the harpsichord *continuo* and therefore

never able to achieve complete freedom of line. While trio-sonatas continued to flourish, the development of idiomatic string-writing, incorporating double-stops and *pizzicato*, challenged the versatility of these compositions as they now could not comfortably continue to wear the all-purpose label - 'to be played or sung'. At the same time, other changes occurred. The gradual disappearance of the *basso continuo* - a method of indicating the accompanying part by the bass note only, with the chord structures shown below the stave as figures indicating the intervallic distance - and the fact that the harpsichord was falling out of favour, helped shape the development of the 18th century chamber music. In the *quatuors* of certain members of the Mannheim group, especially Johann Stamitz (1717-1757) and Franz Xaver Richter (1709-1789) a more 'democratic' style of part-writing was found with elaborate and lyrical lines for all the strings - the bass part in particular shows the cello conceived on terms with the other solo instruments, thus shaking itself loose from the *continuo*. This part-writing, in Richter's string *quatuors* in particular, looked ahead to the quartet writing practices of the later Classical period.

In Italy, the ensemble compositions of Luigi Boccherini's (1743-1805) *concertino a quattro* emerged with his characteristically *cantabile* melodies. Despite the interesting lines of the four parts, it was in Boccherini's inherent application of the *style galant* that these works proved to contain certain weaknesses. Generally, they displayed a lack of concentrated, unified development - whether of texture or content - and, there was a need for a continuous integration of the individual parts, as well as a concentration of ideas, to turn the transitional chamber music of the *divertimenti* into the pure concept of the *genre*.

String Quartet : Classical

Franz Josef Haydn (1732-1809) : Wolfgang Amadeus Mozart (1750-1791) :

Ludwig von Beethoven (1770-1827)

It was left to Franz Josef Haydn (1732-1809), initially, to develop the above characteristics of the *genre*. This was, however, not achieved immediately in his early chamber works which revealed a loose organization of the number of movements and a flexibility of titles used for the same composition. Hoboken shows that one of Haydn's early *divertimenti* existed in many contemporary copies, entitled variously *Divertimento*, *Gassatio* or *Cassatio*, *Quartett*, *Notturmo* and *Sonata*.¹⁸

¹⁸ Pauly, Reinhard, G., Music in the Classic Period, Englewood Cliffs, New Jersey: 2nd Edition, Prentice-Hall Inc., 1973, p. 142. (Hereafter, Pauly, Classic Period)

The earliest dated reference to string quartet playing is found in the autobiography of Carl Ditters von Dittersdorf (1739-99),¹⁹ while the quartets of the young Josef Haydn are said by an early biographer, Georg August Griesinger at the beginning of the 19th century, to have come about because of a chance occurrence. From this impetus, twelve *divertimenti a quattro* survive, probably composed in 1757-58.²⁰ An important compositional development in Haydn's early quartets was the differentiation made between the requirements for orchestral players and those needed for a small string group. The emphasis on intimacy and transparency, initiated by Haydn, and later extended by Mozart and Beethoven, transformed the early experimental pieces of the *genre* into works of the highest standard consistent with completeness in the Viennese Classical period. This they did by recognising the resources contained within the emotional and structural elements of such designs as 1st-movement-sonata-form, and by developing them, within the constraints of the *genre*, to an unequalled level of complexity. To many the Classical Viennese repertory represents the highest peak achieved in Chamber music, when composers wholly in tune with its ideals arguably entrusted their finest thoughts to the String Quartet. Yet the music of Haydn and Mozart in particular was, to a certain extent, dependent on the narrow limits of the tastes of polite circles. The political, philosophical and sociological developments at the end of the 18th century saw the uprising of 'man' whose broadening of thought brought, amongst other liberties, a new vigorous expression in art and literature. Beethoven was the first great composer to whom the limitless field of unconventional human emotion was opened up, and his temperament was ready for the opportunity to express this musically. In this sense, his later works became the prototype of 'modern' music, as he was the first exponent to expand, to the utmost, the liberty of expression and the breaking of all boundaries imposed on musical compositions of the period.

The nature and scope of the string quartets of Haydn, Mozart and Beethoven are such that eminent writers and musicologists throughout the centuries have dealt, at great length, with the profound and delicate moods expressed, the spontaneity of melodic line, the carefully planned structures, the high standard of workmanship, as well as the relationship of the individual to a world of order and system. Some sixty-four quartets span Haydn's entire creative life : from Op. 1 dated before 1759 to Op. 77 (1799), (with two movements, in Bb and d minor of an unfinished quartet Op. 103 (1803)). Mozart wrote twenty-three string quartets starting with K.80 (1770), ending with the last of the Three Prussian Quartets K599. In addition, K504 (1782) consists of six four-part Fugues by J.S. Bach arranged for string quartet and there is a 52-bar Adagio K546 (1788). Beethoven's total of sixteen string quartets comprise Six quartets Nos. 1-6: Op.18, (1798-1800); the Three Rasoumovskys. Nos.

¹⁹ Griffiths, The String Quartet, p. 9.

²⁰ Grout, Donald, Jay, A History of Western Music. London: J.M. Dent & Sons Ltd., reprinted, 1979, p.484. (Hereafter, Grout, History)

1-3 : Op.59, (1806) - dedicated to the Russian ambassador in Vienna who played the violin in his own quartet ; Op.74 (1809); Op. 95 (1810) to the last collection of five, including Op.135, (1826).

These works have been discussed from almost every possible point of view resulting in an expansive literature being at the disposal of a reader wishing to become involved in a detailed study of the quartets of this period.

String Quartet : 19th century - Romantic Period

Franz Schubert : (1797-1828) : Johannes Brahms : (1833-1897)

Felix Mendelssohn (1809-1847) : Robert Schumann (1810-1856)

A superficial glance at the Chamber Music of the Romantic period and the String Quartet *genre* in particular, shows that the style of chamber music was not congenial to the ideals of many Romantic composers as it lacked the intimate individual expressiveness of the piano solo or *lied*. Nor did the medium inspire mythological or historical associations that resulted in virtuoso orchestral compositions, embodying intensity of expression and harmonic colour, closely related to and inspired by 'programmatical' affiliations. This fact is borne out by the compositions of such composers as Berlioz (1803-1869) and Wagner (1813-1883) particularly, neither of whom contributed a chamber work. It was left to composers who had the closest affinity to the Classical tradition to write successfully in the *genre*. Schubert (1797-1828), in his harmonic boldness, subjective expression and fascination for instrumental tone colour, coupled to his use of forms perfected by the masters, is seen to occupy the transitional step between Romanticism and Classicism. He wrote fifteen string quartets with the early ones modelled after Mozart and Haydn. The later quartets : No. 13 a Minor Op. 29, (1824) (D.804), No. 14 d Minor Op. posth., (1824-26), (D810), and the last, composed two years later, No. 15 G Major Op. 161, (1826) (D.887), all combine the Schubertian characteristics of beautiful melodic lines, modulations, variation of thematic ideas and a wealth of harmonic invention, demonstrating that he was neither a faithful adherent of the classical heritage nor an avid devotee to the many musical characteristics displayed in the music of the 19th century. Schubert thus holds a unique place in the history of music of the time.

Brahms composed many string quartets before the relatively late publication of the two, four movement quartets of Op. 51 of 1873 : No. 1 c Minor and No. 2 a Minor, written eight years after the Trio Op. 40 for piano, violin and the Waldhorn (1865), with a third in Bb Major. Op. 67 appearing in 1876, the same year as the First Symphony. Of the fifteen quartets written, only these three remain extant. Brahms is the best example of the continuation of certain classical traditions within the

Romantic style, as he adapted classical forms to his individual style, not only in his chamber works, but also in his four symphonies, piano sonatas and concertos. He uses movement titles in the true classical tradition with such terms as *Allegro* and *Romanze*, respectively for the first and second movements of the Op. 51, No. 1, and *Andante Moderato* and *Quasi Minuetto* for the second and third movements of No. 2. Grout considers Brahms to be: ‘... the giant among composers of chamber music in the 19th century, the true successor of Beethoven in this field as in that of the Symphony.’²¹ However despite the contributions of Schubert and Brahms, and to a lesser extent those of Schumann (1810-1856) - whose three string quartets were written in the same year, 1842 - and Mendelssohn (1809-1847) whose output totalled seven in all, there was, for many reasons, a shift of emphasis away from the string quartet in the 19th century.

The 20th Century String Quartet

In the *New Grove*, Tilmouth writes:

The shift away from the string quartet in the 19th century has not been reversed in the 20th, but the medium has nevertheless continued to attract composers who have responded to the severity of its challenge²²

String Quartet 1900-1950

Systematic Dissolution and Decline of Traditional Syntax

The important and lasting element of the string quartet is the constant presence of the four instruments, resulting in a *genre* that has significantly challenged composers to write innovative and meaningful music throughout the centuries. This medium is one of the most difficult in which to work, as it lacks the advantage of the variation in sound colouring of the wind or percussion instruments. All skill and craft must be directed towards creating a work, using the basic components of melody or horizontal, the harmonic or vertical as well as the textural and rhythmic devices confined within the medium, to generate and sustain the composition into meaningful music. Paul Hindemith's (1895-1963) Six String Quartets, composed between 1919-1945, are a composite 20th century expression and extension of the true *genre*. He explains:

No wonder that chamber music has always, so far as the application of the musical elements is concerned, been the preferred medium for technical audacity²³

²¹ Grout, *History*, p. 574.

²² *New Grove*, *String Quartet*, p. 284.

²³ Hindemith, P., *A Composer's World: Horizons and Limitation*, Cambridge: Mass., 1957, p. 107. (Hereafter, Hindemith, *Composer's World*)

and of Bartók's Six Quartets composed between 1908-1939, Mosco Carner says:

The six quartets occupy a central position in Bartók's creative career each stands at the culmination of a different phase of Bartók's artistic growth, summing up the essential problems, tendencies, aspirations and characteristics of each stylistic stage.²⁴

Further, Matyas Seiber (1905-1960) writes that these quartets express the essence of Bartók's creation, as it is in the economy and clarity of detail and with greatest concentration that he 'utters his most important and profound thoughts.'²⁵

String Quartet

Early Decades of the 20th Century

The medium has, as previously stated, continued to attract composers in the 20th century, but contrary to Brahms' classical approach of restoring balance and clarity - largely through a return to 18th century ideals - many composers have rejected traditional models and sought to develop new sounds and forms in the *genre*. Quartets written between 1900-1945 (including that of Debussy) combine a new and expanded vocabulary contained within structures dependent on an architectonic combination of parts to form the whole. Some of the greatest quartets of Western music - those of Beethoven and Bartók in particular - represent the highest quality of architectural design, and the use of the more traditional designs continued into the first half of the 20th century.

The important development was the chromatic change in both melody and harmony which extended its function from a colour modification to diatonicism to its establishment as a tonal province in its own right. New and distinct paths emerged from, and also in opposition to, Romantic chromaticism. Carner, writing of the early development in 20th century harmony, observes two uses of the twelve semitones of the scale :²⁶

- **chromaticised diatonicism** where the chromatic notes form a type of major/minor scale but are still closely related to their respective diatonic types
- **diatonicised chromaticism** where the twelve semitones maintain certain tones as focal points as in the seven notes of the diatonic scale

²⁴ Carner, M., *Major and Minor*, London: Gerald Duckworth & Co., Ltd., 1980, p. 92.

²⁵ Seiber, Matyas, *Béla Bartók's Chamber Music*, in *Tempo*, Vol. 13, 1949, p. 20. (Hereafter, Seiber, *Bartók Chamber Music*)

²⁶ Carner, M., *A Study of Twentieth Century Harmony* (Counterpoint and Harmony) 2nd. ed., London: Joseph Williams Ltd., 1942, pp. 69-72. (Hereafter, Carner, *Study*)

added to which is a third which bore no relationship to tonal chromaticism

- the 12-tone row of the chromatic scale

The most significant composers of the *genre* fall into two distinct categories :

- Bartók and Hindemith (and to a lesser extent Prokofiev and Shostakovich)
 - diatonicised chromaticism
- Schoenberg, Webern and Berg - 12-tone row

These compositional styles had a profound effect on the use of key signatures and the traditional functions of all accidentals, with the double sharps and flats being abandoned altogether.

Early 20th Century Compositional Innovations

France: Claude Debussy (1862-1918)

Thematic Metamorphosis : Kaleidoscopic Textural Changes : Polytonality

Debussy's single quartet in g Minor Op. 10 (1893), with the concept of thematic metamorphoses and kaleidoscopic changes of textures, stands on the dividing line between the concepts and ideals of Romantic expression - where the *genre* found little scope for expansion - and those of the 20th century neo-Classical style of Hindemith and Bartók, the 12-tone method of Schoenberg and Berg and the pointillistic idiom of Webern.

Darius Milhaud (1892-1974) fell in with a young group of six composers including Poulenc (1899-1963) and Honegger (1892-1955) who, in the 1920s, were christened *Les Six*. He turned away from Impressionism early in his career and his eighteen quartets, written between 1912-1951, contain many compositional practices peculiar to the 20th century - one such device is polytonality found in the String Quartet No. 12, Movement 2 : Theme. Others include the use of the Lydian sharpened fourth within a passage of (A) in the slow movement and in the final cadence a clash of major and minor thirds. String quartets stand at the centre of Milhaud's chamber music output and the fourteenth and fifteenth quartets, completed in 1949, mark an innovative compositional approach in that each separate quartet is thematically independent of the other and has its own distinctive moods and textures, yet played simultaneously, they form an octet. In the earlier Third String Quartet Milhaud added a soprano voice to the two-movement work using verses in memory of the poet Leo Latil.

The *genre* of the string quartet was not particularly strongly represented in France in the early decades of this century. A single quartet each from Ravel and Debussy provided a development which incorporated kaleidoscopic changes of texture and a pursuit of expressiveness. It was Milhaud, however, who contributed significantly to the *genre*, but generally, French composers had not the

intense interest in these compositions as shown, for example, by the composers of Germany or some of the other European countries, represented, particularly in the former by the members of the Second Viennese School, Schoenberg, Webern and Berg and the neo-Classicist Paul Hindemith, and in the latter, by the Hungarian Béla Bartók.

Germany: Schoenberg - Webern - Berg - Hindemith

Arnold Schoenberg (1874-1951) : 12-tone Method and Inclusion of Soprano Voice

The development of Schoenberg's 12-tone method emerged initially in his String Quartet No. 2, Op.10 (1907-8). It was his first venture into atonality, in direct contrast to the neo-classical style of his contemporary Hindemith. In the two final movements of this quartet Schoenberg introduces a soprano voice singing the words of two of Stefan George's poems from *Das Buch der hängenden Gärten*, (*The Book of the Hanging Garden*). The third movement begins with an atonal slow entry described by Schoenberg as being chosen in variation-form lest '.... the dramatic emotionality of the poem might cause me to surpass the borderline of what should be admitted to chamber music.'²⁷ The impact of this quartet has been long lasting and has influenced many modern composers, such as the British composer Brian Ferneyhough (b 1943 -), who has composed three string quartets : Sonatas for String Quartet (1967), String Quartet No.2 (1980) and Adagissimo for String Quartet (1983), and who said in conversation with the freelance writer and music critic, Paul Griffiths: 'My central interests begin again with early Schoenberg. The Second Quartet, for instance, seems one of the century's masterpieces'²⁸ Schoenberg composed four quartets - the last No. 4 Op. 37 was written in 1936 and published in 1939 - but it was in the No. 3 Op. 30 (1927) that the 12-tone system was clarified in his quartet writing. In the matter of extending the sound fabric of music, Schoenberg arrived at innovative symbols to indicate equally new techniques (*sprechstimme* - a cross added through the middle of a stemmed note (✱) in the work *Pierre Lunaire* (1912) for solo voice and five performers (clarinet, bass clarinet, violin, viola and cello)). The result is a flexible, weirdly effective vocal line, sung in strict rhythm with instructions to rise and fall from the pitched note immediately after sounding. The same symbol was used again almost half a century later by Boulez in *Le marteau sans maître* (1952-1954) - scored for contralto voice and a small ensemble of the vibraphone, the xyloimba and percussion instruments.

In the String Quartet No.3 (1927) Schoenberg arrived at another new symbol to effect a concept that had long been in practise in chamber music - that of the important balancing of parts between the

²⁷ Griffiths, *String Quartet*, p. 163.

²⁸ Griffiths, P., *New Sounds, New Personalities, British composers of the 1980s in conversation with Paul Griffiths*, London and Boston: Faber & Faber, Ltd., 1985, p. 81. (Hereafter, Griffiths, *British composers in conversation*)

players, which had long depended on the interpretative skills of the performers. Schoenberg chose not to leave this interpretative aspect to chance and notated the score with signs clearly indicating which player had the principal part (or *Hauptstimme*) and which the secondary part (or *Nebenstimme*). These he marked with an (H) and a (N) respectively.

Comment

Schoenberg's addition of a soprano voice, within the concept of the string quartet, was most revolutionary and bore no relationship to the symphonic precedents of Beethoven and Mahler. Significantly, however, within the traditional structure of string quartet writing, the role of the four players is essentially one of balance and unified ensemble work and the addition of a solo soprano line, as used in the Second Quartet, almost relegates the string players to the role of accompanists. This seems to negate the very fabric of the ideals of the *genre*.

Alban Berg (1885-1935): Romantic Expressionist : 12-tone Method and Tonal Associations

Berg, in contrast to either Schoenberg's or Webern's application of the 12-tone method, sought to develop the system in the direction of Romantic expression. Berg's early quartet, Op. 3 (1910), shows an ambiguity of key that is native to Berg's thinking. In the Lyric Suite, for string quartet (1927), there is brief evidence that Berg inherited his Art world from German Romanticism and his dodecahonic writings tend to incorporate tonal elements into the 12-tone language where the row is such that traditional harmonies can be employed with triadic possibilities. There is agreement that the Sixth movement of 'The Suite' introduces Wagner's Tristan chord progression. It is little wonder, then, that Berg was thought of as being the Romanticist among the Expressionists.

Anton von Webern (1883-1945): Pointillist and Extreme Economist

In contrast to Berg's 'tonally' perceived 12-tone relationships, Webern's music is characteristically tenuous, abstract and timeless - pointillistic in conception - with an avoidance of all triadic chords, scale formations and cadential bass successions of fourths and fifths. He mostly avoided whole-tone groupings, and in his late compositions, for example in the String Quartet Op.28 (1938), his interest in early polyphony shows the use of brief, simple rhythmic cells derived from number proportions - here a 2:1 relationship. The basic intervals of semi-tones, expanded to major 7^{ths} and minor 9^{ths}, are shown in the following example (bars 51-54): Example 2.

Example 2. Semitones expanded to major 7^{ths} and minor 9^{ths}
 Webern, String Quartet Op.28 (1938)

The image shows a musical score for a string quartet, consisting of four staves. The tempo is marked as $\text{♩} = 56$. The score is in a key with one flat (B-flat). The dynamics range from *f* (forte) to *pp* (pianissimo). The notation includes various note values, rests, and articulation marks such as slurs and accents. The score is labeled 'String quartet' on the left side.

Webern's style evolved toward an ideal of utmost purity and economy with all repetition of material suppressed. He cut himself off completely from tonal music and never accepted, as did Berg and latterly Schoenberg, that 'atonal' and tonal elements could co-exist. The Classical and Romantic use of thematic development, with material built on characteristic motives in a statement-counter statement relationship, or the clarity of phrase and periodic structures, as in the quartets of Haydn Mozart and Beethoven, were to Webern's compositional philosophies quite obsolete. He wrote: '... once stated, the theme expresses all it has to say it must be followed by something fresh.'²⁹ True to this dictum, Webern's music deliberately covers a limited field with an entire work derived from a minimum amount of material. Two sets of pieces for string quartet - Op. 5 (1909) and Op. 9 (1913) reflect this characteristic, with Op. 5 having one hundred and thirty five bars, and the second totalling fifty six bars with a performance time of about five minutes. The movements of each piece hardly extend beyond ten bars in duration.

In an entry under **Webern**, the **Grove Supplementary Volume** (1945) comments that in October 1922, Erwin Stein pointed out in The Chesterian - with regard to the work No. 4 Five Orchestral Pieces, Op.10 (1913), scored for celeste, harp, side-drum, solo-violin and solo-violola (both muted) and consisting of only six bars : '... the disintegration of melody, harmony, rhythm and tone -colour begun by Debussy is here carried to its extreme. Beyond this point, if not at this point, music ceases to exist.'³⁰ It begins with '*pp*' and dies away to '*ppp*'.

Webern's music was designed to achieve coherence and homogeneity and to obtain the greatest possible unity by totally rejecting tonal references. This is clearly evident in his works for the string quartet.

²⁹ Machlis, Contemporary Music, p. 271.

³⁰ Grove's Dictionary of Music and Musicians, ed. H.C. Colles, London: Macmillan and Co., Ltd., Fourth Edition, 1945, Supplementary Vol. p. 667. (Hereafter, Grove 4)

Paul Hindemith (1895-1963): neo-Classicist - Expanded Tonality

Hindemith in his early career was counted among the foremost of the *avant-garde* composers in Germany. He brought the changing styles of the early decades of the 20th century to the string quartet, initially, with the dramatic and purely musical aspects of his Expressionist chamber work - the String Quartet No. 2. Op. 21 (1921). It was presented at the Donaueschingen Summer Festival, a gathering organised annually between 1921-1926 as a festival of chamber music for young composers. Hindemith led the excitement through the presentation of a work that used both fiercely energetic rhythms and a language harmonically advanced in its use of dissonance. The music of this quartet reflected the cultural atmosphere in post-war Germany (1914-1918) which strongly favoured brittle, sardonic, parodistic art works; and the early quartets particularly embodied the experimental spirit that flourished under the Weimar Republic because of the technical audacity displayed in what was then, an essentially conservative *genre*. The Third String Quartet (1923) followed a year later and emerged as shifting, angular, irregular and unpredictable but this period was short-lived, and with the need for greater discipline and objectivity, Hindemith returned in the Fourth String Quartet (1924) to the aesthetic values of the High Baroque. It was after the publication of the first four quartets that Fraser (1929) considered Hindemith had made his 'peculiar' and important contribution to contemporary musical history through his ability to do what no other composer had up to that time been able to do to - reach the spirit of Bach and Handel.³¹ But despite this return to neo-Classic-neo-Baroque ideals, Hindemith boldly sets out the elements of 20th century syntax.

- rejection of functional harmony and the development of expanded tonality which includes the use of the twelve semitones of the scale in a dissonant texture fluctuating freely on and around the tonality defining key-notes
- areas of tonal ambiguity
- interplay of keys within a movement that use tonal relationships between any one tone of the scale to any other
- use of non-triadic structures that create sections of indeterminate tonality
- alternation of sections of tonal clarity with those of tonal ambiguity
- preference for the horizontal over the vertical resulting in a texture of dissonant counterpoint emphasising the individuality of the line in contrapuntal combinations
- the use of vertical simultaneities that depart from the triadic structures so fundamental to the harmonic content of previous periods
- the freeing of the melodic line from harmonic associations

³¹ Fraser, A., Paul Hindemith. Music and Letters, X, No. 2., 1929. (Hereafter, Fraser, Music and Letters)

- the absence of harmonic or tonal unity as a unifying factor is replaced instead with the use of rhythmic patterns and linear emphasis of melodic line as integrative aspects

‘Tonality in the 20th century does not exist as an absolute and ‘twentieth-century music makes use of many degrees of tonality and employs many means for establishing them’.³²

Comment

Hindemith’s fundamental approach to tonality in his six string quartets contains some the essential differences that define the two major schools in the first half of the 20th century - dodecaphony and neo-Classicism. The latter, in its broadest meaning, implied a rejection of the 12-tone technique and a new and radical approach about music of the past. The craft that Hindemith displays in the six quartets can be seen basically to stem from a central determination to free the notes of the ‘existing’ musical scale from their traditional association, and by examining their acoustical relationships, formulate a different use for them.

Hindemith’s rhythmic syntax was equally different from that of previous times but, although he often injected a motoric energy into his music, he did not, as Bartók had done, draw his inspiration from folk rhythms and as a result Bartók’s use of new notational groupings and the inclusion of new string techniques was more significant than Hindemith’s. However, to underestimate Hindemith’s contribution to the re-construction of music from the early 1900s to post-War (1945) would be to deny the importance of neo-Classicism in the early decades of the 20th century.

Europe

Hungary: Béla Bartók: (1881-1945): Reconciliation of Folk and Contemporary Practices

The most prominent European composer of string quartets is Béla Bartók. He wrote six quartets that spanned his entire creative life - from No. 1 (1909) to No. 6 (1939). He died in 1945. These chamber works cover almost every important stage of Bartók's mature working life and his quartets continue the Beethovenian tradition of intellectual concentration. Milton Babbitt writes: ‘... there is, throughout, a single conceptual attitude and, from the second quartet on, a personal sound is present, through which this conception is disclosed.’³³ Most importantly, what emerges is the combining of all the important 20th century ideals of Bartók’s personal expression with the influences of folk-music,

³² Persichetti, V., *Twentieth Century Harmony, Creative Aspects and Practice*, Faber and Faber, London, p. 248. (Hereafter, Persichetti, *Harmony*)

³³ Babbitt, Milton, *The String Quartets of Bartók*, in *Musical Quarterly*, vol., XXXV, 1949, p. 377. (Hereafter Babbitt, *Bartók*)

felt even in his most abstract works, often in an indirect and sublimated way - but always present. In them the fundamental musical demands of the epoch are presented in such a way as to '.... emphasiz[e] the impossibility of divorcing the qualitative aspect of the musical achievement from its strategic aspect.'³⁴ Babbitt goes on to say that it is in this respect that Bartók's music is so completely of its time, and achieves a '.... contemporaneity far transcending mere consideration of style and form.'³⁵

Bartók's quartets were not widely played in his lifetime but now enjoy an undisputed place in the repertory of every professional quartet.

Within the scope of the present discussion, a detailed analysis of Bartók's quartet writing is not practicable. It is only possible to hint at the most salient factors contained in the works. The use of new string techniques and a new way of notating time signatures are described in the following examples, Examples 3 and 4. The investigation into extended aspects of Bartók's notation is given later in the relevant sections of Part II.

Example 3. Metric complexities
Bartók, Quartet No. 5 (1943), Mov. III, bars 1 - 4



Note : This movement contains an essay in the 'Bulgarian' rhythms frequently used by Bartók .

- the asymmetrical organisation of the ($\frac{9}{8}$) time signature is arranged in the following sub-division: $(4 + \frac{2}{8} + 3)$
- and is heard at the outset of the movement in the *Scherzo* theme stated initially by the second violin.

The Trio that follows is marked with a time signature:

- $(3 + \frac{2}{8} + 2 + 3)$

alternating with further changes marked

³⁴ Babbitt, Bartók, p. 377.
³⁵ *Ibid.*, p.377.

- $(^2 + \frac{3}{8} + ^2 + ^3)$ and $(^3 + \frac{2}{8} + ^2 + ^3)$

based on the total of (10/♩) per grouping, thus injecting a new form of pulsating, rhythmic dynamism into the music of the *genre*.

Example 4. Innovative *pizz.*

Bartók, Quartet No. 4 (1928), Mov. IV, bars 76 and 80

Note : This movement is played *pizzicato* using all kinds of effects specifically marked with instructions such as:

- chords to be played ‘*arpeggio*’ only when marked, ‘*arp.*’ -
- *pizzicato* is done with double stoppings
in unbroken chords (*non. arp. sul pont.*)
in guitar-like repetitive chord strummings

Bartók’s innovative ‘snap’ and fingernail and all other *pizzicati*, as well as other selected techniques and symbols, are explained and illustrated fully in the relevant sections dealing with 20th century notation and techniques.

There is a firm consensus that Quartet No. 6, (1939) contains the consummation of Bartók’s music. Helm calls it ‘.... the crowning glory of the quartets and the apotheosis of what has gone before one of the most moving commentaries on our century so far.’³⁶

³⁶ Helm, E., *The Music of Béla Bartók*, ed. H. Harog, in *European Music in the 20th Century*, London: 1957, p.31. (Hereafter, Helm, Bartók)

Comment

There is an abundance of published, detailed writings and analysis of the Bartók quartets but the purpose of this discussion is to pinpoint the new and innovative techniques of string quartet playing and the dissolution of the conventions of functional harmony. No mention is made, for example, of the large scale ‘arch’ design that Bartók often used, or the fugal textures in dissonant counterpoint. One of his important contributions to the early decades of the 20th century was the loosening of the conventions contained within the major and minor system, which contributed so strongly to the restructuring of musical syntax in the early decades of the 20th century. On this point Bartók wrote:

The ultimate goal of our strivings is indeed the unlimited and complete exploration of all possible available tonal material. But of course certain connections of these (constant) chords, particularly progressions suggesting the tonic-dominant relation, are utterly contrary to the music of to-day.³⁷

This goal is clearly shown in his quartet writings in which he demonstrates the possibility of a coherent order of both diatonic melody and freely chromatic harmony and an acute awareness of *timbre*. In the use of the following elements, Bartók created a musical syntax of vital force and of important aesthetic significance:

- polymodality
- whole-tone scalic structure
- polytonality
- linear cadence
- dissonant harmony

virtuoso use of :

- double stoppings
- tremolos
- double stops *glissandi*
- hammered chords

Many of the innovative procedures described in the preceding pages culminated in Bartók’s assimilation of the influences of south eastern European folk music into 20th century compositional

³⁷ Bartók, B., *Das Problem der neuen Musik*, in *Melos* 1, 1920, p. 107.

- asymmetrical formations
- repeated notes
- passages of alternating complex rhythms
- free use of modes which centred his music around rather than in a tonality
- borrowed characteristics from peasant instruments such as the use of bass drones
- a new dissonant concept in the use of pedal points that both contradict, define and bind the harmonic structures of the movements.

The quartets display a wholly 20th century concept of expanded tonality in the lack of dependence on the major/minor key system - not suggesting atonality or keylessness, but rather, the use of a series of new structures which demonstrate clearly that the old harmonic relationships are no longer binding.

Bartók's quartets are profoundly contrapuntal in the 20th century sense, in that the melodies are not supported by a chord structure of tonality but are dependent on an interaction and simultaneity of voices. This creates a type of linear counterpoint which is often responsible for determining the tonal centres. In the use of modes Bartók weakens the functional dependency of the harmonic dominance of the tonic/dominant.

The resultant syntactical compositional material used in Bartók's quartets runs parallel to that previously listed on Hindemith's quartet writings and relates specifically to the creating of chamber works in a tonal language of great flexibility based, in the broadest sense, on both the reinforcement and contradiction of traditional principles.

Many diverse elements and techniques are incorporated into Bartók's quartet writings, and it is in his particular use of primitivism and intellectualism that he took '..... the ultimate step from Nationalism to the universal.'³⁸

England

In the years before the Second World War (1939-1945), English composers Hubert Parry (1848-1918) and Charles Villiers Stanford (1852-1924) kept romantic techniques alive with little reference to chamber music, and for composers such as Ralph Vaughan Williams (1872-1958) and Frederick Delius (1862-1934), quartet writing, in particular, was a *genre* that did not lend itself to either the

³⁸ Machlis, Contemporary Music, p. 189.

to chamber music, and for composers such as Ralph Vaughan Williams (1872-1958) and Frederick Delius (1862-1934), quartet writing, in particular, was a *genre* that did not lend itself to either the romantic or nationalistic characteristics that dominated English compositions of the early decades of the 20th century. Similarly, Edward Elgar (1857-1934) wrote just a single quartet, Op. 83 in 1918. It was only after the 1930s that English composers turned to the string quartet, with Lennox Berkley's (1903-1989) first work in the *genre* appearing in 1935. The more significant post-war quartets of Benjamin Britten (1913-1976), Michael Tippett (1905-1998), Richard Rodney Bennett (1936-), Gordon Crosse (1937-) and Brian Ferneyhough (1943-), and the respective changes in string techniques and notational symbols will be discussed later under the relevant headings.

America

Charles Ives (1874 - 1954): Radical thinker

The American Charles Edward Ives (1874-1954) was the most radical composer of his time and his writings were contrary to those of his contemporaries. His style was neither that of the German tradition of composers who had studied in Europe, nor that of those emigrants to America who composed in the styles of nationalistic romanticism. Ives wrote two string quartets, No. 1 (1896) and No. 2 (1907-13), and he stands revealed today as the first truly American composer and is considered to be an original spirit of his time. This is shown by the fact that when Schoenberg was still writing in a post-Wagnerian manner and Bartók and Hindemith had only just been born, Ives had found a way to compose in such concepts as polytonality, atonality, cluster chords, polyrhythms and also in quarter-tones. He also integrated well-known American tunes into his works.

Earle Brown says Ives was one of the first composers 'whose musical imagination and conception seriously fought against the inadequacies of the standard notation,'³⁹ and Cowell points out that his whole approach to complex rhythms should be understood as 'an attempt to persuade players away from the strait-jacket of regular beats, with which complete exactness is impossible anyhow'⁴⁰ Ives often expressed regret at having to write out a piece at all, since its rhythm would then be hopelessly crystallised.

Ives was an adventurous composer and fought battles against the musical society of the day with an iconoclastic approach to music in general and to the string quartet in particular. This was most evident in his Second String Quartet which he started to compose around 1905 and which pre-dates the early

³⁹ Brown, E., Notation and Performance of New Music, in The Music Quarterly, 1986, p. 186. (Hereafter, Brown, Notation)

⁴⁰ *Ibid.*, p. 186.

Stravinsky composition, Three Pieces for Strings, by about nine years. In short, this quartet was not a string quartet at all in the true sense of the *genre* for many reasons. Ives dichotomously states that the several short movements are '.... related only by contrasts.'⁴¹ The fact that the first and second movements are marked 'Discussions' and 'Arguments' respectively, suggests a reinforcement of his intent.

Ives ceaselessly probed into different aspects of music and this meant that single-handed he discovered many of the paths to be subsequently explored by composers of both the generation following him and those of the present day *avant-garde*. Some of these innovations are discussed below :

Example 5. Inclusion of Popular Tune Against Dissonant Counterpoint
Ives, Quartet No. 2 (1907-1913), Tune - Dixieland , by Emmett Mov. 1, bars 60-61

The image shows a musical score for four staves. The first staff is marked with a box containing '60' and the instruction 'accel. più mosso'. The second staff has 'pp' and 'Solo' markings. The third staff has 'ff' marking. The music features complex rhythmic patterns and dissonant counterpoint.

Note : The dissonant counterpoint between Violin 1 & 2 and Cello is heard against an early popular American tune - Dixieland by D. Emmett - in the viola part. The vitality of these folk tunes appealed to Ives and he included many quotations of songs in his works. Example5.

Ives' Rhythmic Approach

The following example, Example 6, demonstrates Henry Cowell's earlier point that Ives' whole approach to complex rhythms should be understood as '.... an attempt to persuade players away from the straight-jacket of regular beats, with which complete exactness is impossible anyhow'⁴²

⁴¹ Griffiths, The String Quartet, p. 207.

⁴² Brown, Notation, p. 186.

Example 6. Linear Independence of Parts
 Ives, Quartet No. 2 (1907-10), Mov. 1, bars 79-82

The image shows a musical score for four staves, likely representing different instruments in a quartet. The score is characterized by complex polyrhythmic patterns, with various note values and rests. A box labeled '80' is positioned above the first staff, indicating the starting point of the example. The notation includes various rhythmic markings such as accents and slurs, and the overall texture is dense and intricate.

Note: The simultaneous use of many rhythmic beats results in a linear independence of the parts. Ives' childhood impressions of many bands playing together possibly encouraged him to experiment with polyrhythms. On this point John Cage has written : '.... one [of the things that interest me] is what I like to call the mud of Ives',⁴³ and by this he meant the super-imposition of many lines into a complex sound of which the details are not easily discernible or even perhaps easily decipherable. Numerous examples of Cage's observations regarding many lines of complex sound are found in the second quartet. Example 6.

Descriptive titles

Ives' penchant for using words to indicate what he required in a composition echoed the descriptive pieces of the French composer Eric Satie (1866-1925), who used such titles as: *Aperçus désagréable*: (Disagreeable remarks (1908-1912)); and *Véritable préludes flasques (pour un chien)*: Truly floppy preludes (for a dog) (1912).

Ives has the unusual instruction at the end of movement 2, of the Second Quartet (1907-1913), *Andante con scratchy* (as in tuning up), and finishes the movement with another descriptive request! *Allegro con fistiswatto* (as a K.O.) , and adds, further, to a *con fuoco* request the words (all mad).

⁴³ Cage, John, A Year from Monday, Calder and Bayers, 1968, p. 42. (Hereafter, Cage, A Year from Monday)

Comment

Ives' quartet music was totally unknown until the middle of this century - his String Quartet No. 2 was only published in 1954, some forty years after it was completed - thus his influence on music in the early decades of this century has been limited. But, considering Ives' isolation from the main developments in Western Music, it is interesting to note that he evolved many techniques subsequently used by composers in the second half of this century. Stockhausen, in the electronic composition *Hymnen* (1967), extends Ives' use of tunes within a composition and introduces anthems collected from the world, subjecting them to manipulation before combining them into a composite whole. Although this process may not be directly influenced by Ives, it may be said of the further developments of the *avant-garde* composers in the second half of this century: 'What was possible in a culture that lacked a tradition has now become possible in Europe with its centuries-old tradition - but fifty years later.'⁴⁴

Henry Cowell (1897 - 1965) : Experimentalism

Cowell was another radical thinker who belonged to that group of composers in the early decades of this century who were termed, either in approval or disapproval, as having an experimentalistic approach to composition. In the early 1920s his piano works attracted attention for having exploited the concept of clusters of notes played together with either the fist, forearm or palm, as in The Tides of Manuanuan (1912). He introduced other extra-ordinary techniques such as plucking, beating or brushing the inside of the piano in such pieces as the Aeolian Harp (1923) and the Banshee (1925). It is, therefore, of little surprise that when he turned to string quartet writing he did not seek inspiration and guidance from across the Atlantic but was influenced, rather, by what was around him. He spent his boyhood in the American West, around San Francisco, and was exposed to traditional music, American and Asian, that permanently influenced him. He was particularly interested in the sounds of the Far East, and his music was a palette where any resource, any experiment, in both exotic and ethnic traditions were all part of his musical canvas. Cowell was certainly an innovator in musical composition and with his early 'Mosaic' String Quartet of 1934, he is credited with the earliest example of 20th century indeterminacy. His influence on subsequent American composers - especially Cage - found favour with those who sought to question accepted ideas about music traditions, and his early experiment of so-called 'open' form is an anticipation of the musical explorations which were to later become widespread in all works, including string quartets, but only after the 1950s.

⁴⁴ Bray, *Units*, 23 - 25, p. 101

Additional American composers of Early 20th Century String Quartets

String quartet composers in the United States after World War I and before World War II include : Ernest Bloch (1880-1959) who wrote five: Samuel Barber (1910-1981) two, in an essentially diatonic style: Walter Piston (1894-1976) and Roy Harris (1898-1979) both composed three containing energetic rhythms, as well as strongly syncopated and harshly dissonant passages firmly based in tonality, but without any innovations of new string techniques or symbols.

Comment

Chamber works play a vital and significant role in the music of the post 1940 decades, and American quartet composers were to demonstrate the speed with which new ideas were developed in the *genre*, which encompassed music of no single style or characteristic, and embraced a whole new attitude to compositional techniques and notational representation.

Russia : Arts and The Central Committee

Shostakovich (1906-1975) and Prokofiev (1891-1953)

The most prolific composers of quartet music in the Soviet Union were Dimitri Shostakovich (1906 - 1975) and, to a lesser extent, his compatriot Serge Prokofiev (1891-1953), both of whom belonged to the first generation of artists who grew up under the Soviet regime resulting from the Bolshevik Revolution of 1917. The younger composer, in particular, was a product of Soviet training and was 'encouraged' to compose in the manner exhorted by the members of the Central Committee who, after a conference in January 1948, expected '.... composers to find the strength to choose the proper road to overcome as quickly as possible the lag from which you are suffering and to develop into a glorious cohort of Soviet composers who will be the pride of the entire nation.'⁴⁵ The term 'lag' was used to reprimand Soviet composers for being susceptible to the influences of Western music which was considered by the regime to be inimical to socialist art. It's creed dictated as alien the notion that any individual artist created as a form of self-expression , and such 'indulgent' pursuits were aligned to *bourgeois* formalism! It is, therefore, against this background of the Stalinist period and the subsequent continuing bureaucratic control that the musical development of Russian composers must be understood.

⁴⁵ Machlis, *Contemporary Music*, p.233.

Shostakovich : (1906-1976)

Shostakovich wrote fifteen string quartets: the first Op. 49 (1938) and the last Op.144 (1974), and of these Dr. J. Drury comments in the *Ars Nova* music magazine: 'Shostakovich's dilemma was that, while he always desired to be a good communist and a useful and patriotic Russian citizen, he was by inclination an individualist and intellectual.'⁴⁶ The solution for his compositional problems, according to Drury, was to cultivate three styles or three categories with 'different functional styles which were to some extent cultivated simultaneously, and which are the direct result of Shostakovich's dilemma in soviet society.'⁴⁷ Starting with the String Quartet No. 2 Op. 68 (1944), Drury writes: it is in the 'serious, private and later primarily chamber style,'⁴⁸ which marked Shostakovich's 'third period' as a composer, that his quartets of the last thirty years of his life can be placed. Generally these works disclose a Classical clarity of form, a mildly dissonant style rooted in tonality, and certain of the earlier quartets (Nos. 5-9 and 11) are played without a break with the separate stages playing an important part in underlying the structural unity. Of the use of the 12-tone method in the Twelfth Quartet Op.133 of 1968, Drury discusses it as being 'transitory, fleeting gestures which alternate with longer and more triadically-organized, or tonal sections.'⁴⁹

Comment

Taking into account the political climate in which Shostakovich lived, one may ask if it is possible to say that he found a way of merging the best of traditional procedures with innovative processes to create meaningful and interesting music? Drury says: 'In my opinion these string quartets are the most profound and most musically, structurally and technically potent of all of Shostakovich's numerous works.'⁵⁰ However, within the context of this discussion on the development of the *genre* and the important shaping of new parameters, might it be permissible to suggest that the political climate of the composer's lifetime prevented him from writing music generally and string quartets in particular, that encompassed the radical thinking of either his European or American contemporaries?

⁴⁶ Drury, J. Shostakovich's three styles: one solution to a 20th Century Composer's Place in Society, in *Ars Nova* Journal of the Department of Musicology, University of South Africa, Pretoria: 1983, p. 6. (Hereafter Drury, *Ars Nova*)

⁴⁷ *Ibid.*, p. 7.

⁴⁸ *Ibid.*, p. 7.

⁴⁹ *Ibid.*, p. 9.

⁵⁰ *Ibid.*, p. 8.

Prokofiev : (1891-1953)

For twelve years, from 1918 to 1934, Prokofiev lived out of Russia, spending ten of these years in Paris. Due, in part, to his long residence abroad he was often accused by the Central Committee of the Communist Party, along with other contemporary composers of the time, of writing degenerate Western music.

In the quartet *genre*, Prokofiev wrote two string quartets: No. 1 Op. 50 (1930) and No.2 Op. 92 (1942). The last work, in particular, contains characteristics that influenced Bartók's writings - folk melodies, both quoted and suggested and combined with 20th century techniques, the simultaneous use of major and minor scales, chromatically conceived melodies in expanded tonality and the presence of pungent dissonances. This combination of folk idiom and contemporary techniques gave a fresh sound to his music. Given the constraints placed on his compositional expansion within the Soviet doctrine, and in the context of this investigation, the observation is that the syntax of the *genre*, as in the Shostakovich works, lacks the radical developments that occurred freely in America and Europe at that time.

Comment

Despite Prokofiev's difficulties with the doctrine of socialist realism, he appears to have remained faithful to its creed. He wrote the following lines a year before his death : '.... the composer..... is in duty bound to serve man, the people He must be a citizen first and foremost, so that his art may consciously extol human life.'⁵¹ The fact that he placed the notion of loyalty to the State above all else, and bound the composer's creativity to a secondary duty of serving the masses, places into historical perspective the fact that his musical language was explicitly controlled by the overall concepts of Art, as dictated by Russian policy of that time. It is little wonder then, that his quartets have made scant impact on the syntactical expansion of the *genre* in the 20th century.

Stravinsky : (1882-1971)

Earlier than the quartet works of either Prokofiev or Shostakovich, Igor Stravinsky's first 'string quartet' Three Pieces for String Quartet (1914), emerged from the period of his sensational ballet compositions written between 1910-1914, which include The Firebird (1910); Petrushka (1911); and

⁵¹ Machlis, Contemporary Music, p 221.

The Rite of Spring (1913). On the style and structure of the quartet, Griffiths remarks : ‘ for the first time in the history of the *genre*, [this work] is determinedly not a ‘string quartet’ but a set of pieces to be played by four strings,’⁵² as there is no acknowledgement to a tradition or form, but, ‘ only seems iconoclastic because of our own experience of the *genre*'s traditions.’⁵³ However, this statement may be true only in retrospect as the quartet displayed the very antithesis of the basic definition of the *genre* of the time, which still retained in the early decades of the 20th century the concept of a ‘dialogue’ between four instruments with subtleties of blend and texture. By contrast to the iconoclastic works of Schoenberg and Webern, this work is completely fragmented. With each instrument sounding for itself there are no avenues to connect it to the quartet tradition. This is clearly seen in the instrumentation where for example :

- the viola held ‘D’ is sustained throughout the movement, and
- there is a repeated pattern in the cello part
- with both the first and second violins restricted to a range of a perfect fourth
- creating a static harmonic effect

Comment

Griffiths observes again: ‘ the fact that the outstanding composer of the twentieth century could treat the ensemble as something totally new or totally dead is one symptom of the revolution in musical composition around the time of the First World War.’⁵⁴ And indeed at that time the development of music, and the string quartet in particular, displayed a lack of continuity about a past and any assurance about the course of composition in future works. Unlike Bartók, who emphatically believed that the *genre* of the string quartet had a vital part to play in the music of the 20th century, for Stravinsky the quartet had no future. In 1924 George Dyson, the English composer, wrote of the second of Stravinsky’s Three Pieces: ‘ If this type of passage has any proper place in the art of the string quartet, then the end is near.’⁵⁵ What Dyson was referring to, was the extraordinary manner in which the second violinist and the viola player had to hold their instruments - reversed like cellos - a reversal of position that was to be frequently found in the string quartets post 1960. Stravinsky’s next excursion into the *genre* appeared thirty years later when the four strings are drawn out of the orchestra to play the prelude to the graveyard scene in the opera The Rake’s Progress (1947-1951). A further excursion into the string quartet is found in the short epitaph composed on the death of the Welsh poet Dylan Thomas (1914-1953), In Memoriam Dylan Thomas (1954), which accompanies the tenor voice.

⁵² Griffiths, The String Quartet, p. 170.

⁵³ *Ibid.*, p. 170.

⁵⁴ *Ibid.*, p. 171.

⁵⁵ Kemp, New Grove, p. 285.

If musical thought and practice in any age does not pursue the element which introduces new parameters to musical composition, then the stimulus to all artistic creation and all aesthetic response will, in the end, fall into meaningless repetition, clever or deliberate *pastiche*, and become inevitably the devices by which a culture destroys itself and ensures its levelling down to nothingness. In retrospect, it could be argued that Stravinsky sought to find a new approach to quartet writing by composing instinctively, free of the traditions that encompassed other composers of this period. He expressed his attitude to music in the following words : ‘... Rhythm and motion, not the element of feeling, are the foundations of musical art’,⁵⁶ and having said this, it is not surprising that the *genre* of the string quartet was unsuited to Stravinsky’s musical philosophies in those early years of the 20th century.

Comment : Neo-classicism : Serialism

In the early decades of this century, the quartets of such composers as Schoenberg, Webern, Berg, Hindemith and Bartók, and to a lesser extent those of Ives and Stravinsky brought to a close an era in which the music of the *genre* contained new compositional techniques. What emerged was a diverse selection of styles, aesthetics, and a variety of techniques that were in considerable contrast. Two main streams of composition developed : Neo-classicism and Serialism, with the above mentioned composers dedicating their efforts in one way or another between the ‘camps’ of either tonality or atonality and all, with the exception of Ives and Stravinsky (in his early quartet), falling broadly into either one or the other. The music of other composers in different parts of Europe, in Russia and in America, as discussed earlier, is not significantly innovative to be of mention in this closing comment.

Generally, the compositional methods of either tonality or atonality and metric rhythm were all accommodated by traditional concepts of form and generally identifiable as a coherent extension of the distinguishing aspects of the *genre*. Tonal compositional structures extended syntax beyond the vertical identification of chords in third construction, with the emphasis placed on the interacting horizontal lines, dissonant counterpoint and a contrapuntal texture, thus creating a totally new 20th century sound. Of the quartets of Hindemith and Bartók it is often ‘ ... impossible to determine whether harmony functions as a causative or resultant effect’⁵⁷ - an important factor in the resolve to loosen the effects of functional harmony. In the quartets discussed up to this point, a limited number of new string techniques and new symbols emerged, as well as Stravinsky’s unusual requirement of reversing the playing position of the upper strings.

⁵⁶ Macchiis, *Contemporary Music*, p. 173.

⁵⁷ Graves, William, L. Jr. *Twentieth Century Fugue: A Handbook*. Washington, D.C.: The Catholic University of America Press, 1962, p.39. (Hereafter, Graves, *Fugue*)

The effects of the 'method' used in the quartet writings of Schoenberg, Webern and Berg were far reaching. Rooted in the principle of the 'row', it is then not surprising that, based on such a radically new concept of composition, these quartets represent a total shift away from the syntax by which the *genre* had been previously identifiable. This resulted in chamber works that were innovative in the most shattering sense. The inclusion of either a soprano voice to Schoenberg's Second Quartet ; or Webern's extension of the principle of the 'row' to include *timbre* ; or his aphoristic approach of total economy resulting in a pointillistic texture ; or Berg's unity of atonality and tonality, are all important innovations within the *genre*. However, the most significant factor is the adoption of the particular method of composition which resulted in music that represented, at that time, the greatest possible shift away from the developmental path of the *genre* of previous centuries. It can be rightly said that the disclosure of Schoenberg's 12-tone method was: ' more than a unique eruptive phenomenon: [it] dislocated music from all its strata, and with [its] appearance a new geological formation took place.'⁵⁸ In the context of the string quartet, serialism proposed such a radical change in the traditional concept of the *genre*, as a style of composition at that time, that it was completely irreconcilable with the neo-Classical traditions as found in the works of Bartók and Hindemith.

Boulez' states critically in an essay of 1948, that 'Messian does not compose - he juxtaposes' and admonishes Bartók for having a rhythmic scale 'much simpler and more traditional' than that of the Rite of Spring ; Schoenberg and Berg are criticised because they 'remain attached to the classical bar and the old idea of rhythm ; and Varèse 'for spiriting away the whole problem of technique [:] a facile solution which solves nothing' and even Webern - whom Boulez considered to be the reference point of modernism - was admonished for 'his attachment to rhythmic tradition'.⁵⁹

The important factor is, however, that history compels artists to move in a certain direction at a certain time. Without the dissolution of traditional musical syntax and string techniques contained in the remoulding process of quartets in the early decades of this century, the subsequent developments in syntax might not have taken the trends they did in the latter half of the century. Their impact and significance, either at the time of composition or within the context of 20th century development, cannot be ignored.

Thus, the developments of music in the second half of the century demanded to be expressed in a different way and the notational symbols were being stretched to the limit of their representational possibilities. The electronic and atomic ages and the social and intellectual climate after World War

⁵⁸ Mitchell, D., Language of Modern Music, 1966, p.60.

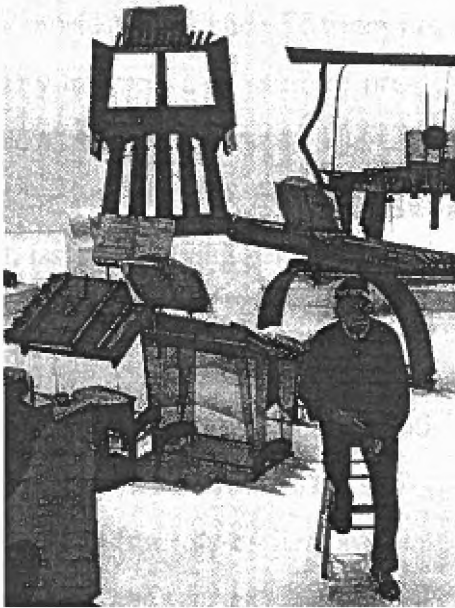
⁵⁹ Boulez, Proposals, Stocktakings from an Apprentice, Oxford, 1991

It challenged traditional concepts - as had serialism in the early decades of the century - and sounds and syntax of a different type were sought to unify the divergent thinking of the composers of the second half of the century. For many musicians of the post-war period there existed an immense field of unexplored sound that lay outside the boundaries of conventional musical syntax. Yet in the 1950s the confrontation between serialism and non-serialism continued and was further divided between those who sought a more ascetic language in the form of Webern's approach, while others preferred to unite new compositional methods with traditional language - as Berg had done. From the 1960s composers were forced to develop the art of string quartet writing in different ways, and what emerged broke away from the paths of pre-war music, with some composers, such as Boulez, demanding that music 'begin' again. For these composers every element of the language had to be re-examined and the resultant syntax was aimed at eradicating any suggestion of previous musical usage.

Just how composers, post 1945, realized changing attitudes in the *genre* of the string quartet will be examined in later chapters.

3

NOTATION



Harry Partch (1901 - 1974)

An integrated notation involves much more than merely inventing it : that would be easy, but to make it immediately comprehensible and translatable into physical acts is another thing.

Harry Partch

Chapter Three

NOTATION

Modification : Continuity : Change : A Chronological Perspective.

The appropriateness of a notational system has nothing to do with the completeness, incompleteness, or the amount of detail shown. It can only be determined in terms of the performer's ability to interpret it.⁵⁹

A History of Notation - A History of Music

Notation is not the music itself and no notational system provides a totally unambiguous summary of the final musical experience. With any notation, some license may always be necessary or desirable to accurately interpret a measure of pre-determined compositional requirements that are deemed appropriate at any given instance. These fragile issues cannot be successfully accomplished without some creative interpretative freedom, and must principally represent and reflect the divergent, yet consistent, issues involving period and style.

The history of notation is well documented and this is not the place to discuss Western notational developments in detail, but a brief mention of the main changes provides a chronological link between early notation and that of the second half of the 20th century while, at the same time, showing that notation has from its earliest systems, proceeded from vague and inexact symbols through ceaseless renewal and constant change to ever clearer and more exact representation of the composer's intent, only to disintegrate again in the post-war period into notational representation of certain inexactitudes. An investigation of the stages of notation demonstrates, amongst other aspects, the importance of recognising that the varying systems provide an insight into the style and structure of the history of music itself, and specific notational symbols of any one particular period present '.... in all its various stages the perfect expression of the music it represents.'⁶⁰ This premise holds true from the early neumatic representational signs of Gregorian chant and the Dasian signs from c 900 to the equally unfamiliar notation of the latter half of the 20th century.

⁵⁹ Cole, H., *Sounds and Signs, Aspects of Musical Notation*, London: Oxford University Press, 1974, p. 16. (Hereafter, Cole, *Sounds and Signs*)

⁶⁰ Apel, W., *The notation of polyphonic music 900 - 1600*, Medieval Academy of America, Cambridge, Mass. 1951, p. 86. (Hereafter, Apel, *Notation 900 - 1600*)

A brief examination of the history of notation shows that relative instability has occurred throughout the centuries whenever notation has been inadequate to express the ideas and aspirations of composers seeking to introduce innovative techniques which were not integral factors in 'given' and 'inherited' practices. Thus the nature of symbolic representation in music has always concerned itself with notation that extends musical sound possibilities. Prior to 1600 the many approaches to notating the composers' intentions were very different from those we think of as the 19th century ideal.

Problems of editing Mediaeval and Early Renaissance Music

In the chapter dealing with Medieval and Early Renaissance Music up to 1450, John Caldwell comments that 'Medieval music presents the severest problems to the editor.'⁶¹ A legible transcription into modern notation necessarily results in an appearance totally at variance with that of the original source. He points out further, that any attempt by the editor to match the note-values of the sources, especially in the earlier part of the period, would be wholly misplaced as 'modern longs, breves, semibreves and minims do not even have the merit of looking like their forebears of the thirteenth and fourteenth centuries, and the numerous ligatures have no modern equivalent at all.'⁶²

The historical tendency in the Middle Ages was for note-values to get smaller and smaller, and on this point he explains that the difference between the time-values of French notation and those of the 14th century Italian system lay in the value attached to the minim. In French notation a uniform value was placed on the minim throughout the range of available meters, whereas in the Italian system there was a peculiarity whereby 'a breve might contain four, six, eight, nine or twelve minims.'⁶³

In the 15th century there was a gradual slowing down of the beat and shorter note values appeared. Symbols resembling the semiquaver (♩) (*fusa*) and the demisemiquaver (♪) (*semifusa*) were found. Also a change from filled-in to hollow notes appeared with symbols smaller than a minim still notated in black, but with one less crook than in previous use. The sequence of notes from the larger to the shorter values found around c1450-c1630 were used as follows:

breve	(♩)	:	semibreve	(♩)	:	minima	(♩)
seminima	(♩)	:	fusa	:	:	semifusa	(♩)

The important change was the discarding of the original extra crook of each of the last three notes. Gradually rounded notation superseded the diamond shaped 'heads'.

⁶¹ Caldwell, J., *Editing Early Music*. Oxford: Clarendon Press, 1985, p.13. (Hereafter, Caldwell, *Editing Early Music*)

⁶² *Ibid.*, p. 13.

⁶³ *Ibid.*, p. 13.

Rests

The importance of rests was known to Greek theorists and various signs were used to describe both short and varying degrees of long rests.

- the indivisible short rest was notated (λ) and called a Lambda
- the long ones were notated as follows :

two times: ($\overline{\lambda}$) three times: ($\overline{\overline{\lambda}}$) five times: ($\overline{\overline{\overline{\lambda}}}$)⁶⁴

Neume notation appears to have had no rest signs but there is not absolute clarity about this supposition. In the older notation of the Troubadours and Minnesingers, rest signs are mostly lacking and have to be filled in according to the meter of the poem. The use of rests dates from the invention of 'measured' music where notes were composed in definite and proportionate values and necessitated the inclusion of rests.⁶⁵ Apel comments that the rests are the surest and most valuable aid in recognising the mensuration.

In earlier times the *cantus* was sung either without pauses or with only slight breaks when necessary for the separation of the sentences in the text. In part music, rests were indispensable and with the consistent use of mensural notation, symbols were devised to correspond with the respective notes values. Initially the four rests were symbolised as follows:

a = *pausa longa imperfecta*

b = *pausa longa perfecta*

c = *pausa*

d = *semipausa*

⁶⁴ Reiman, *Dictionary*, p. 648.

⁶⁵ Apel, *Notation 900-1600*, p. 347.

When the minim came into use there was confusion as to just how it should be notated since the *pausa*, *semipausa* and the equivalent of the minim had to be placed in the same space, but in such a way that the distinction was clearly shown. It was later determined that the minim be distinguished from the other two rests by using one-third of the space as opposed to that of the *semipausa* which was allocated two-thirds. Later, Philipp de Vitry (c1290-1361) proposed that the minim rest ON the line. Signs equivalent to the *semiminima*, the *fusa* and the *semifusa* were added. Two rests, the *semipausa* and *suspirium*, have remained in use until the present and are in fact those of the semibreve and minim respectively, albeit slightly increased in size. Two of the longer rests are also found in standard notation, the *pausa* or *breve* denotes a two bar silence and occasionally a four bar pause is notated with the sign of the *longa imperfecta*. Riemann explains the when the change to white notes occurred in the 14th century, 'an unpleasant contradiction was discovered between notes and rests - (quavers with single tail, quaver rests with double tails, and so on),⁶⁶ resulting in a reversal of tails for the smaller values and so giving rise to the signs now in use.

It is shown in a later section - Rhythm - that in contemporary proportional rhythmic notation, rests are abandoned.

Interpretative Confusion : Uncertainty

A Need for Explanatory Notes in 14th and 20th Centuries

Today, for purposes of analysis and performance, it is convenient to modernise early notations and express them in our present terms of interpretation, but the compositional intentions of these early systems still remain a matter of musicological conjecture in areas of precise stylistic requirements and in the important need for performance flexibility. Earle Brown suggests that the performance results from original notation are not so radically different from those of standard notation, but that the current '.... imposition of standard "fixtures", such as metric durations, barlines, and precise pitch tends to ignore the aural tradition and nature of performing [and that] other evidence tends to attach a rigidity of image which is an aural conditioning and performance standard, acquired only since about 1800.'⁶⁷

Notation has been a constant difficulty and frustration to composers throughout the ages, and continues to be so today because of its relatively inefficient and incomplete transcription of what Earle Brown calls '.... the infinite totality which a composer traditionally "hears".'⁶⁸ He says further,

⁶⁶ Riemann, *Dictionary*, p. 648.

⁶⁷ Brown, E., *Notation and Performance of New Music*, in *The Music Quarterly*, 1986, p. 183. (Hereafter, Brown, *Notation*)

⁶⁸ *Ibid.*, p. 186.

that it serves as a ‘...vocabulary and punctuation in an abstract language whose syntax is potentially infinite,⁶⁹ and as such, it continues to evolve.

There was a period when notational symbols remained relatively stable and served the needs of composers adequately, especially for music based on the diatonic scale involving major and minor harmony with a rhythmic writing of regular beats, grouped simply in twos and threes or multiples thereof. It remained stable for all music written and played in ‘standard’ ways - from the Baroque period to the first half of the 20th century. However, this was not always the case as in the periods prior to the 17th century and from the earliest times, the symbols took on ever changing shapes, until towards the end of the 14th century the evolution led to a phase of unparalleled complication and intricacy. Rhythmic complexity demanded the invention of highly involved methods of notation and in this period there were all kinds of notes. Originally, the notes of Measured Chant were entirely black, but after a time red notes were intermixed with them and their original values altered. By the end of that century, to add to the confusion there were :

- black, white and filled red notes
- hollow red notes
- half red and half white
- as well as half red and half black
- and many additions taken from various notations in use at the time.

Gradually, both the black and red forms fell into disuse and white notes with square or lozenge-shaped heads were used instead. Other innovations in the 14th century were written in the form of a circle or heart. Apel is of the opinion that these elaborations of notation were ‘... mere tricks of affected erudition since the effects desired could be represented in much simpler ways.’⁷⁰ He explains a further practice: ‘Here for the first time we find the use made of canons, i.e., written prescriptions which explain the meaning of the notes “*sub obscuritate quadam*”.’⁷¹ In the early decades of the 20th century instructions, either in the score or as a preface, appear in a very limited way, but thereafter explanatory notes became a necessary reference for players for the understanding and execution of a large variety of new and complex symbols.

Notation Systems

From the earliest times of notating music there is no known period of absolute stagnation as each successive stage of musical development has naturally demanded new and extended notational styles.

⁶⁹ Brown, *Notation*, p. 186.

⁷⁰ Apel, *Notation 900-1600*, p. 403.

⁷¹ *Ibid.*, p. 403.

Three simple stages of development are generally accepted for practical purposes.

1. In the earliest stages of simple melody, musical sounds were represented by letters of the alphabet.
2. In the Middle Ages these letters were superseded by Hieratic characters, specifically known to the monks of the period as *Neumae*.
3. The final stage was reached when the characters, called Notes, were written on the lines and spaces of the stave.

Apel, however, lists six main phases in the development of notation signs:

- Greco/Latin grammatical accent signs
- Neumes (c 8th-12th centuries)
- Black mensural notation (c 1250)
- Black mensural notation with additional signs ((c 14th century)
- White mensural notation (c 1450)
- Modern notation (after 1600)⁷²

and explains that Greek musical notation systems left no immediate traces in music notation of the Christian era. He says, further, that our modern system is rooted in the vaguer symbols of Greek and Jewish recitation.⁷³ Ulrich and Pisk confirm that the recently discovered Dead Sea Scrolls - biblical manuscripts found in Jordanian caves in 1947 and later - contain signs similar to those in the liturgical scripts of early Christian sects in the Orient, strengthening the conjecture that there exists a common musical heritage between peoples of related cultures despite geographical separation.⁷⁴

Western Notation - A Brief History

The history of the development of music as an art form is simultaneously the history of changing notation.

The foregoing discussion and the following summary of Western notation are an important inclusion in this thesis to demonstrate that notation symbols, throughout the history of Western music, have

⁷² Apel, *Harvard Dictionary*, p.579., Notation IV.

⁷³ *Ibid.*, p. 528.

⁷⁴ Ulrich & Pisk, *A History of Music and Musical Style*. New York: Harcourt, Brace Jovanovich, Inc., 1963, p.12. (Hereafter, Ulrich & Pisk, *History*)

necessarily had to be adjusted, extended and renewed to accommodate the musical expansion of each particular period. What emerges is a history of constant change that provides an insight into the style and structure of music itself and a continuing demonstration, in the 20th century, of a need for flexibility to express ‘vocabulary and punctuation in an abstract language whose syntax is potentially infinite.’⁷⁵



- Music was sung and played before written records were devised to preserve it and even after notation was developed during the Christian era its representation was approximate rather than accurate.
- From c800 the *Neumes of Plainchant*, consisting of points, lines, accents hooks, curves and other figures placed more or less over the syllables intended to be sung in the Latin text of the Catholic liturgy, aptly and practically showed the simple intervals used to express the Latin text.
- With a developing need to stabilise pitch, Guido d'Arezzo recommended - about two centuries later - the use of a **stave** with four lines and spaces and a red and yellow line to fix the pitch of the chant.
- An important development around 1200 was the establishment of set patterns, called **ligatures**, consisting of groups of two or more notes combined together to form a single symbol in which the rhythmical values depended on their grouping according to different modes, classified according to the number of notes per group. The resultant six modes of combined patterns related the time values to the length and brevity of the melodic tones to indicate the rhythmic intent of the chant.
- Gradual evolution was further encouraged by experiments in notation to accommodate the declaiming of the **complex syllabic text of the Motet**. Attention was now paid to single note values and the use of rests.
- Another important development in the late 1200s was **the use of the semibreve as a distinct value** devised by the theorist Franco of Cologne with the introduction of the *modus perfectus* and *imperfectus*, a complex system of **translating rhythms into individual note forms**. Together with the formulation of a strict set of rules for the use of ligatures, Franco's writings and those of Petrus de Cruce led to one of the great musical developments in a **strong organised measured rhythm** that subsequently allowed a counterpoint of rhythms, wherein Renaissance Art attained ‘a rhythmic complexity that part-wise has never surpassed.’⁷⁶
- In the latter half of the 14th century the **confusion relating to the semibreve and minim rests was clarified**. A simple distinction arose whereby both rests took up half the space of

⁷⁵ Brown, *Notation*, p. 186.

⁷⁶ Reese, G., *Music in Renaissance*, p. 3.

the staff resulting in the 'modern' practise of having the semibreve rest 'hanging' from the line thus:

() and the minim rest 'sitting' on the line thus: ()

- The symbols of polyphonic writing of both the Middle Ages and the Renaissance succeeded in developing a **more accurate type of notation** that narrowed the gap between the composers' intentions and the performance of the works.
- Notation of the 14th century saw changes as a result of various developments outside those of music alone.
- White notes were used to replace black and red filled notes. **White Mensural** notation became **standard** for the music of the **15th century**.
- Although such devices as **colouration and ligatures** continued to be used well into the 17th and 18th centuries, they **gradually became confined to 'mannered' effects**.
- Towards the end of the 16th century **note forms became more rounded** and surpassed the use of lozenge-shaped and diamond 'heads'.
- There was a **progressive slowing down of the beat** and shorter notes values appeared. However, in certain instances composers continued to use the () for works to be played or sung at speeds other than those shown in the notation. This practice exploited the system of so-called double speed without using smaller notes values, by simply placing a stroke through the (c), thus: ()
- Gradually the **minim was replaced by the crotchet as the main beat**
- The **introduction of time signatures**, as commonly used today, were found around the early 1800s in the idiomatic violin pieces of such composers as Vivaldi and Corelli.
- Musical sources of the early periods **rarely indicated the required accidentals** to caution against the use of the augmented 4th and the inversion interval, the diminished 5th. The practise of *musica ficta* arose. The conventions of the time required that the leading notes at cadence points and the 3rd of the *finalus* chord be raised half a step.
- *Musica recta* resulted from the **transposition of the hexachord** which needed the addition of flat signs to **maintain the intervallic structure**. Thus arose both the use of sharps and flats to adjust the interval and eliminate the *tritonus* interval - the *diabolus in musica*. However, these additions were initially largely a matter for individual and local taste and were made spontaneously at performances and also included in the written text where none existed.
- **Barlines gradually became common practice** during the 16th and 17th centuries. Earlier than the mid-15th century they were either not used at all, or very irregularly and without

reference to equal beats per measure. When notated, they were drawn casually only into the scores of choral or instrumental music.

- In the late 1600s the process emerged whereby the **barlines were arranged** in accordance with present day understanding of equal spacing of the music with **relation to pulse within the measure.**

Comment

Baroque musicians had at their disposal virtually the same notation as used today - excluding that of post-war *avant-garde* composers - yet, importantly, the players focussed less on the specific notation and more on what was implied by the stylistic conventions of the period. These procedures continued to apply to musicians of the Classical period and to a lesser extent to those of the Romantic Age.

In the Baroque period in particular, the notation was far from being exact in the smaller details relating to rhythm, ornamentation, figuration, dynamics and expression, and the responsibility for executing these aspects was left largely to the performer. It was taken for granted that musicians would execute the notation's literal demands but, more importantly, they were expected to impart into the music the essential aspects of inherited practices with little assistance from the notation.

No music can be successfully performed solely from notation in isolation, as in each successive period there exists an incompleteness which demands something beyond that shown in symbols. For a performance that consistently and successfully projects the underlying style of any particular period, contemporary conventions including textures, tone quality, *tempo*, attack and articulation, dynamics, and the considerations of idiomatic techniques of specific instruments, must all be critically observed. It is generally accepted that these elements are not to be found precisely in notation.

François Couperin (1668-1733), a keyboard virtuoso in the highly embellished *rococo* style, wrote in : *L'art de toucher le Clavacin* (1717):

I believe that in our fashion of writing music there are faults which are related to the method of writing our language.

That is, we write differently from the way we perform it.....

For example, we play several successive conjunct eighth notes in a dotted manner, even though we notate them equally. ⁷⁷

⁷⁷ Rowen, *Music Through Sources and Documents*, p.188.

Over two hundred years later composer Lukas Foss (Berlin 1922-), an immigrant to the United States in 1937, who took his place in the forefront of experimentation with indeterminacy, group improvisation and fresh approaches to sound, commented on the state of inexact notation when he wrote:

This brings me to the notational dilemma of the 1940s and 1950s:
the precise notation which results in imprecise performance.⁷⁸

Thus over the centuries there have been changing functions and relationships between notation and performer which have often resulted in the same outcome - writing one thing and playing another.

We arrive, once again, in the second half of the 20th century with a variety of notational symbols that are, anew, both complete and incomplete. Complete in the notation of total serialism where playing preciseness requires performers to be in some sort of musical straight jacket and which entails extreme and demanding complexities of frenetic counting and watching. Yet, despite having the intent of complete control through all the musical parameters it can only be done approximately. On the other hand, in the aleatoric approach, notation is incomplete but has once again expanded performers' choices - choices that are today, however, somewhat different from the choices exercised in the earlier centuries of Western music.

Comparison : Correlation and Extension

There are certain correlations to be derived from the preceding discussion between practices of early notation and notation in the 20th century, the least of which shows that notational circumstances have, in some cases, come full circle. This point will become clearer when, in later chapters, discussion centres around the changing syntax of contemporary notation where , for example, aspects of rhythmic notation have a tenuous comparison between ligatures, beaming and note lengths as well as attitudes to time-signatures and barlines. In the random adding and taking away of accidentals, the tonal uncertainty of key signatures and accidentals have, to a certain degree, brought back into focus a connection between the lack of uniformity in early notation and 20th century notation.

Adaptations are relevant and prevailing in all periods and styles of musical syntax and an understanding of their musical development makes comprehensible the interrelationship between notation and the history of music, and the corresponding relevance between the notational changes of each period of western art music.

⁷⁸ Foss, L., *The Changing Composer - Performer Relationship*, in *Perspectives of New Music*. Vol.1, No.2, 1963, p.48. (Hereafter, Foss, *New Music*)

Contemporary electronic music has shown up the limitations and restrictiveness of standard notation as well as the restrictiveness of rhythm forever bound to the concept of meter and barline. It has opened up and provided unlimited possibilities in the development of new notational systems and extended music - and chamber music in particular - to untried and endless innovations.

Notational Change : Broad Chronological Categories

Only a break with established musical aesthetics and philosophies can bring about a commensurate notational change, and such profound upheavals have occurred extremely rarely.⁷⁹

Added to Apel's historical categories described earlier, the American musicologist Kurt Stone points out three such breaks in all of Western music history and categorises them as follows, including the directions taken around the 1950s.:

1. Shift from Monody to Polyphony - c A.D. 900

The first basic reorientation occurred with the shift from monody to polyphony around A.D. 900, resulting in the replacement of the vague neumatic notation by the more precise intervallic staff notation. Later there followed the introduction of the important specificity of durations. Both these developments have continued to remain integral units of Western musical language until the present time.

2. Balance between Horizontal and Vertical Structures- c 15 -16 centuries.

The 15th and 16th centuries saw the demise of the early pre-dominantly linear polyphony and the emergence of vertical structures. Around 1600 chords and chord progressions became recognised as structural elements within a composition and by 1650 functional harmony started to emerge as an independent force, capable of both co-existing with the linear element and at times superseding it. This brought about a second radical notational change in the replacement of the traditional linear part-books by score notation, enabling the reader to follow not only the horizontal lines but the significant vertical aspects as well.

3. Contrasting directions: Precision vs Aleatory - c 1950s.

⁷⁹ Stone, Kurt, Music Notation in the Twentieth Century, A Practical Guide Book, New York: W.W. Norton & Co., 1980, Introduction XV. (Hereafter, Stone, Music Notation)

3. Contrasting directions: Precision vs Aleatory - c 1950s.

The third stylistic upheaval came around the 1950s when two contrasting directions developed : one an unprecedented precision of every component of musical texture, and the other, a stylistic trend which rejected precision and introduced deliberate ambiguity, indeterminacy, improvisation and unpredictable sounds and circumstances. Again, these developments required an adjustment to notation which, at times, was radically applied with a completely new approach to symbolic representation.

The Need for New Notation : A Survey of Thoughts

Opinions - from 1900s

A musical notation is a language which determines what you can say, what you want to say determines your language.⁸⁰

At the end of the 19th century an opinion on notation expressed the following belief:

.... our present system of Notation leaves little to be desired, for it is difficult to conceive any combination of sounds, consistent with what we believe to be the true principles of Musical Science, which it is not capable of expressing.⁸¹

Yet only three decades later, Henry Cowell, in an article titled: **Our Inadequate Notation**,⁸² commented that the very opposite was the case. He explained that the notation of the time (1927) gave only bare details of pitch and rhythm of conventional modes, and little else. 'It cannot exactly convey a subtle tonal effect of any description.'⁸³ This point no doubt illustrates general perceptions of notational deficiency and incompleteness to express the extensive and complex shadings needed to interpret music which, at that time, was not generally defined in the fabric of Western Art sound.

He writes further that if any special effects are desired by a composer, as for example quarter-tones, exact slides and involved cross rhythms, they cannot be accurately notated without the addition of new means to the current system.⁸⁴ The suggestion of the time that 'new' effects be left to the discretion of the performer, was to Cowell quite unacceptable, as he predicted 'any of a hundred different ones may be produced,'⁸⁵ thereby anticipating what was to become the preferred approach to many

⁸⁰ Cardew, C., *Notation-Interpretation, Etc.* in *Tempo*, Vol.,58, 1961. (Hereafter, Cardew, *Notation*)

⁸¹ *Groves*, 4th edition, p.478.

⁸² Cowell, H., *Our Inadequate Notation*, in *Modern Music*, Vol., 4., No. 3, 1927, p.29. (Hereafter, Cowell, *Inadequate Notation*.)

⁸³ *Ibid.*, p.29.

⁸⁴ *Ibid.*, p.29.

⁸⁵ Cowell, *Inadequate Notation*, p.29.

Notating non-Standard Effects

In the early decades of the 20th century attempts at notating effects outside those of standard symbols resulted in a certain amount of confusion, as totally different outcomes were notated by the same symbol, while for the identical requirement composers often used a limited variety of different symbols. For example, Schoenberg in the first of his Three Piano Pieces, Op. 11 (1909), indicated the silent depressing of the key with an open diamond shaped sign (◊), and Ives in his Fourth Symphony for Orchestra (1916-1919) used a similar symbol for quarter-tones (◻), despite the fact that an open note symbol had been in use from the middle of the 18th century to represent a stopped harmonic in string music.

In an article on notation for string instruments, Siegfried Palm comments about the confusion caused by the symbol used for quarter-tone notes in Bernd Zimmerman's (1918-1970) chamber work, the piano trio 'Presence' (1961). He pertinently points out that the first thing a string player thinks of on seeing a square note is that it means a harmonic, and for this reason, one should leave it alone.⁸⁶

In Gardiner Read's Source Book of Proposed Music Notation Reforms the list of proposed new notation is endless, and no area has escaped critical reassessment. Since roughly 1700, composers and theorists, musicians and educators have put forward proposals to simplify or improve the traditional system, while others have advocated an outright replacement of the system.

In 1903, C.F. Williams wrote that if the shelves of the various libraries of Europe were searched, it would probably be found that a system of new notations would appear every three or four years with the title suggesting '*the new notation*' and with each author believing it capable of becoming universally adopted.⁸⁷ Read continues, that far from improving the notation of the time, the separate proposed reforms of conventional symbols and the more radical substitution of the old by new and superior methods, succeeded only in creating more problems for the performer than they solved. Despite being marginally interesting and challenging to the musicians of the time, most nevertheless faded out, with some barely surviving the lifetime of their inventors. However, with the appearance of electronic sounds in compositions of the 1940s, the question of notational adjustment and the inevitable invention of radically new symbols had to be seriously considered, not as in previous reforms as a simplification or alternative to current systems, but as an urgent need to accommodate sound that extended far beyond time/pitch relationships.

⁸⁶ Palm, Notation For Stringed Instruments, p.66.

⁸⁷ Williams, C.F. Abdy. The Story of Notation. London: The Walter Scott Publishing Co., Ltd. (Hereafter, Williams, Story of Notation)

Time/Pitch Relationships 1920s

Up to the time of total serialism, Western Notation had basically been concerned to specify the relationships of rhythm and pitch. *Timbre*, inflection, dynamics and mode of attack may or may not have been in the notational directive of the period; but common to all systems had been the concern with pitch and its relationships. During the early decades of this century, a gradual metamorphosis away from melodic pitch relationships was effected by two of the most important and radical developments of the period that served indirectly as catalysts to precipitate future changes to notation. Firstly, in the introduction of Schoenberg's 12-tone method, the resultant pitch relationships were a radical deviation from the standard intervals commonly used in melodic construction, and secondly, in Varèse's opposing compositional viewpoint the purpose of traditional syntax was defied by the use of 'organic features of a continual process of expansion, penetration, interaction and transmutation.'⁸⁸

Schoenberg's emancipation of the dissonance and Varèse's liberation of pitch which was constituted in a series of sound masses, significantly pointed towards the expansion of new ideas that eventually led to music which was forced into radically new notational systems. Varèse in particular, discounted the use of counterpoint and innovatively subordinated both harmonic and melodic intervals to rhythm and sonority. His compositions were the forerunners of the modern aspects of sound, classed as having highness and lowness, 'including non-fixed as well as fixed frequencies so that a wide array of melodic structures [could] be encompassed.'⁸⁹ His unresolved dissonances produced new shrill sounds, in the form of rhythmic cells and sound masses, which he termed 'organised sound'.

With the continuing use of both these developments, the inherited concepts of early 20th century melody and the crucial vertical alignment in triadic tonal music were destroyed, and with them went the standard definitions, not only of melody, but of all chord structures and cadences that had been the corner stones of Western music for centuries. Erhard Karkoschka places great emphasis on the role enharmonic notation of 12-tone serialism played in restructuring the prior understanding of accidentals to the visual implications of harmonic structures within tonal music. He maintains that the principle change in relationship of intention to notation did not occur until the Viennese atonalists made enharmonic change an integral part of musical progression.⁹⁰ It is the 'serial' use of a proliferation of accidentals that contradicts the meaning of standard notation. As a result a conflict arises, specifically in atonal music, when the unversed reader or interpreter looks for the accustomed

⁸⁸ Wen-Chung, c., *Varèse : A Sketch of the Man and His Music*, in *The Musical Quarterly*, ii, April, 1966, p.156. (Hereafter, Wen-Chung, *Varèse*)

⁸⁹ Wittlich, Gary, E. [Co-ordinating editor] . *Aspects of 20th Century Music*. New Jersey: Prentice Hall Inc. , Engelwod Cliffs, p.277. (Hereafter, Wittlich, *Aspects of 20th Century Music*)

⁹⁰ Karkoschka, E., *Notation in New music. A Critical Guide to Interpretation and Realisation*, translated from German by Ruth Koenig, London: Universal Edition, Ltd., 1972, p. 1. (Hereafter, Karkoschka, *Notation in New Music*)

tonal/harmonic relationships that are non-existent. There is no correlation between what is expected and the resultant effects of the visual/sound associations, thus creating a reason for the introduction of confusing tendencies in notation.⁹¹

Further, on the viability of the use of chromatic alteration in 12-tone compositions, Marshall Bailey, writing in *The American Composers Alliance Bulletin* says in his article : **Duodecuple Notation** (1962): '.... [12-tone] notation's first shortcoming is its inability to differentiate between chromaticism and twelvetonism.'⁹² In dodecaphony, the twelve tones are free of tonality and therefore individual in significance and function, and he takes this point further by saying : 'As long as F sharp, for example, is related to F in name and direction, it cannot function independently.'⁹³ He contends further that notation has failed to progress from semitonism to tonism, as it does not negate the concept of chromaticism based on the semi-tone system. The idea conveyed by the word 'twelve-tone' should indicate a unit of twelve tones (sounds) and not twelve semi-tones. Bailey adds : 'the five-line staff with sharps and flats is utterly fallacious, inappropriate, inadequate and unsatisfactory in recording duodecuple music of either strictly serial or atonally free compositional procedure.'⁹⁴

A relatively recently published book by the Chroma Foundation, **Chromatic Notation** (1983),⁹⁵ gives the results of a survey of new notation ideas. The outcome is based on a selection of thirty-two new systems of inventors from ten countries. Thomas Reed from the Northeast Missouri State University was among those whose new notational proposals were selected from over a hundred responses interested in designs for a basic system of music. The book narrowed the selection of a chromatic notation down to a very few basic designs. The editor Albert Brennink explained in part two, that the shortcomings of traditional notation become evident in the assumption that Guido d'Arezzo and others, who helped shape standard notation, did not base their notation on a twelve-unit plan - they did not think in those terms as they seldom used the five tones that were 'non-alphabetical'. Reed comments, however, that ancient Chinese music used a system which included twelve chromatic tones in an integral, equal way, so that players were able to use pentatonic melodies in all twelve keys with equal convenience, and without favouring one single tonality above the rest, despite using only five tones in their scale.⁹⁶ Reed asks : 'It is possible that the pressures of 20th century Western music will tend to make us examine the utility of a more appropriate notation that is more suitable for chromatic music, while still being suitable for strictly diatonic music?'⁹⁷

⁹¹ *Ibid.*, p. 1.

⁹² Bailey, **Duodecuple Notation**, p. 12.

⁹³ *Ibid.*, p. 12.

⁹⁴ *Ibid.*, p. 12.

⁹⁵ **Chromatic Notation**, ed. Albert Brennink, Chroma Foundation, Victoria: B.C., Canada, 1983.

⁹⁶ Reed, Thomas, S., **Chromatic Notation Research**, in *National Association of College Wind and Percussion Instructors Journal*, Fall, 1984, p. 27. (Hereafter, Reed, **Chromatic Notation**

Research)
⁹⁷ *Ibid.*, p. 27.

The search for a suitable chromatic notation to eliminate the shortcomings of standard notation is continuing, principally in an effort to exclude the concept of chromaticism as an extension of tonality where the halfsteps are dependent upon seven notes for their names and meanings. The legacy of chromaticism is inherited from previous centuries, and it is the particular usage of the Romantic, post-Romantic and Impressionistic periods, which according to Bailey, 'greatly increased notation's lag.'⁹⁸

Chromatic alteration, however, continued to serve the needs of composers in the early decades of the 20th century. In Berg's Lyric Suite for String Quartet (1926), there are accidental signs before almost every note. Later in the century, Stockhausen eventually approached this question in the singular manner of notating all notes requiring accidentals with only the sharp sign.

Decline of Standard Notation - post 1945

Post 1910, Schoenberg's concern was to prevent the stagnation of musical development by formulating his 12-tone method of composition. However, importantly, despite his iconoclastic works and those of Varèse and the later integral serialists, these musical experiments were accommodated by the use of traditional notation. Although this system could be seen, at that time, to fulfil its artistic responsibility by conveying the intentions of the composers, it is debatable whether it could continue to serve as a vocabulary in an abstract language where the sound possibilities outweighed the existing notation symbols. In fact, certain composers came to question the very fabric of 12-tonism and integral serialism as compositional processes. On the continuing viability of Schoenberg's method, Stefan Wolpe (1902-1972) commented in a lecture presented at the University of California, Los Angeles, in 1959, titled : **Thinking Twice**,

The saturated balance of twelve tones is partly very mechanistic and neutral in quality, though the order of the twelve undoubtedly renders the circuit as particular..... no amount of transposition, permutation, and the various modes of projection and exposure of a twelve-tone set, no amount of dislocation or multiplication of sets in motion can relieve the ear from hypertrophic abundance of a pitch-totality that, in this exclusive form, must stagnate.'⁹⁹

⁹⁸ Bailey, Duodecuple Notation, p.12.

⁹⁹ Wolpe, S., Thinking Twice, Contemporary Composers on Contemporary Music, eds. Schwartz & Childs, New York: Holt, Rinehart and Wilson, 1967, p.275. (Hereafter, Schwartz & Childs, Contemporary Composers)

Earle Brown, in his article on *New Music* comments particularly on the rhythmic fragmentation in works of total serialism which he considers has arrived at 'the extreme point of fragmentation and fractioning [until] it becomes a "statistical" accuracy.'¹⁰⁰ He debates the question of composers insisting that any degree of fragmentation of duration is accurately performable and says 'it may be, but if it is not, the development of precision in notation has contradicted itself.'¹⁰¹ He says further that the notational accuracy possible on paper bypassed its maximum point of *producing* finite control in performance and proceeded into a realm of human response where it again became only an approximation. He ponders: 'then the question arises, is there not a more functional and less self-defeating and more realistic graphic suggestion?'¹⁰² A contrary view was held by Siegfried Palm who, at Darmstadt in 1972, was of the firm opinion that traditional notation still had ample resources to write down 'yet unheard of sounds.'¹⁰³

Lukas felt in 1963, that traditional notation should be expanded, not replaced. He explains further of his awareness of the inherent subtlety of the relationship of barline and beat but admits there is 'also a need [for] moments of no barline and no beat - notes held not by mutual agreement as to the number of counts, but via a spontaneous reaction of one performer to the other.'¹⁰⁴ The development of this concept in performance is, according to Foss, far from resolved in the 'notation co-ordination domain.'¹⁰⁵

With the development of electronic sound in composition, the demise of standard notation became a reality for post-war composers. In Boulez' extension of Messiaen's method of integral serialism - with the principle of pitch serialisation applied to other parameters of duration, loudness and attack - the standard symbolic representation of musical intent in Western music was extended to the ultimate. Composers were now faced with the rapid development that technology brought into all the parameters of music and many, such as Boulez, Ligeti and others, felt that they were insufficiently equipped to develop the new technical possibilities to the full and recognised that one lifetime, even in the twentieth century, would not be enough.

Stylistic Upheaval - 1950s

Post 1945, a crucial consideration amongst many composers was the pursuit of a new musical language to express contemporary musical ideas. The newly discovered universe of acoustic

¹⁰⁰ Brown, *The Notation and Performance of New Music*, p. 193.

¹⁰¹ *Ibid.*, p. 193.

¹⁰² Brown, *The Notation and Performance of New Music*, p. 193.

¹⁰³ Palm, *Notation Strings*, p. 65.

¹⁰⁴ Foss, *The Changing Composer-Performer Relationship*, p. 49.

¹⁰⁵ *Ibid.*, p. 49.

phenomena encompassed an unlimited spectrum of sound and noise which resulted in a deficiency and an inconsistency of available notational symbols to express areas that explored sound concepts far beyond the traditional. Thus there arose, compositionally, a new struggle between the idea born in the imagination and the material dependent upon the realities of the system and upon technique.¹⁰⁶ The composer now had to battle with concepts of diatonic and metric principles which were no longer part of the musical imagination.

In 1949 Harry Partch (1901-1974), another challenging figure in American music who devoted his career to experiencing and explaining unorthodox musical views, expressed concern over the difficulties of evolving a theory of notation when he wrote in his book, **Genesis of a Music**:

To provide notation is a matter of paper and pencil..... but to evolve a theory, to develop instruments upon it, and to write and present the music conceived therefrom is easily a matter of a lifetime.¹⁰⁷

He suggests further, that an integrated notation involves much more than the mere invention of it, and to make it immediately comprehensible and translatable into physical acts from the 'hodge podge of lines, numbers and notes which result is no sesame to an understanding of the fabric of theory which the composer has laboriously built up.'¹⁰⁸

Inherited Notation Symbols around 1945

Around 1945, the inherited notational symbols and the musical syntax consisted broadly of:

- staves
- ledger lines
- clefs
- barlines
- time signatures
- note heads
- rest signs
- key signatures
- accidentals
- dynamic markings
- verbal instructions
- *tempo* indications

¹⁰⁶ Haubenstock-Ramati, R., Notation - Material and Form, (translated by Katharine M. Freeman) in Perspectives of New Music, Vol. 4, No.1, 1965, p. 44. (Hereafter, Raubenstock-Ramati, Perspectives)

¹⁰⁷ Partch, H. Genesis of a Music, Madison, Wisconsin: University of Wisconsin Press, 1949, p.210. (Hereafter, Partch, Genesis.)

¹⁰⁸ *Ibid.*, Chapter 13, p.211.

In the 1950s a stylistic upheaval began to erupt and erode away many of the accepted definitions and meaning contained in traditional syntax. These diametrically opposed developments each demanded new approaches to notation and were broadly categorised into two main streams :

- **determinate**
 where an unprecedented increase in precision of every musical parameter :
 pitch
 duration
 intensity
 colour
 and rhythm
 was revealed in the meticulous attention to detailed notation

 - **aleatory**
 where deliberate ambiguity, varying degrees of indeterminacy and the use of unpredictable sounds were introduced
- all of which were shown in the use of imprecise notation that allowed the greatest freedom of performance.

These two streams were experimenting and developing along different lines, yet complemented one another and shared the basic premise of a type of 'pre-ordering' which guarantees a particular, but not necessarily specific, result. Foss says that both involve a canvassing of possibilities which is always in danger of deteriorating into a cataloguing of possibilities of games of numerology.¹⁰⁹ He says, in addition, that both run the risk of self-deceit : serial music in the direction of a would-be order, aleatory music in the direction of would-be freedom.¹¹⁰

The American composer Barney Childs (1926-), who has amongst other compositional attitudes a strong interest in American Indian melodies, explains that some composers of the time (1969) were forced to write either indeterminate or serial music and reject 'what may have been a perfectly valid previous compositional personality which simply wasn't being sufficiently noticed to keep the composer and his music in the public eye.'¹¹¹ In his opinion the result of the 'serialist/aleatoric' bandwagon is a great deal of very dull music as it all sounds distressingly similar, except perhaps for a composer's current discovery in search for novelty. The reason for what he terms 'dullness' arises

¹⁰⁹ Foss, *The Changing Composer-Performer Relationship*, p.52.

¹¹⁰ *Ibid.*, p.52.

¹¹¹ Childs, *Indeterminacy and Theory*, p.18.

from the format used in many compositions, and he cites certain approaches as being contributory factors for this similarity.¹¹² He says finally, that in his opinion bad indeterminate music is fatally easy to write and play!¹¹³

Convention : Index of New Notation (1964)

By 1974, some seventy years after the pronouncement that standard notation was capable of expressing any combinations of sounds, members of the Index of New Notation - a project of the New York Public Library - found it imperative to initiate a seminar in collaboration with the representatives of the Musicology Department of Ghent University, to investigate and endorse proposals considered to have fulfilled all the requirements for notational standardisation of 'the new musical concepts..... springing up everywhere since the 1950s.'¹¹⁴

Assembled at the University were over seventy music specialists from all over Europe and North America under a conference Committee consisting of :

- Kurt Stone (Editor, Author, Dir. Index of New Musical Notation - New York City, USA)
- Gerald Warfield (Composer, Ass. Dir. Index of New musical Notation - New York City, USA)
- Prof. Jan-Lea Broeckx and Herman Sabbe from the State University, Ghent.

The expansion of new musical concepts, new notation and new performance techniques created a flood of individual signs representing the specific and innovative sounds peculiar to each composer. Commenting on this resulting plethora of signs on addressing the delegates at the Conference, Kurt Stone said:

As more and more new notational devices were invented, efficiency of communication declined, resulting in poorer and probably fewer performances of new music than there could and should have been performed.¹¹⁵

These difficulties became obvious to concerned players and composers alike who, in exhibiting dissatisfaction with conventional notation to describe such concepts as pitch, clefs, key-signatures, accidentals, leger lines and the restricting and exacting symbols to denote rhythm were, nevertheless

¹¹² *Ibid.*, p.18.

¹¹³ *Ibid.*, p.18.

¹¹⁴ Stone, K., Interface, International Conference on New Musical Notation, Report, in *Journal of New Music*, Amsterdam: Swets & Zeitlinger, p.17. (Hereafter, Stone, New Musical Notation)

¹¹⁵ Stone, New Musical Notation, p.18.

unable in the early 60s and 70s to clarify and standardise alternate notational systems. No one system emerged from contemporary developments to structure new standards of notation that could follow successfully in the wake of the traditional symbols - fast considered by some composers to becoming inapplicable or even obsolete.

Another reason for the lack of acceptance of any one new system of notation is that experimenting composers create pertinently new systems to satisfy their individual needs. Karkoschka says, appropriately, that new music finds its own solution for every situation.¹¹⁶

There arose a diversity of notations resulting from the dissimilarity of styles that emerged during the 20th century. No one central compositional technique evolved to dominate and satisfy the ideas of all *avant-garde* composers, especially those of the post-1945 period.

Old Instruments - New Sounds : The String Quartet post-1945

One has to practice one's art with a knowing sense of
its radical nature.¹¹⁷

The specific scientific advances in the field of acoustics and electronics was to play a vital role in the development of quartet music as it provided a stimulus for composers to liberate the sound capacity of traditional instruments. Emerging from the electronic studios was a novel mixture of colouristic possibilities that was to influence the writings of post-war composers of the *genre*. There was, too, close contact between composer and player that proved to be mutually stimulating, as the symbiotic effect of new challenges for both resulted in a discovery and development of a whole new gamut of sound; new avenues of expression, unusual relationships of pitch, *timbre* and duration and a new kind of abstract thought that concerned itself with sound and structure for its own sake. Other processes arose to enlarge the performer's role with a choice of what to play, when to play it, as well as the use of improvisation, which is sometimes within limits set by the composer and at other times the free choice of the performer. All these approaches led to the experimenting of new playing techniques and new notation.

However, conventional notation and techniques were not overturned suddenly or completely. The works of Hindemith, Schoenberg, Webern, Berg and Bartók - and other lesser composers - drew to an end the significant quartet compositions of the earlier decades of this century. The quartets of

¹¹⁶ Karkoschka, *Notation in New Music*, p.9.

¹¹⁷ Schwartz and Childs, *Contemporary Composers*, p.227.

Bartók's nationalism were such that, despite his patriotism, ideological factors expressed in musical symbolism were not an issue - as had been for the Russians - and he was able to use the nationalistic elements in his music as pure compositional material. Webern's use of delicate dynamic levels and the close interaction of participating instruments, as well the general inwardness of his music, were all derived from a style of characteristic chamber music writing, but in the extremity of application, it was almost as if 'in the blaze of Webern's consummate mastery, chamber music burnt itself out.'¹¹⁸

The use of novel notation during the first half of the century was rare and disregarding its existence seemed to be common practice. Rejection of standard techniques and notation symbols was gradual, and the techniques that had provided the corner stones of Western musical architecture in the previous centuries were now being slowly eroded away.

The shift, initially, involved a concern with the changing concepts of musical philosophies linked to the various social and aesthetic ideals of the time reflected, for example, in such quartets as John Cage's chamber work String Quartet in Four Parts (1949). This quartet was influenced particularly by his embracement in 1947 of the Oriental philosophy, Zen Buddhism, which taught a mistrust of the rational mind and a searching out of ways to nullify powers of decision. A retreat from Western syntax is shown in Cage's use of:

- single notes of the melodic line without accompaniment
- harmony non-functional with sounds being a series of unconnected verticals
- sounds chosen for colour and occupying a specific allotted space according to the composer's numerical proportions
- repetitive use of the same chords
- fixed gamuts of sound with chords, intervals, triads and aggregates needing one or more of the instruments for their production
- no vibrato

Cage sought to let sounds be themselves and this he achieved in his single quartet, which is unmistakably *his*, since at that time, nobody else had embarked on the writing of quartet music with

- a dispassionate unfolding of sound
- an approach untroubled by rhythmic activity
- a complexity of dissonant counterpoint as well as
- a total absence of directional harmony

¹¹⁸ Bujic, B., Chamber Music in the Twentieth Century: Cultural and compositional Crisis in a Genre, in *British Journal of Aesthetics*, 1982, p.116. (Hereafter, Bujic, Crisis of a Genre)

The writing totally ignores, and shows a complete indifference to, the quartet style and tradition.

The example following, taken from the 3rd movement, entitled Winter, shows the unusual use of rhythmic evenness and the repetitive use of the same chord structures. Example 7.

Movement 1 - Summer: (in France)	- with preservation
Movement 2 - Autumn: (in America)	- with destruction
Movement 3 - Winter:	- with peace
Movement 4 - Spring:	- with creation

Example 7. Rhythmic Evenness and Repetitive Chords
Cage, String Quartet in Four Parts (1949), bars 199 - 206.

The image shows a musical score for four staves, likely representing the four parts of a string quartet. The time signature is 2/2. The score is marked with 'd. 54' and '200' at the top. The music consists of repetitive chord structures and rhythmic patterns across the four parts.

In a lecture delivered in the Summer of 1948, Cage compared Beethoven's structural defining with that of Webern and Satie. He considered Beethoven's compositional approach to be 'an error', while endorsing Satie's and Webern's by declaring: 'there can be no right making of music that does not structure itself from the very roots of sound and silence - lengths of time.'¹¹⁹ From this belief he devised a combination of what he termed 'Law Elements' - determined by elements which 'can be and ought to be agreed upon'¹²⁰ together with elements that cannot be agreed upon. These two opposing elements are used to form 'an organic entity'. The following example taken from the frontispiece of the manuscript, (published by Peters and Co., edition (1960)), explains in Cage's handwriting the rhythmic ratios used for the four movements. Example 8.

Example 8. Rhythmic Ratios associated with each movement
Cage, String Quartet in Four Parts (1949 - 1950)

THE RHYTHMIC STRUCTURE OF THIS WORK IS $2\frac{1}{2} \cdot 1\frac{1}{2}$, $2 \cdot 3$, $6 \cdot 5$, $\frac{1}{2} \cdot 1\frac{1}{2}$. THE DISPOSITION OF THE TONES WITH RESPECT TO THE STRINGS IS AS FOLLOWS:

¹¹⁹ Griffiths, *Modern Music*, p.22.

¹²⁰ *Ibid.*, p.22.

Despite there being no inclusion of new symbols or string techniques as such, Cage destroyed the conventional musical continuity of the *genre* by wholly ignoring the precept of the so called 'proper quartet style' and liberated the traditional concepts in a different way from those of the earlier innovative compositions of the century.

Griffiths suggests that, more than any other sort of music in the western tradition, the string quartet has enjoyed the stability, yet also the capacity, for constant renewal of a living species.¹²¹ But, despite its capacity for constant renewal, the *genre* was soon to find itself, after World War 2, in a sort of compositional crisis.

The dilemma affecting music in general, and the string quartet in particular, was how to adapt musical composition to the unusually radical techniques and styles taking place at that time. As with all great music, the developmental paths of the second half of the 20th century were opened up and took shape from the problem itself. An attitude had to develop that would master the multi-faceted dimensions that had become available to composers through the use of expanding parameters and give music a meaning corresponding to the social, cultural and technical outlook of the period. The search for new forms of expression was increasingly determined by composers who used the creative opportunities afforded them by contemporary discoveries. The 20th century composer had now to co-ordinate the theories of engineers with his own artistic creativity and produce music that reconciled human artistic thoughts and aims with the technicalities of the electronic age - a problem entirely peculiar to musical composition in the second half of this century.

One such composer who, with Stravinsky and Cage, made the string quartet something quite different from the structures of traditional syntax was Iannis Xenakis (born Braila, Rumania, of Greek parents, 1922-) who graduated from the Athens Polytechnic School with a degree in engineering. He based his musical theories on the laws of mathematics and physics, and called his music *stochastic*, a term related to the Swiss physicist's Bernoulli's (1700-1782) principle of the Law of Large Numbers or Probabilities, (1732). Xenakis wrote about his revolutionary theories decades later than those expressed by Varèse' experimental musical philosophies which, naturally, extended far beyond those of the older composer. Based on abstraction and formalization of compositional processes, his book is titled: **Formalised Music: Thought and Mathematics in Composition.**¹²² In it he denounces linear thought (polyphony) and perceives contradictions in serial music, and proposes, like Varèse, 'a world of sound-masses, vast groups of sound-events, clouds, and galaxies governed by new

¹²¹ Griffiths, *The String Quartet*, p.6.

¹²² Xenakis, Iannis, *Formalized music: Thought and Mathematics in Composition*. Indiana University Press, 1971. (Hereafter, Xenakis, *Formalized Music*)

characteristics such as density, degree of order and rate of change, which require definitions and probability theory.’¹²³ The theory of the law of large numbers can informally be explained as follows:

- If you toss a coin once the result is unpredictable within the obvious limits of the two alternative possibilities. Continue to toss it and the number of heads and tails will increasingly tend towards equality: ‘the law of large numbers implies that the more numerous the phenomena, the more they tend towards a determinate end.’¹²⁴
- ‘Large Number’ or ‘Stochastic’ music ‘entails the provision of limits of sound aspects (for example, a range of equally tempered semitones) and of a formula to determine the probabilities of choices within these limits: the calculations may be carried out manually or automatically.’¹²⁵

Mathematics has a vital role to play in Xenakis’ belief in the evolution of a truly modern music. He admits that ‘if one approaches music in the same way that I approach mine, it marches with and intermingles with mathematics.’¹²⁶ But he warns: ‘Don’t ask me to define music solely in mathematical terms. These two “arts” cannot be identified with each other, cannot be placed one above the other, only they fuse, having certain aspects in common.’¹²⁷

The impact of this music, says Dallin, would be even greater if more musicians had the necessary command of higher mathematics to comprehend fully his philosophic concepts and to apply his compositional methods.¹²⁸

The unusual title of the string quartet : ST/4-1, 080262. is explained as follows:

- ST = a STring Composition
- 4 = for four (4) players
- 1 = the first (1) such composition
- 080262 = composed on the 08th February,(02) 1962.

This composition displays the extreme contrasts between constantly changing durations, dynamic and pitch patterns and a simpler texture which includes a descending chromatic scale with regular note

¹²³ *Ibid.*, p.33.

¹²⁴ Bois, M., *Iannis Xenakis The Man and his Music*, London: 1967, pp.9-16. (Hereafter, Bois, *Xenakis*)

¹²⁵ Griffiths, P., ‘Xenakis: Logic and Disorder,’ in *Musical Times*, CXVI, April, 1975, pp. 329-330.

¹²⁶ Bois, *Xenakis*, pp. 9-16.

¹²⁷ *Ibid.*, p.p. 9-16.

¹²⁸ Dallin, *Twentieth Century Composition*, p.247.

values and a constant dynamic level. It also illustrates clearly the composer's remark that stochastic laws 'are the laws of the passage from complete order to total disorder in a continuous or an explosive manner.'¹²⁹ Such contrasts are a fundamental feature of stochastic works.

Survival of the *Genre* post 1945

New Sounds : New Language

The need for new sounds manifests itself in a search for a new approach to language. In the *genre* of the string quartet immediately post-war, new values were found by composers who boldly grasped the technical resources and applied them, with creative perception, to a *genre* that, despite having its image developed and changed throughout its history, found itself anachronistically in an age that still retained as its main component, players using instruments perfected in the 17th century. Composers were forced to understand that the continued use of material that had contributed to the historical maturing of the *genre* throughout the centuries would lead to stagnation, as the use of the traditional technical capabilities of 17th century instruments appeared to have been exhausted in terms of 20th century compositional practices.

Thus there emerged a period of diverse musical discovery as composers of the *genre* came to realise the limitation of the 'standard' notational system to express the divergent and complex approaches to:

- duration
- rhythmic structures
- microtonal systems
- accidentals
- pitch
- *tempo* markings
- dynamics

and a whole range of special effects.

It seemed as if the time was ripe just after the War for composers to create a whole new outlook to musical syntax because of what was seen to be the bankruptcy and stalemate of ideas inherited from previous centuries. There was an urgency and a need for the infusion of new and unexpected ways of coaxing new *timbres* from age-old instruments.

¹²⁹ Butchers, C., 'The Random Arts : Xenakis, Mathematics and Music,' in *Tempo* 85, 1968, p.5.

The problem now seems to be one of survival. What is needed is for composers to continue to preserve music's right to be itself in all ways, which includes developing new syntax and string techniques to ensure the survival of the *genre* in the second half of this century. However, this presents certain problems as some compositions may be described in terms of 'a continuing struggle between the composers' desire to explore the innermost secrets of their art, and pressure of society on them to produce music which could be put to good use,'¹³⁰ which often links music to a wide variety of ideological and financial issues with dubious lasting musical results.

Thus the exploration continues for ways to produce new sounds on traditional stringed instruments with new symbols being developed creating a vast body of material that is often alien to musicians schooled in conventional notational systems. Also, there exist a plethora of signs which, at best, are repetitive and at worst, confusing and contradictory, and which entail the learning of new and specific symbols each time by performers - as well as having to be introduced to listeners. Subsequent developments in these areas have become radical and, in some cases, extreme.

Listed below are extracts from two important authors' views on the categories found in 20th century notation.

David Cope, who at the time of publication of his book, *New Music Composition*, (1977),¹³¹ was Assistant Professor at The Miami University of Ohio, organises modern notation into four main categories:

1. metered
(usually standardised around the grand-staff concept and the G and F clefs.)
2. improvisational
(often based on traditional concepts of note-heads, etc. but only as raw material from which the performer may interpret as indicated.)
3. proportional
(meterless notation in which a given time-block of indicated duration exists with notes in locations very close to where the composer intends; avoids strict metric ideas; visual is proportional to aural activity in terms of time.)
4. indeterminate
(includes a wide range of graph musics and combinations of other types mentioned above in nonspecific situations.)

¹³⁰ Bujic, *Crisis in a Genre*, p.117.

¹³¹ Cope, *New Music Composition*, p.256.

Erhard Karkoschka¹³² summarises the important present-day phenomena in modern notation as consisting of the following categories:

1. Changes in traditional notation
 - 1.1. simplifications.
 - 1.2 additions and elaborations

2. Partly new principles
 - 2.1 notation of approximate values
 - 2.2 action notation
 - 2.3 qualitative notation

3. Completely new principles
 - 3.1 tempered notations
 - 3.2 verbal scores
 - 3.3 musical graphics
 - 3.3.1 to be read with the usual pitch and time axes
 - 3.3.2 to be read freely

4. Notation of electronic music
 - 4.1 based on old notation with new symbols
 - 4.2 schematic drawings
 - 4.3 verbal instructions
 - 4.4 punched tape instructions with diagrams and verbal indications

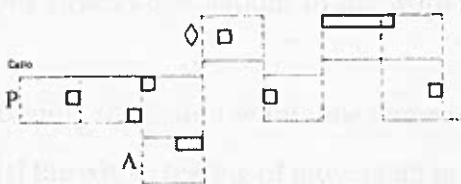
The investigation that follows is concerned with usage of Western notation and the development of new string techniques in a selection of 20th century string quartets. Also under discussion are works that significantly extend the parameters of musical syntax and which reveal a new type of string virtuosity in the *genre*. As it is clearly impossible to include all the quartets composed post-war that use new signs and related techniques, the meaningful selection chosen illustrates the mainlines of development. Certain interesting and original experiments may be missed, but wherever possible this thesis will try to represent the essential aspects of new notation and new string techniques.

¹³² Karkoschka, *Notation in New Music*, p.5.

PART 2 : INVESTIGATION

4

RHYTHMIC NOTATION



The exploration of unconventional rhythmic ideas, and its attendant problems of notation and realization, has become a deep concern for many living composers.

*Extract from score **Projection 1** (1950)
For Solo Cello: Morton Feldman (1926 - 1987)*

John MacIvor Perkins

PART II: INVESTIGATION

RHYTHM : *TEMPO* : PITCH : PITCH EXTENSIONS : RIGHT HAND
TECHNIQUES : *TIMBRE* : REPEATS : STAVES : SUNDRY TECHNIQUES :
SUMMARY AND CONCLUSION

Chapter Four

RHYTHMIC NOTATION

Introduction

The analysis of rhythmic notation in the early periods of Western music is one of the most difficult tasks that confront the analysts, as Mediaeval notators were mathematically imprecise in their time specifications. The obstacles presented by rhythm in 20th century music often seem just as problematical. Rhythmic syntax has proved to be inadequate for the unprecedented and radical developments post 1945 and new and diverse symbols have gradually evolved to represent, in sound, these changing developments in rhythm.

Curt Sachs, in his *Rhythm and Tempo*, commented on the confusion that has existed since ancient times regarding the definition of rhythm and considers the ‘different meanings that authors have given the word “rhythm” in two and a half thousand years to be useless.’¹³³ However, he has pointed out that various Greek connotations of the word reflect the concept of organised fluency.¹³⁴

On the defining of rhythm within the context of this discussion, Apel states: ‘In its primary sense, [rhythm is] the whole feeling of movement in music, with a strong implication of both regularity and differentiation’¹³⁵, and Paul Griffiths states: ‘nothing is changeless, and so rhythm is an inevitable consequence of all music, since rhythm is the composed and/or perceived alteration of musical elements in TIME.’¹³⁶

In the music of approximately the last three and half centuries, rhythmic and durational notation presented little difficulty of interpretation since meter, rhythm and phrasing were all bound up with one another. Such practices as cross rhythm and syncopation presented no notational problems and even the occasional irregularities that occurred could easily be recognised, labelled and notated.

¹³³ Sachs, C., *Rhythm and Tempo*. New York: Dent, 1953, p.12. (Hereafter, Sachs, *Rhythm and Tempo*.)

¹³⁴ *Ibid.*, p.13.

¹³⁵ Apel, *Harvard Dictionary*, p.729.

¹³⁶ Griffiths, *Encyclopaedia*, p.151.

Particular types of note values, placement of barlines and grouping have all been developed in the course of history, conditioned by such factors as period and style, and have become embedded in traditional rhythmic notation. These continued to be used in the first half of the 20th century. The following example, taken from Hindemith's First String Quartet (1910), demonstrates the common metric structures still in use at that time.

- equal pulses heard at regular recurring intervals of time
- pulses of either two or three pulse groups sub-divided on several levels
- pulse groups generally maintained throughout the composition
- pulse groups - both of faster and slower levels coincide
- time-signatures mostly constant

20th century techniques are as follows:

- changing the time signature within the initial statement (bars 1-2) creating a *variable meter*
- accent displacement in subsequent entries after initial entry (bars 5-8)

The example below also demonstrates a successful union of the two stylistic techniques that together, constitute the style of the neo-Baroque. Example 9.

Example 9. Techniques that constitute the neo-Baroque and 20th Century rhythmic practices Hindemith, Quartet No. 1, Op. 10 (1919), Movement 1, bars 1-4

Sehr lebhaft, straff im Rhythmus

The musical score shows four staves: Violine I, Violine II, Viola, and Violoncell. The key signature is two flats (B-flat and E-flat). The tempo and mood are indicated as 'Sehr lebhaft, straff im Rhythmus'. The score includes dynamic markings such as 'f marcato' and 'sul G'. The time signature changes from 3/4 to 4/4 and back to 3/4. The music features complex rhythmic patterns with many accents and slurs.

It was as early as 1913 that striking and significant changes in rhythmic attitudes first appeared in Stravinsky's ballet Rite of Spring, and signalled a new and complex approach to rhythm with a cult of Primitivism based on a new musical language which included polyrhythms and rapid change of time signatures with no stable metre. Bartók's later rhythmic inventiveness, emanating from his

involvement with folk music, contained periodic alternation of irregular metres with regular, *giusto* type Rumanian rhythms and also the so-called 'Bulgarian' rhythmic groupings. Added to which, he incorporated into his Art music, ethno-musicological sources found notably in Hungarian, Yugoslavian, Turkish and Algerian folk tunes.

Thus in the early decades of this century the equilibrium of rhythm and phrasing bound to a steady meter was profoundly upset, and it became indisputably clear that contemporary music would be impoverished if limited to the regularities and ratios bequeathed to it from earlier periods 'and transmitted largely through notational conventions which reflect attitudes about life far different from ours.'¹³⁷ As a result new rhythmic trends emerged in 20th century music with resultant notational consequences.

Time Signatures

Modern Innovations

Many innovations were made to standard rhythmic notation in the first decades of the 20th century and new groupings arose. Included are the following:

- metric structures with *regularly* varied pulse groups
(e.g. Bartók: Quartet. No. 5. bars 1-6, p88)
- metric structures with *irregularly* varied pulse groups
(e.g. Stravinsky : Rite of Spring bars 142-, p89)
- metric structures with *non-synchronous* pulse groups
(e.g. Bartók: Quartet No. 3. p91)

Stravinsky's and Bartók's new rhythmic perspectives, shown below, each had their own brand of irregular but proportionate units. It was not a question, at that time, of merely substituting new irregular elements for regular ones, but rather a new and radical approach to the experience of time perception. These two composers used unusual time signatures to notate their rhythmic patterns, but this is by no means exclusive to the 20th century as earlier in the 18th and 19th centuries exceptional time signatures, for that time, were used by J.S.Bach, as for example in Prelude No. 15 in The Well Tempered Klavier: $\frac{24}{16}$; and in Beethoven's Piano Sonata Op. 111 in c minor (1822), prefaced by a time signature of $\frac{12}{32}$.

¹³⁷ Eirckson, Robert, Time Relations Journal of Music Theory, No. 7, 1963, p. 179. (Hereafter, Time Relations)

Example 10. Unusual time signatures, metric structures with regularly varied pulse groups
Bartók, *Quartet No. 5* (1934), *Scherzo*, bars 1-7

Alla bulgarese, (vivace, ♩ = 46)

The musical score consists of two systems of four staves each. The first system is labeled 'Alla bulgarese, (vivace, ♩ = 46)'. The second system begins with a boxed number '5' in the first measure. The notation includes various rhythmic values and dynamic markings such as *p*, *pizz.*, and *arco*.

- the irregularity is reflected in a new approach to time signatures
- in the *Scherzo* the asymmetrical organisation of $\frac{9}{8}$ into $\frac{4+2+3}{8}$ is clearly visible in the theme.

The *Trio* is based on the complex rhythm of $\frac{10}{8}$ subdivided into alternating groupings:

- $\frac{3+2+2+3}{8}$ $\frac{2+3+2+3}{8}$ $\frac{2+3+3+2}{8}$
- pattern groupings are regular and predictable with the 'eighth-note' groupings maintained throughout a given section, establishing a sense of continuity for player and listener alike.

This is categorised as being a *compound* time signature. Example 10.

In his use of time signatures Bartók saw a new notational answer to the rhythmic complexity he conceptualised.

The ballet example below has been chosen to illustrate the frequent change of meter, as up to that time no string quartet composition had displayed Stravinsky's approach in the use of variable meter.

Example 11. Frequent meter change
 Stravinsky, *Rite of Spring* (1913), Sacred Dance of the Chosen Virgins, bars 142-143

The image displays a page of a musical score for the 'Sacred Dance of the Chosen Virgins' from Stravinsky's 'Rite of Spring'. The score is divided into two systems, each covering bars 142 and 143. The first system includes parts for Oboe (Ob.), Clarinet in G (Cl. in G), Clarinet in Bb (Cl. in Bb), Cor in F (Cor. in F), Trumpet in C (Tr. in C), Trumpet in D (Tr. in D), Trumpet in Bb (Tr. in Bb), Trombone (Trbn.), and Timpani (Timp.). The second system includes Violin I (Vl. I), Violin II (Vl. II), Viola (Vla.), Violoncello (Vc.), and Contrabass (Cb.). The score is characterized by frequent meter changes, with time signatures of 2/8, 3/16, 2/16, 2/4, and 3/4. Performance instructions such as 'ff sempre', 'sempre sf', 'con sord.', 'div. a 3', and 'unis.' are present throughout the score.

- time-signatures of $\frac{2}{8}$, $\frac{3}{16}$, $\frac{2}{16}$, $\frac{2}{4}$ and $\frac{3}{4}$ amongst others, produce rhythmic phrases of varying lengths which result in irregular varied pulse groups.

Griffiths suggests that it is misleading to suggest that 20th century music has been distinguished by a revival of rhythm. He proffers that in music of this time, 'rhythm and meter and phrasing have been lost, so that individual beats become more prominent.'¹³⁸ Rhythmic prominence is aptly shown in the Rite of Spring with the innovative use of the following:

- rapid change of time signatures
- no stable meter
- accents used against a prevailing meter
- piling-up of cross rhythms
- importance of each individual beat within the meter

Griffiths suggests further, that The Rite of Spring is not the origin but rather 'the first triumph of a new view to rhythm at the extremes of instability and pulsing.'¹³⁹ In Stravinsky's own words, this concept of rhythm is surely a 'first triumph' when he says: 'Very little immediate tradition lies behind the *Sacre du Printemps*. I had only my ear to help me. I heard and wrote what I heard'.¹⁴⁰

Stravinsky's use of the unequal unit with consistent patterning of eighth notes and the lack of regularity of the larger unit (Sacrificial Dance) are often quoted as perfect examples of original rhythmic phrase constructions, and Stravinsky is said to have commented, in conversation to Robert Craft, that no composer, to his knowledge, has extended the idea of variable meter further.¹⁴¹

Whereas Bartók and Stravinsky used multiple sub-divisions and frequent changes of time signatures, Hindemith in the second movement of the Third Quartet (1922) (marked *Schnelle achtel. Sehr energisch* (♩ = 176-184)) translated the Baroque effect of the rhythmic pulse into the 20th century by the following modifications without the use of a time signature.

- total absence of time signature (see example below). Example 12.
- changing number of beats per bar without any indication to the performer
- the opening bar consists of five reiterated notes in all instruments, which are played as five equal notes and not as a presumed subdivision of 3+2 or 2+3. The pulse is then complicated by the irregular rhythmic organisation of the following bars where, for example, in the first six there is no regular ordering of accent.

Bukofzer calls the above points 'the rhythmic pulse not ordered by regularly returning accents at the beginning of a measure,'¹⁴² as representative of the neo-Baroque rhythmic stylistic consequences of the music.

¹³⁸ Griffiths, Encyclopaedia, p.151.

¹³⁹ *Ibid.*, p.151.

¹⁴⁰ Machlis, Introduction to Contemporary Music, p.131.

¹⁴¹ Stravinsky, I. and Robert Craft, Conversations with Igor Stravinsky, New York: Doubleday & Co., Inc., 1959, p.123. (Hereafter, Craft, Conversations)

¹⁴² Bukofzer, Manfred, 'The Neo-Baroque, in Modern Music, XXII, No. 3, March-April, 1945, p.152. (Hereafter, Bukofzer, Modern Music)

Example 12. Rhythmic pulse
 Hindemith, *Quartet No. 3, Op. 22* (1922), Movement 2, bars 1-3

Thus composers of the early 1920s and '30s preferred the challenges presented by the non-symmetrical, freer use of rhythm, where the change from one meter to another was both unpredictable and, at times, unannounced - not indicating changes of meter was a habit indulged in by Hindemith which disturbed Eschman.¹⁴³

Dissolution of time signatures

Contemporary use of Unconventional time signatures

There are various reasons behind the 'unfamiliar' use of time signature this century. Many composers have previously recognised the restrictive use of barlines which, in essence, has related significantly to the time signature for centuries. After their first use from the beginning of the 16th century, found in Agricola's *'Musica Instrumentalis'* (1529), barlines have been universally used in music until the later decades of the 20th century. In some cases the style of the composition e.g. a *Fantasia* requires no definite rhythmic structure and the irregularity of rhythmic design may require that barlines be dispensed with. Previous examples include Emanuel Bach's *Fantasia in c minor* as well as the beginning section of Beethoven's *Sonata in B flat, Op. 106*. However, in performing music of these periods, the approximate values of the notes, if not their absolute value, must be preserved. 20th century composers have also found that the use of barlines confine the free flow of the music and, as such, they have lost much of their former musical meaning for contemporary use and function. In many cases they now act, not as pulse indicators, but as technical devices for the precise indication and co-ordination of the different note values. In other cases time signatures and beats have no musical relevance since the music has neither pulse or pattern, and further, there is a dispensing of meter and barline altogether so that each duration may enter on its own terms. In scores that still use

¹⁴³ Eschman, K., *Changing Form in Music*. Boston: E.C. Schirmer Music Company, 1943, p.68. (Hereafter, Eschman, *Form*)

time signatures, the complex and innovative subdivisions of the rhythmic unit often affect their use and design. Contemporary application in the string quartet *genre* includes various unconventional time signatures which, at times, relate to a greater complexity of pulse and pattern, and at other times not, while some composers simply refrain from placing the time signature in the conventional place with little or no notational significance. Others structure unusual time signatures to the metric irregularities of the music - some of which are shown below. However, in the early quartets of this century the demise of the 'traditional' use of time signatures was evident:

String Quartets (1900-1957)

Webern : Hindemith : Bartók : Schoenberg

Webern : String Quartets, (1905-1938)

Quartet	Date	Movements	Time signatures
1. Use of <i>variable meter</i>	(1905)	1	Yes
2. <i>Langsamer Satz</i>	(1905)	1	Yes
Use of simple quadruple throughout			
3. <u>Rondo</u>	(1906)	1	
Use of compound duple throughout			
4. <u>Five Movements for String Quartet</u>			
<u>Op. 5</u>	(1909)	1 2 3 4 5	
Time signatures in all movements with a <i>variable meter</i> in (5)			
5. <u>Six Bagatelles for String Quartet</u>			
<u>Op. 9</u>	(1913)	1 2 3 4 5 6	
This quartet of six movements and an approximate playing time of 3½ minutes, has respectively, the following number of bars per movement : 10 : 8 : 9 : 8 : 13 : 9 : all of which have time signatures. Despite the brevity of writing Movements 1,4,5, have <i>variable meters</i> with three changes each.			
6. <u>String Quartet Op. 28</u>	(1937)	1 2 3	
All movements have a time signature with 2 and 3 making alternatively little and extensive use of <i>variable meter</i> respectively. Included in the last movement is the use of $\frac{3}{32}$ for ten bars.			

Hindemith : String Quartets Nos.1-6, (1921-1949)

Quartet	Date	Movements	Time signatures
<u>No. 1 : Op. 10</u>	(1921)	1 2 3	

Use of conventional time signatures in all movements.

<u>No. 2 : Op. 16</u>	(1922)	1 2 3	
Movement 1:			No
2:			No
3:			$\frac{2}{8}$ $\frac{3}{8}$

with the instructions that the crotchet (J) 'immer gleich' = the dotted crotchet (J.)

Thus Hindemith uses a combination and mixture of rhythmic subdivisions of the beat, which add up to inter-changeable values of a crotchet or dotted crotchet per bar. See Example 13 following.

Example 13. Mixture of rhythmic subdivision of beat without change of time signature
Hindemith, Quartet No. 2, Op. 16 (1922), Movement 2, bars 144-148

145 Gleiches Zeitmaß

<u>No. 3 : Op. 22</u>	(1923)	1 2 3 4 5
-----------------------	--------	-----------

Movement 1 : No

the *fugato* subject states a variance of meter between bars 1 - 5. Bar 1 consists of five crotchets, 5, and the three bars following

(bars 2-4) continue the subject in a subdivision of the beat equal to 4.

Quartet	Date	Movements	Time signatures
---------	------	-----------	-----------------

Quite unlike the approach to variable meter of either Schoenberg or Bartók, Hindemith, in fact, uses a variable meter without notating time changes. This omission occurs throughout the movement with the basic crotchet pulse being contained in a subdivision mixture of the following numerators without any regularity

5 4 3
 ↓ ↓ ↓

Movement 2	No
------------	----

with the last four bars ending with unstated variable time signature of

4 3 5 5
 ↓ ↓ ↓ ↓

Movement 3	Yes
------------	-----

Movement 4	No
------------	----

Movement 5	No
------------	----

with the first seven bars changing the subdivision of the beat between

4 3 4 2
 ↓ ↓ ↓ ↓

which continues without any regular ordering of the variable meter to the end of the movement.

<u>No. 4 : Op. 32</u>	(1923)	1 2 3 4	
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Movement 1

within the double fugue subject entry Hindemith once again uses a variable subdivision of the beat without indicating the change.

Movement 2

use of *polymeter* where the Violin 1 and Cello use a (C) in simple time against a 12/8 compound quadruple in the Violin 2 and Viola. This arrangement appears again later in the movement but with a reverse order of both time signatures and instrumentation.*

Movement 3

at the end of this movement there is a rare notating of *variable meter*

<u>No. 5 : (in Es)</u>	(1944)	1 2 3 4	Yes
--------------------------	--------	---------	-----

<u>No. 6</u>	(1949)	1 2 3 4	Yes
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Comment

Despite utilising an unnotated *variable meter* in successive bars in many movements, Hindemith uses fairly conventional subdivisions of the beat. Thus when he fails to show a time signature, it is the result of an explicit and readily grasped variation of the beats per bar.

Bartók : String Quartets Nos. 1-6, (1908-1943)

Quartet	Date	Movements	Time signatures
<u>No. 1: Op. 7</u>	(1908)	1 2 3	Yes
<u>No. 2: Op. 17</u>	(1917)	1 2 3	
Movement 1			Yes

Bartók makes early use of a *polymeter* and *compound meter* with a mixture of $\frac{8}{8}$ in each of the upper three parts and $\frac{3}{8}$ in the cello part. This causes an asymmetrical bar arrangement between the parts as shown below: Example 14.

Example 14. Polymeter and compound meter
Bartók, Quartet No. 2, Op. 17 (1917), Movement 1, bars 54-55

Bartók makes use of other combinations of *polymeter* in this movement.

Movement 2	Yes
Movement 3	Yes

<u>No. 3</u>	(1927)	1 2	
Movement 1			Yes
use of <i>variable meter</i>			
Movement 2			Yes
use of <i>variable meter</i> and <i>polymeter</i>			

Quartet	Date	Movements	Time signatures
<u>No. 4</u>	(1928)	1 2 3 4 5	
Movement 1			Yes
Movement 2			Yes
<p>at bar 76 Bartók changes , firstly, only the cello part from $\frac{6}{8}$ to $\frac{3}{4}$, with the compound pattern (♪ ♪) remaining in the other parts against the simple sub division of the cello (♪ ♪). Then the simple division is given to Violin 2 and Violin 1 in each of the following bars against the original continuing $\frac{6}{8}$ rhythm in the Viola part. This scheme continues for twenty bars and the <i>polymeter</i> between the various parts is shown in a variety of combinations. However no asymmetry of barlines occurs.</p>			
Movement 3			Yes
Movement 4			Yes
Movement 5			Yes
<u>No. 5</u>	(1934)	1 2 3 4 5	
Movement 1			Yes
<i>variable meter</i>			
Movement 2			Yes
Movement 3			Yes
<i>compound meter</i> used in both the <i>Scherzo</i> and <i>Trio</i>			
Movement 4			Yes
<i>limited use of variable meter</i>			
Movement 5			Yes
<u>No. 6</u>	(1939)	1 2 3 4	
Movement 1			Yes
Movement 2			Yes
<i>limited use of variable meter</i>			
Movement 3			Yes
<i>limited use of variable meter</i>			
Movement 4			Yes

Comment

Bartók's most radical approach to time signatures appears in the Fifth Quartet (1943) where the 'Bulgarian' rhythms - which he used often in his later works - are a study in asymmetrical organisation of the $\frac{3}{8}$ compound triple rhythm divided into clear, visible, subdivisions of the beat.

He meticulously notates all time changes. Bartók's use of the less traditional time signatures centres around :

variable meter

compound meter

polymeter

Schoenberg : String Quartets Nos. 1-4, (1904/5-1936)

Quartet	Date	Movements	Time signatures
<u>No.1: Op. 7</u>	(1904/5)	Single (sectional)	Yes
<u>No. 2: Op. 10</u>	(1907/8)	1 2 3 4	Yes
<u>No. 3: Op. 30</u>	(1926/27)	1 2 3 4	Yes
Movement 4			
use of <i>variable meter</i>			
<u>No. 4: Op. 37</u>	(1936)	1 2 3 4	Yes
Movement 1			
use of simple quadruple throughout			
Movement 2			
use of <i>variable meter</i>			
Movement 3			
use of <i>variable meter</i>			
Movement 4			
use of <i>variable meter</i>			

Use of Time Signatures : 1900-1952

Of the other string quartets examined written between 1900-1952 time signatures featured as follows:

Composer	Quartet	Date	Movements	Time signatures
Ives	Quartet No. 2	(1907-)	1 2 3	Yes
Cowell	Movement for String Quartet	(1934)	1	Yes
Prokofiev	Quartet No. 2	(1948)	1 2 3	Yes
Cage	String Quartet in Four Parts	(1949-)	1 2 3 4	Yes
Carter	Fantasia	(1951) (see Metric Modulation)	1 2 3	Yes
Feldman	Structures for String Quartet	(1951)	1	Yes
Rochberg	String Quartet	(1952)	1 2 3 4	Yes (variable meter)

Comment

In the early decades of the 20th century composers broke away from using single time signatures, or only the occasional changes of meter, within a movement. New rhythmic complexities were now defined mostly by the use of *variable*, *compound* and *polymeter* time signatures. This resulted from exposure to the many and varied influences and changing musical philosophies discussed in Part I.

It was unusual for that period not to indicate a time signature, but in Hindemith's case neither the lack of time signatures nor the complex time changes were considered to be a crucial factor to time identification, as the subdivisions of the beat were structured in such a way as to be easily discernible. At that time, too, Schoenberg and Webern were much more concerned with the dissolution of functional harmony and the introduction of the 12-tone method into their compositions than with adopting a radical approach to rhythm. This development contrasted acutely to the imaginative approach to rhythms of both Bartók and Stravinsky, and also to the motoric rhythms of Hindemith's neo-Baroque.

Generally, in the early decades of the 20th century, all the innovative rhythmic patterns were able to be confined and described within the basis of traditional principles and 'common practice' symbols, as the concepts of rhythm and meter had not, as yet, expanded much beyond extension and simplification.

However, time signatures were not to be totally discarded, but their continued use was to become inconsistent in the light of the musical syntax that was to develop in the second half of the century. Karkoschka says of contemporary thought that musical ideas have, apparently, changed so much in two generations that the entire previous framework of notation - and not only that - seems to have been exploded.¹⁴⁴

Use of Time Signatures : 1950-

In the post-1950 quartets that have been researched (see Scores), time signatures are found in the following scores:

Composer	Quartet	Date	Time signatures
Bartolozzi	<i>Quartetto per Archi</i>	1960	
Fisher	Quartet No. 1	1961-2	
Cowell	Quartet No. 5	1962	
Hiller	Quartet No. 5 in $\frac{1}{4}$ Tones	1962	
Berio	<i>Sincronie</i> : for String Quartet	1963-4	some use of
Shifrin	Quartet No. 3	1965-6	
Powell	Filigree Setting for String Quartet	1965	some use of
Bennett	Quartet No. 4	1966	
Ferneyhough	Sonatas for String Quartet	1967	
Becker	<i>Streichquartett Nr. II</i>	1967	unusual use of a large single figure to denote the value of varying selected beats per bar e.g. ((1 = \downarrow : bar 14) or (3 = \downarrow : bar 136))
Ligeti	Quartet No. 2	1968	
Bredemeyer	<i>Streichquartett</i>	1968	some use of

¹⁴⁴ Karkoschka, *Notation in New Music*, Translated from German by Rati Koenig, London: Universal Edition, 1972, p.1. (Hereafter, Karkoschka, *Notation in New Music*)

Composer	Quartet	Date	Time signatures
Crumb	Black Angels	1970	some use of
Wyschnegradsky	<i>Composition Pour Quatour à Cordes</i>	1970	
Sculthorpe	Quartet No. 8	1970	some use of
Tschaikowsky	Quartet in A	1971	
Kirchner	Quartet No. 3	1971	some use of
Wuorinen	String Quartet	1971	
Holliger	String Quartet	1973	some use of
Szokolay	<i>Streichquartett Nr. 3</i>	1973	
Britten	Quartet No. 3	1975	
Henze	Quartet No. 5	1976-7	
Rihm	<i>Im Innersten Drittes Streichquartett</i>	1976	
Schmidt	<i>Zweites Streichquartett</i>	1979	
Lachenmann	<i>Gran Torso für Streichquartett</i>	1971-6-8	
Ferneyhough	Quartet No. 2	1980	
Brandmüller	Quartet No. 1	1983	
Heyn	<i>Sirènes für Streichquartett</i>	1983	
Gielen	<i>Streichquartett</i>	1983	
Matthews	Quartet No. 1	1983	
Danielpour	String Quartet	1983	
Dillon	String Quartet	1983	
Brandmüller	Quartet No. 2	1985-6	
Hoenigsberg	Movement for String Quartet	1985	
Volans	Hunting: Gathering 11	1987	
Huber	Doubles	1987	
Brewaeys	String Quartet	1989	
Reynolds	Coconino - a shattered landscape	1989	
Cerha	<i>II. Streichquartett</i>	1989-90	
Casterede	<i>Quartettsatz</i>	1989	
Lachenmann	<i>II. Streichquartett</i>	1989	
Yun	<i>Streichquartett</i>	1989	some use of
Tippett	Quartet No. 5	1989	

Comment

In the foregoing discussion it has been shown that time signatures continue to be a viable reference for different rhythmic patterns and metric subdivisions well into the 1980s. However, in certain compositions, the use of the time signature took on a variety of meanings and in many cases had no reference to meter and note-values of traditional intent. Music's rhythmic complexities further diminished the standard implications and appropriateness of the time signature as a beat indicator and, in many cases, duration evolved a flexibility which rendered it's use futile.

Unusual Time Signatures

$\frac{10}{16}$	Elliot Carter	String Quartet No. 2 (1959)
$\frac{11}{16}$	Leon Kirchner	String Quartet No. 1 (1949)
$\frac{13}{16}$	Leon Kirchner	String Quartet No. 1
$\frac{15}{16}$	Elliot Carter	String Quartet No. 1 (1951)
$\frac{10}{32}$	George Rochberg	String Quartet (1957)
$\frac{10}{32}$	Charles Wuorinen	String Quartet (1971)
$\frac{13}{8}$	Stephen Fisher	String Quartet No. 1 (1961-62)
$\frac{1}{4}$	Charles Wuorinen	String Quartet (1971)
$\frac{1}{8}$	Brian Ferneyhough	Second String Quartet (1980)
$\frac{1}{2}$	Gunther Becker	String Quartet No. 2 (1967)
1	Gunther Becker	String Quartet No. 2 (1967)

Comment

Thus the natural evolution of musical rhythm, the contemporary use of irregular metre and the exploration of unconventional rhythmic ideas have resulted in music full of varying and unfamiliar time signatures.

Numerators and Denominators

Conventional time signatures, in which the upper figure stands for the number of beats and lower figure stands for the kind of beats per bar, are suitable wherever the bars are built up of identical units with simple multiples of the pulse. Certain composers this century have chosen to notate time signatures with modifications to the standard symbols. The following examples occur from the early 1920s and show a range of subjective uses without necessarily significantly affecting the rhythmic intent of the score.

- Schoenberg has placed a *single large fraction-like signature* to encompass the stave from the top to the bottom: Fourth String Quartet (1939), Mov. 1.

whereas

- Bennett has placed a *single large time signature* to incorporate the Violin 2 and Viola staves: String Quartet No. 4 (1966)

and

- Ferneyhough, on the other hand, places a *large single time signature* in between the Violin 2 and Viola staves: Sonatas for String Quartet (1967)

with

- Holliger using only the *occasional single* number to denote time duration per second and a limited use of *fraction-like time signatures* in a quartet that has radically different time ratios and a range of new playing techniques.

Of this String Quartet of (1973) Griffiths says it is: 'a piece that contains within itself the physical and mental exhaustion that its virtuoso demands entail'¹⁴⁵ and which tests new techniques to the extreme.

¹⁴⁵ Griffiths, The String Quartet, p. 203.

Alternating Meters

To avoid the repetitious notation of regularly recurring time changes, double or triple combinations are placed at the beginning of the movement or phrase, indicating a continuation of a pattern of consecutive alternating meters per bar: e.g. $\frac{6}{8} + \frac{6}{4}$

No such time signature appears in the quartets researched.

Variable Meters

Variable meters are used where no consistent beat occurs in the ensuing bars and thus a new time signature is necessary for each following bar or bars. Composers use various ways of notating these new and changing time signatures:

- Carter in *Fantasia (1951)* uses many *tempo* and time signature changes throughout the three movements of this quartet and ends the third movement *Variations* with this selection of variable meters in the last ten bars: 495-505 :

$$\begin{array}{cccccccccc} 2 & 3 & 6 & 6 & 4 & 6 & 3 & 4 & 5 & 4 \\ 4 & 8 & 8 & 8 & 4 & 8 & 8 & 8 & 8 & 4 \end{array}$$

However, this particular type of *variable meter* is extended beyond the concept of a changing the sub division of the beat and is a technique called *metric modulation* which was introduced by Carter. The pulse is changed from one passage to the next and is done in conjunction with a changing meter by introducing a rhythmic character as a cross rhythm

Modulation)

- Despite F...
his personal
states:

E... subdivisions serve only as a means of orientation; they have no function of articulation, and they are not intended to mark a metre or a pulsation. Accents are to be played only when notated; nowhere should a feeling of barring be created. ¹⁴⁶

¹⁴⁶ Fisher, *String Quartet No. 1*, Edition Peters, Corporation, New York, London, Frankfurt, 1964, in *Instruction for Performance*. (Hereafter, Fisher, *String Quartet No. 1*)

The quartet ends, in the last fourteen bars, with the following selection of changing time signatures. However, if the immediate statement above denies their traditional function and use, it could be suggested that using a time signature at all, results in a certain immateriality.

$$\begin{array}{cccccccccccc} \frac{3}{4} & \frac{6}{4} & \frac{2}{4} & \frac{1}{4} & \frac{2}{4} & \frac{3}{4} & \text{---} & \frac{4}{4} & \text{----} & \frac{2}{4} & \frac{4}{4} & \frac{3}{4} & \text{-----} \\ \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} & \frac{4}{4} \end{array}$$

- Berio in Sincronie: for String Quartet: (1963 - 1964) has availed himself of a *fair use of the variable meter*

$$\begin{array}{cccccc} \frac{2}{8} & \frac{3}{8} & \frac{4}{8} & \frac{3}{16} & \frac{2}{8} & \frac{3}{8} \end{array}$$

which alternates between the quaver and semi-quaver denominator, as shown above, and with the use of a crotchet denominator to a lesser extent.

These he places between Violins 1 and 2, and Viola and Cello respectively.

- Rochberg also has a wide selection of *variable meter* in the his String Quartet (1952) which ends, in the third movement, with a different time signature for each of the last nine bars, with the exception between bars 3 and 4, as follows:

$$\begin{array}{ccccccccc} \frac{11}{16} & \frac{6}{8} & \frac{6}{16} & \frac{6}{16} & \frac{7}{16} & \frac{4}{8} & \frac{3}{8} & \frac{5}{8} & \frac{6}{8} \end{array}$$

- Dillon's String Quartet (1983) has a *multifarious use of variable time signatures*. In a composition of 327 bars, (with a suggested playing time of 20 minutes) only the following bars consecutively retain the meter:

: between bars 185 - 196

- Dillon uses an unus

$$\begin{array}{cccc} \frac{3}{8} & & \frac{9}{16} & \frac{7}{16} \\ & 16 & & \end{array}$$

and

- Ferneyhough's String Quartet No. 2 (1980), in the initial solo of Violin 1: bars 1 - 13, has a change of time signature in every bar but without a time indication in the first. These are arranged as follows:

bar 1: no time signature but an indication that the seven notes are = the value of a quaver (♩). This makes the suggested time signature read:

$$\frac{1}{8}$$

bars 2 - 13 : respectively are notated:

$$\frac{5}{8} : \frac{3}{8} : \frac{2}{8} : \frac{8}{8} : \frac{1}{8} : \frac{5}{8} : \frac{3}{8} : \frac{4}{8} : \frac{2}{8} : \frac{5}{8} : \frac{6}{8}$$

Although this appears to be a stable quaver meter progressing from bar to bar within the denominator of a quaver unit (♪), the *tempo* markings placed above almost every bar indicate metronome changes, thus creating the following *tempo* fluctuations:

bar	1 - 2	= ca. 70
bar	3 - 5	= ca. 56
bar	6	= ca. 82
bars	7 - 8	= ca. 56
bars	9 - 10	= ca. 70
	with <i>molto rall. to</i>	= ca. 56
bars	11 - 13	= ca. 70
	with <i>molto rall. to</i>	= ca. 56

Ferneyhough's single movement quartet has a total of 164 bars. Of these bars, only 33 retain the time signature of the bars immediately preceding them. It is interesting to note that the only denominator used within the concept of the *variable meter* throughout the quartet is the $\frac{1}{8}$ note (quaver),

while

- Gielen in his five movement *Streichquartett, Un vieux souvenir* (1983) has for the last movement a mostly barless, asynchronous series of large dissonant intervals ranging between 7th - 9ths (with the exception of the first two lines of the movement). The *variable meter* occurs in the following bars :

bars	199 - 214
bars	263 - 287
bars	307 - 322
bars	402 - 415

i.e. a total of 57 bars within the four movements of 494 bars. Each denominator is consistently that of the *semiquaver* (♪) against a variety of numerators as follows:

$$5 : 7 : 9 : 4 : 3 : 6 : 2 :$$

- Henze, on the other hand has a set of basic *variable time signatures* written directly above the staff : String Quartet No. 5 (1976)
with
- Lachenmann enclosing *variable time signatures* in rectangular blocks placed below each separate stave: *II. Streichquartett. 'Reigen Seliger Geister'* (1989).

whereas

- Huber uses a *variable time signature* above the staff with the denominator as a note, and not as a number

$$\begin{array}{ccccc} 5 & 4 & 5 & 2 & 5 \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \end{array}$$

in his quartet *Doubles, mit einem beweglichen Ton, für Streichquartett* (1987).

and

- Hiller in *String Quartet No. 5*: (1962), a composition written in a 24-note serial row of an even-tempered quarter-tone scale, uses in Variation 8 a succession of *variable time signatures*. Out of a variation of 79 bars, only eight take on the the time signature of the previous bar, and for only a further single bar. Some of the following combinations are included in bars 176 - 183:

$$\frac{1}{8} : \frac{2}{8} : \frac{3}{8} : \frac{11}{8} : \frac{1}{8} : \frac{3}{8} : \frac{4}{8} : \frac{1}{8}$$

Comment

The systematic change of meter in consecutive bars was introduced in the 1950s by the Chinese born German composer Boris Blacher (1903-1975) who lived most of his life in Berlin, and who used the *variable meter* to systematise rapid metrical change. However, the use of Blacher's variable meters has no connection with Carter's technique of *metric modulation*, discussed later in this chapter.

Quartets not listed above that contain variable meter:

Composer	Quartet	Date
Bartolozzi	<i>Quartetto per Archi</i>	(1960)
Powell	Filigree Setting for String Quartet	(1965)
Druckman	String Quartet No. 2	(1966)*
Bennett	String Quartet No. 4	(1966)
Ligeti	String Quartet No. 2	(1968)
Kirchner	String Quartet No. 3	(1971)
Rihm	<i>Im Innersten Drittes Streichquartett</i>	(1976)
Schmidt	<i>Zweites Streichquartett</i>	(1979)
Lachenmann	<i>Gran Torso für Streichquartett</i>	(1971-)
Danielpour	String Quartet. (Requiem)	(1983)
Volans	Hunting : Gathering II	(1987)
Reynolds	Coconino - a shattered landscape	(1989)

Mixed Meters

Mixed time signatures are used when the beats, within the bars, consist of unequal groups of successive units. This category of time signature is used quite extensively in 20th century quartet music, and one such example can be found in the following score by Stephen Fisher which has a *variety of mixed meters* used mostly for short single bar units.

- String Quartet No. 1 (1963)

Some unusual combinations are:

$\frac{6+3}{4 \ 16} : \frac{2+1}{4 \ 16}$ $\frac{4+7}{4 \ 16} : \frac{2+3}{4 \ 16}$ each for one bar
 with

- Bartolozzi, *Quartetto per Archi* (1960), using a combination containing the following:

$\frac{5+1}{4 \ 8}$ and $\frac{4+1}{4 \ 8}$ in a limited number

Fractional Meters

Another category in the list of unusual time signatures involves the use of fractions. Two kinds of fractions are used:

- those that involve a fraction added to the numerator

e.g. $\frac{3 \ 1/2}{4}$ which may also be written as $\frac{3+1}{4 \ 8}$. This is explained as being three-and-a-half times the value of the quarter note and equals three crotchet notes and one quaver note.

In Fisher's use of the above mentioned fractional meter the metric indications serve as more than arithmetic indicators to the performers.

In his String Quartet No. 1: (1961), he explains in the performance notes:

‘They were chosen, as often as possible, to indicate various motivic and segmental divisions within phrases as well as to indicate inflectional (as distinct from overtly emphasised) accents.’¹⁴⁷

¹⁴⁷ Fisher, S., String Quartet No. 1.

- The second use of fractional meter is as a fraction over a denominator e.g. $\frac{23}{4} : \frac{23}{4}$: which appears in Boulez' music, *Le Marteau sans Maître* (1953-55), translated as The Hammer without a Master, which is a chamber suite based on three short fragmentary, surrealist poems of Rene Char (1907-1988). It comprises an unusual combination of six instruments, alto flute, viola, guitar, vibraphone, a xyloimba percussion - combining the metallic sonority of the xylophone and the wood sound of the marimba - and a selection of percussion instruments (manipulated by a single player). A contralto voice combines with the instruments. Machlis comments that Boulez has stated in an essay on rhythm "I think that music should be collective magic and hysteria"¹⁴⁸, and the composers iconoclastic rhythmic musical philosophies of both these elements find compensation in his dynamic use of intensively conceived time signatures of mathematical ratios.

However, it can be said that this mechanistic use of *fractional time signatures*, such as is used by Boulez, may be mathematically comprehended by the performers, but it is doubted whether they are able to convey accurately to the audience the intended highly complex ratios. As such, this notation may represent the composer's conception of the work, but in execution, it is reasonable to expect that it can only impart an adequately close approximation of the work's intentions.

No string quartet researched contains the particular type of fractional time signature described above, although Fisher uses the fraction as *part of a variable meter* combined with a *polymer* between the four parts at bar 121 and 123 respectively:

Bar 121:	$\frac{3}{4}$	violin 1	Bar 123:	$\frac{3+1+1}{4 \ 16 \ 64}$
	$\frac{9}{8}$	violin 2		$\frac{9}{8}$
	$\frac{3}{4}$	viola		$\frac{3+1+1}{4 \ 16 \ 64}$
	$\frac{3}{4}$	cello		$\frac{3+1+1}{4 \ 16 \ 64}$

In the quartet *Doubles, mit einem beweglichen Ton* (1987), Nicolaus Huber uses a time signature which includes a fraction as follows:

Bar 132: $4 \frac{1}{2}$ = a rhythmic grouping equal to 4 (♩) notes with a single (♩) added at the end of the bar to make up the correct time signature placed above the staff.

¹⁴⁸ Machlis, *Contemporary Music*, p.495.

This rhythmic grouping is clearly set out in terms of the players' understanding and does not fall into the category where there is a perception that, more than ever, types of fractionally rhythmically complex passages can be thought of as having a meaning that lies halfway between written and sounding notes.

Polymeters - combination time signatures

Polymeters are used when there are two or more simultaneous patterns of regular accentuation occurring within the bar. This is not to be confused with the technique of cross rhythms, where two patterns with various sub-divisions of the beat are effectively organised within a single given time signature. The use of this rhythmic texture is one method of achieving a non-synchronous relationship between the parts.

Bartók uses the polymeter in the early string quartets but this technique is not a 20th century innovation. Apel¹⁴⁹ cites an example taken from the 15th century where, in Conraquus de Pistoria's *Veri almi pastoris*, different mensurations are called for in the voices without any indication. It is transcribed into mensural notation in the next example below, and Apel emphasises the point that although it is possible to write the top voice into $\frac{6}{8}$ meter, in doing so 'a particular characteristic of rhythm and phrasing is lost, to say nothing of the complete obscuring of the notation which results from such a method.'¹⁵⁰ In mensural notation of the early 14th century the practice of using combinations of different note values within a single composition was common. The time values are described in the following terms and indicate prolation which was used within a composition alternatively to indicate all the combinations stated below i.e. *modus : tempus : prolatio*, or the four combinations which consisted of the *tempus* and *prolatio* groupings, of which the latter combination was most generally practiced.

The following example clearly shows the use of :

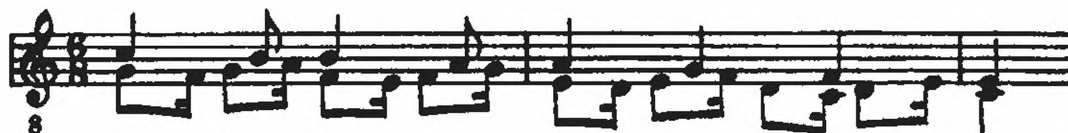
prolatio as well as a *proportio dupla* (2) and *proportio tripla* (3), which has a two to three quaver relationship (♪ : ♪♪)

- *modus* the relationship between *longa* and *brevis*
- *tempus* the relationship between *brevis* and *semibrevis*
- *prolatio* the relationship between *semibrevis* and *minima*

¹⁴⁹ Apel, *The Notation of Polymorphic Music, 900-1600*, Cambridge, Mass: The Mediaeval Academy of America, 1961. 5th edition, revised with commentary. p.429. (Hereafter, Apel, *Notation 900 - 1600*)

¹⁵⁰ *Ibid.*, p.429.

Jo. Cunelier, *Se Galas*
 Early example of *prolatio*/polymeter



In Bartók's *String Quartet No. 3* (1927) *Secunda parte*, bars 18 - 25, there is a brief use of genuine polymeter as shown in the following example. Example 15.

Example 15. Use of polymeter
 Bartók, *Quartet No. 3* (1927), Movement 2, *Secunda parte*, bars 18 - 25

- at bar 19, changing use of meter between $\frac{3}{4}$ and $\frac{2}{4}$ used simultaneously with $\frac{2}{4}$ in Violins 1, 2 and Viola against $\frac{3}{4}$ in cello

Bartók also used polymeters in an earlier quartet *String Quartet No. 2* (1920), 3 bars after No. 41 where nonsynchronous pulse groupings and different pulse rates are used in the four parts.

- the cello and viola begin with a synchronous pattern with both parts moving within a $\frac{6}{4}$ time signature but after three bars the cello changes to four crotchets per bar against six of the viola

- Bartolozzi: *Quartetto per Archi* (1960): Mov. 2: bars 48 - 49 there is the use of *polymeter* where the stable meter of the cello is kept against the *variable meters* of the upper parts as shown below:

5/8: 3/8: 5/8: 3/8: 5/16 in the other three parts : Violins 1,2 & Viola
 4/4 : Cello

Comment

When the need arises, as shown in the above examples, composers of the 20th century use time signatures that expose the *sense* of their rhythmic innovations related to rhythmic patterns - patterns that extend far beyond those of preceding centuries.

Dispensing of Denominator

It has become common practise among some composers of this century to dispense with the use of the denominator indicating the pulse of a unit per bar. Instead, a *single large figure* is written on or over the staff, leaving the performer to deduce the value of the intended pulse. This is done by both observing the pattern arrangements generated by the notes within the bar, and logically assessing the relevant pulse.

Often composers couple this time indication with a metronome mark written above the staff which is equated to an accompanying note value: e.g.

(♩ = 126).

This particular technique is found in Gunther Becker's *Streichquartett Nr. 11* where a single large figure replaces the use of both the numerator and denominator and relates the rhythm and *tempo* of the bar to a time span - in this case to five seconds. The example following demonstrates this use: Example 16.

Powell states that the X replaces a time signature where there are no fixed common *tempi* and /or metrical units. Notice the following points :

- The players all begin simultaneously and proceed, as directed, quite independently.
- Despite the varied grouping of patterns of the same note value ($\frac{\text{F}}{4}$), they nevertheless produce a composite rhythm that abdicates any pulse references.
- Violins 1 and 2 measure their rhythmic units through the subdivision of the beamed groupings.
- In this passage of obscured meter, despite the simple even-note patterns, rhythmic vertical simultaneity is of no importance as the composer's performance instructions state :

Individual speeds: as fast as possible

which results in a negation of any synchronisation of the parts.

Comment

The exploration of unconventional rhythmic ideas in 20th century quartets can be seen in time signatures which, from the early decades, have lead to a striking inconsistency and dissolution in the notating of this category of 'conventional' symbols.

Below are some of the contemporary uses:

- unusual time signatures
- absence of time signatures
- alternating meters
- variable meters
- compound meters
- mixed meters
- fractional meters (category 2 not found)
- compound meters with unorthodox groupings
- polymeters
- dispensing of denominator
- new symbols

Despite expansion and flexibility in the rhythmic aspect of contemporary thought and its continuing state of rapid transition in the second half of this century, in the above mentioned quartets, with the exception of the Hindemith, conventional notation is used within the durational structure of a time

signature. The notating depends mostly on musical appropriateness to demonstrate the rhythmic explicitness of the music, although at other times depending simply on a personal preference. Powell alone uses a completely new symbol to emphasize irregular rhythmic simultaneities.

Metric Modulation

The term *modulation* is traditionally applied to the process of tonality change, i.e. a change of key within a composition. It was considered to be an harmonic device solely for tonal shift from the 15th century until the second half of the 20th century, whereupon the implications of the term took on a different meaning.

Apel¹⁵¹ suggests that Obrecht (c. 1450-1505) and Josquin (c. 1450-1521) seem to have been the first composers to make deliberate use of tonal modulations - passing through five or six keys. These modulations were generally down to the lower fifth: D-G-C-F-B \flat , etc. This process developed further and continued, throughout the following centuries, to represent an essential structural harmonic plan in many categories of musical composition. In the early decades of the 20th century both Schoenberg and Schenker realized that the concept of modulation was not a fundamental rationalization of structure and their respective theories largely supplanted the traditional concepts of modulation as an integral part of a composition. Modulation is effected in various ways. An important aspect of the harmonic theory which demonstrates modulation is the 'pivot' chord which functions as a common chord in both the old and the new key.

With the introduction of the term *metric modulation* a new concept of modulation is introduced. Usually associated with the American composer Elliott Carter, but also with other contemporary composers, there occurred a fusion of metric structures involving *changes in pulse groupings* and *changes in pulse rate*. The term *modulation* which traditionally involved the use of a 'pivot' structure - amongst other devices - was retained to describe the new technique, for contained within the theory of *metric modulation* is the '*pivot note value*' which continues to function in both the old and the new time structures.

This system involves making the value of *one note* of the *old tempo and meter* become *equivalent to another note value* in the *new tempo and meter* through the use of a pivotal subdivision of the beat that is common to both time structures. The subdivision of the beat acts in both rhythms as a

¹⁵¹ Apel, *Harvard Dictionary*, p.537.

'seaming' between the sections and provides a degree of unity which would otherwise be lacking if the change were made without any relationship to the previous section. Another important component of metric modulation is the element of cross rhythm that is created from the adjacent use of the dotted rhythmic pulse of compound meter and the undotted pulse of simple meter (or *vice versa*).

The example below is taken from Carter's String Quartet No. 1 (1951) to illustrate two aspects of metric modulation: Example 18.

- the adjacent use of compound and simple meter equal to the same *tempo* by the use of the metronome indication (bars 19-22)
- the pivotal rhythmic element that acts as a metric modulation (bars 13-22)

There are certain additional aspects of notation that are significantly used in *metric modulation*, which the example also illustrates. They are as follows:

- a light double-bar between two measures always indicating a change of time value in the written notes. In this case it is from a dotted quaver to a crotchet note: ($\text{♩} = \text{♩} (\text{♩} = 120)$ at (bars 21-22))
- at the double bar the relationship between the notation of one bar and the next is given by an equation of note values and speed indications
- the first note refers to the note values of the preceding bar and the second to those in the bar following - as shown below where, at the barlines, changes in speed are indicated.

Example 18. Metric modulation
Carter, String Quartet No. 1 (1951), Movement 1, bars 19-23

Duration: Notice the change from the compound to the simple pulse rate.

<i>Compound</i>	bars:	20	21
bars 20-21	$\frac{4}{4}$ =	♩.	♩.
<i>Simple</i>		22	23
bars 22-	$\frac{4}{4}$	$\text{♩} \text{♩} \text{♩} \text{♩}$	etc.

Metronome marking:

bars 20-21	$\text{♩.} = 120$	(continued from bar 17)
bars 22-	$\text{♩} = 120$	($\text{♩} = 120$)

Explanation:

- in bars 20-21 the dotted quaver (♩.) notes are played in the cello part at the rate of $\text{♩.} = 120$ which is the *old note value*
- in bar 22- the crotchets (♩) notes are played by the cello and viola parts respectively at the rate of $\text{♩} = 120$ which is the *new note value*

Thus, bars 20-21 and 22-23 must continue to sound rhythmically identical despite the adjacent change of note value which, although notated differently, allows the music to move without a pause at a constant pulse rate = 120

$$\frac{4}{4} = \frac{4}{4} = 120$$

$$\text{♩} \text{♩} \text{♩} \text{♩} = \text{♩} \text{♩} \text{♩} \text{♩} = 120$$

From bars 13-17 the ratio between the speed of each pulse-change is related to the value of the semiquaver as follows:

bars 3-14	speed $\text{♩} = 72$	$4 \text{ ♩} \times 72 = 288$ per metronome
bar 15	speed $\text{♩.} = 72$	$5 \text{ ♩} \times 72 = 360$..
bar 17	speed $\text{♩.} = 120$	$3 \text{ ♩} \times 120 = 360$..

i.e. a speed relationship between the changes of 4:5.

From this, the inversely proportional mathematical principle is used to determine the metronome marking of the new *tempo* where, in this case, the *tempo* is inversely proportional to the number of pivot note values thus:

$$\frac{\text{new tempo}}{\text{old tempo}} = \frac{\text{number of 'pivot note values' in old metric unit}}{\text{number of 'pivot note values' in new metric unit}}$$

Presuming that there is no speed indicated between the change of *tempo* at bars 14-15 in the Carter example above, then by using the above formula the new *tempo* at bar 15 is determined thus:

$$\frac{\text{new tempo } (x)}{72} = \frac{4 \text{ (♩)}}{5 \text{ (♩)}} \quad 5x = 360 \quad x = 72$$

Therefore the *new tempo* in bar 15 is (♩) = 72

Early Proportions - *Proportio*

Proportional change is the diminution and augmentation of metrical values in certain arithmetic ratios, and occurred commonly as a characteristic feature of Flemish music of the 15th and early 16th centuries where the 2:3 ratio - amongst a great variety of unequal ratios - was mostly practised in relationships between sections of duple and triple meter. Apel states that the history of sectional relationships goes back to considerably earlier periods where, 'the first traces of this method are encountered in some of the *clausulae* [cadence - particularly the cadential formulas of 16th-century polyphonic music]. Tinctoris in (*Diffinitorium* [c. 1475; printed c. 1494])¹⁵², treated this aspect, as all others, most exhaustively in his theoretical writings. Apel says further, that in this period the system of proportions developed far beyond the bounds of practical application and into the realm of pure speculation. 'Gafurius, for instance, does not hesitate to explain proportions calling for a diminution in the ratio of 9:23'.¹⁵³ Needless to say, even the theoretical value of such extravagances is doubtful, to say nothing of their bearing on actual music.

Metric modulation - common pivotal element

As discussed earlier, a crucial aspect of metrical modulation of the second half of this century, is the presence of a subdivision of the beat acting as a common pivotal element.

In Example 18, this metamorphosis is clearly demonstrated by the changing pivotal rhythmic pattern values (coupled with a variance in speed) at bars 21-22. From bars 13-22 the modulation is explained as follows:

- a simple ($\frac{4}{4}$) subdivision of the beat starting at bar 13 (♩ = 72)
- to a compound subdivision ($\frac{6}{16}$) of the beat at bar 17 (♩ = 120)
- and back again at bar 22 to a simple meter ($\frac{4}{4}$) (♩ = 120)

¹⁵² Apel, *Harvard Dictionary*, p. 176.

¹⁵³ Apel, *Notation 900-1600*, p. 145.

Irregular note groupings, such as are found in bar 14, have the capacity to perform in either compound or simple meter and act in just that capacity by changing from 5 semiquavers = 4 semiquavers = 6 semiquavers grouped firstly in simple, and then in compound time.

The modulatory section starts in bar 14 where

- the subdivision of five semiquavers ($\overline{\overline{\overline{\overline{\overline{\cdot}}}}}$) is shown in simple time
- and gradually takes on a function in bar 17 reflected as a compound meter. ($\overline{\overline{\cdot}} \overline{\overline{\cdot}}$)
- thus the modulatory 'seaming' occurs where the irregular grouping of the five semi-quavers can function both in simple and compound time, allowing a metric modulation to evolve through a common pivotal rhythmic subdivision of the beat.

The existence of a modulatory number of bars is the essential difference between the *prolatio* of the earlier centuries and the more complex use of this technique in the 20th century.

Barlines

As discussed in an earlier chapter, most Renaissance music is unbarred, and in editing it and Medieval music, the barring should never be dictated by the *tactus* theory - the 15th and 16th century term for 'beat'. The purpose of barlines, in this period, differed from present day practice as it was used primarily as a means of orientation, without implying a regular beat. When barlines did appear, they were included in the music for a variety of reasons, and were only regulated with regard to the pulse and meter in the 17th century when it became common practice to place a single solid line through the score from top to bottom.

Barlines in the 20th century

20th century composers have tampered with many aspects of standard notation and the barline is no exception. For centuries it has been tied to meter, outlining the regular pulse, but without necessarily being intended only as a primary stress element.

Early in the 20th century, many rhythmic concepts were available to composers and assimilated into art music. The expansion and complexities of durational groupings prompted a need for greater freedom of rhythmic notation, and a modification of the placement and purpose of the barline found its way into modern scores.

Composers in the early decades of this century added a succession of secondary dotted lines to the primary solid lines. Later, the function was changed and modified from being related only to a specific time span, controlled by equal units and regular rhythmic settings, to pulseless, meterless unit-free durations that eventually discarded the regular use of the barline altogether. Rhythmic freedom now became an integral part of Western music, and associated with this changing aspect, contemporary perceptions altered the former control exercised by the use of the single, solid barline.

Irregular Placement of the Barline

Early in this century, composers chose to arrange barlines in a way that exposed the sense of the music resulting in unorthodox positioning of the barline.

When found in contemporary scores, barline placement is open to a variety of interpretations. Beats are now added or subtracted to form irregular rhythms; polyrhythms appear, as do ever changing meters, resulting in a disregard for rules.

The barline is once again used as a means of ensemble orientation, as contemporary asymmetrical rhythms, unusual metric structures, and obscured pulses create a need to indicate the areas of simultaneousness.

The 'unorthodox' use of barlines indicates:

- irregular sub-divisions of the beat
- polymeters
- a clarification of asymmetrical note-groupings in ensemble playing
- emphasis of the importance of either rhythmic or motivic structures
- a guide line for the co-ordination of aspects of musical syntax
- as time indicators e.g. when marked in seconds

Irregular Barlines and Polymeters

Bartók, in his early String Quartet No. 3 (1927), uses irregular barlines, staggered between the parts in such a way as to accommodate the use of polyrhythms in Part 2 of the two movement work. The following example demonstrates his particular subdivision of the changing beats. Each part is allocated its own rhythm with the separate barlines no longer serving as a common point of reference. Example 19.

Example 19. Polymeter and adjusted barlines
 Bartók, *String Quartet No. 3* (1927), Part 2: (between) 37-38

The image shows a musical score for Example 19, consisting of four staves. The top staff is for the Violin 1, the second for Violin 2, the third for Viola, and the bottom for Cello. The score is marked 'a punta d'arco (al 0)' and includes a box around the number 37. The notation is complex, with various rhythmic values and time signature changes. The Cello part has a constant time signature of 2/4, while the other instruments have changing time signatures.

- Viola : Bartók changes the time signature at bar 37 from : $\frac{2}{4}$ to $\frac{3}{4}$ to $\frac{2}{4}$ and back to $\frac{3}{4}$
- Violins 1 and 2 : Cello: constant time signature of $\frac{2}{4}$

The polyrhythms, created by the use of polymeters, affect the positions of the barlines, causing irregular barring between the parts. Bartók could have scored the pulse changes between the instruments in a different way - by the use of a single barline for all the parts. This would have resulted in a conflict of rhythmic notation, as only one of the two time signatures could be 'correctly' structured within the meter, with the other time signature having adjustments in the form of irregular notational groupings beamed across the barline.

Contemporary use of Modified Barlines and Polymeter

Without time signatures, the barline loses its universally accepted implications and a multiplicity of meanings and functions emerge.

In the second half of the century, the use of increasingly meterless, pulseless music, without time-signatures, communal *tempi* or metrical units, provided the means for rhythmic independence between the parts, which in turn produced a whole variety of notational procedures and meanings with regard to the positioning of the barline. These diverse practices, however, are not under discussion in this section of the investigation, as each composer uses his own practical method of inserting barlines to ensure that the notational indications are a direct translation of the auditory requirements.

Pertinent to this discussion are the quartets of the early decades of this century, where irregular durational structures result in barline modification. Some examples of recent works that retain time signatures with asymmetrical barline positioning, are also discussed.

Irregular Dotted Barlines

The most prevalent modification of the barline in use in present-day music is the dotted line. These lines generally act as secondary pulsation indicators for either,

- the subdivision of complex rhythms to enable a player to assimilate intricate reoccurring patterns
- subdivisions of a standard time signature especially in ensemble playing, or alternatively
- to show the structure of compound meters.

The increasing use of polyrhythms and polymeters in contemporary ensemble works necessitates the use of 'staggered', irregular barlines, to accommodate the contrary pulse relationships that exist between the different note-groupings of mixed time-signatures. When this multiplicity appears in a single section of a composition, each composer notates the changes in his own way. This is demonstrated in examples that follow.

Dotted Barlines : Secondary Pulsation Indicators

Dotted barlines are used for clarification of irregular subdivisions of standard time signatures.

In the following example Bartók's use of separate dotted lines for each part shows an uncharacteristic and varying subdivision of the normal time signature i.e. ($\frac{4}{4}$): thus creating a conflict between the repeated rhythmic pattern and the given time signature. Example 20.

- Between each primary solid barline, dotted lines occur to subdivide the four parts into separate rhythmic pairs:
 - violins 1 and 2,
 - viola and cello.
- in each pair there is a different subdivision of the beat within the ($\frac{4}{4}$) time signature
- violin 1 and 2 : within simple quadruple the normal accent comes on beats 1 and 3. But in this rhythmic pattern the longer notes create a syncopated effect. ($\frac{4}{4}$ ♩ ♩ ♩ ♩ |)
- thus the stress-note of the rhythmic pattern is in contradiction to the time signature.
- the use of the dotted line clarifies the importance of the repeated rhythmic grouping
- viola and cello have the reverse pattern

Example 20. Dotted barlines
Bartók, String Quartet No. 5 (1934), Movement 1 (at H), bars 147-148

The musical score for Example 20 consists of four staves. Above the first staff, the tempo is marked "poco rit." followed by "Tempo I. (♩ = 132)". A circled letter "H" is placed above the first staff. Dynamic markings include "dim. . . mf" and "sempre f". The text "in rilievo sin al. e. ♯" is written below the third staff. The score shows complex rhythmic patterns with dotted lines and syncopation.

The effect of the deliberate disturbance of the normal pulse of meter, accent or rhythm is not unusual and was first used in the French *Ars Nova*, by Machaut, and reached its all-time peak of complication in the music of the late 14th century. However, 'syncopation was not explained as it is today (such an explanation would have been impossible since dynamic accent or strong beat are concepts foreign to early theorists), but as a separation of a normal group of notes by the insertion of larger values.'¹⁵⁴

What is of paramount importance, here, is that :

- the alternating recurring rhythmic patterns in the four instruments override the subdivision of the simple quadruple time and
- the dotted lines are positioned in such a way as to emphasise the dominance of the syncopated rhythmic pattern above all else, despite the use of the ($\frac{4}{4}$) time signature.

Dotted Barlines: Motivic Emphasis

Example 21. Motivic emphasis
Bartók, String Quartet No. 5 (1937), Movement 1, bars 172-175

The musical score for Example 21 consists of four staves. A box containing the number "170" is placed above the first staff. Above the second staff, the tempo is marked "poco allarg." followed by "Un poco più mosso". A tempo marking "♩ = 144" is also present. The score shows complex rhythmic patterns with dotted lines and syncopation.

¹⁵⁴ Apel, Harvard Dictionary, p. 829.

175

- Bartók has used a single dotted line
- shown in each part separately starting on different beats of the bar
- to accentuate the initiation of an important grouping of motifs, as well as the
- motivic relationship between Violins 1 and 2 : Viola and Cello, which, at times is in unison and at other times doubled at the octave. Example 21.

Extended Dotted Barlines : Ensemble Orientation

- In the following example Bartók introduces a single dotted barline placed through the four staves which serves as
- an orientation sign for the different parts of the ensemble,
- a point which restructures and clarifies the irregular and varied groupings between the pairs of instruments. Example 22.

Example 22. Extended dotted barlines for ensemble orientation
Bartók, String Quartet No. 5 (1934), Movement 1, bars 155-157

155

sempre più f

sempre più f

sempre più f

sempre più f

Dotted Barlines: Subdivision of Irregular Meter

Dotted barlines, as adopted in the Webern String Quartet *Sechs Bagatellen* (1924), are necessary to show the inconsistent use of the subdivision of this irregular meter. The Second Movement has a time signature of 5 crotchets to a bar, which is traditionally subdivided into either a 2 to 3 or 3 to 2 ratio. However, Webern's use of dotted lines clarifies a further point, that of the inconsistent apportioning throughout the movement of either one or other of the subdivisions. It proceeds as follows:

bar 1	:	2 and 3	subdivided by a dotted line through the stave
bar 2	:	3 and 2	
bar 3	:	3 and 2	
bar 4	:	2 and 3	
bar 5	:	3 and 2	
bar 6	:	3 and 2	
bar 7	:	2 and 3	
bar 8	:	only 3 beats	

Webern introduces another durational modification in the overlapping of the beats that make up a single bar.

- the last bar consists of only three of the five crotchets;
- the two 'missing' beats would, in traditional rhythmic notation, normally be found in the first bar to act as an anacrusis to a piece that ends with an insufficient number of beats.
- Webern disposes of this practice
- and uses the dotted line of the 2 : 3 ratio to enclose both the first two beats at the start of the movement, and the last two 'missing' from the last bar;
- these overlap and act as both the beginning and the end of the asymmetrical rhythmic grouping.

The movement consists of 8 bars

Further examples of displacement of Barline

The two examples following are taken from string quartets of the same period and show a contemporary approach to polymeter and barline displacement. Examples 23 and 24.

It is as Karkoschka says: 'Old music continues to be notated in the traditional manner, and new music finds its own solution for every situation.'¹⁵⁵

¹⁵⁵ Karkoschka, *Notation in New Music*, p. 9

- Bartolozzi : *Quartetto per Archi* (1960)
- Hiller : *String Quartet No. 5. (in Quarter tones)* (1962)

Example 23. Polymeter and irregular barlines between parts
Bartolozzi, *Quartetto per Archi* (1960), Movement 1, bars 49-51

Within the context of contemporary notation, Bartolozzi's use of solid irregularly positioned barlines to indicate the polymetric time signatures is straightforward, as unlike the Bartók examples, there is no conflict between note-groupings and time signatures, nor are there consistent 'motivic' structures between the parts - all the note-groupings are dissimilar and require no specific clarification through the use of secondary barlines.

Hiller, in his *String Quartet No. 5 (in Quarter Tones)* (1962), uses both solid barlines and dotted lines as primary durational and secondary pulse indicators respectively. This he does for clarification and differentiation of the simultaneous use of dual time signatures shown in the following example.

Example 24. Polymeter related to primary solid and secondary dotted barlines
Hiller, *String Quartet No. 5 (in Quarter Tones)* (1962), Movement IV, Variation 5, bars 17-19

There are two different time signatures:

- Violins 1 and 2 : $\frac{4}{4}$
- Viola and Cello : $\frac{7}{8}$
- solid barlines between the two upper parts and the two lower parts are used consistently with regard to the independent time signatures of each respective pairs of instruments
- violins 1 and 2 have a consistent solid line related to the $\frac{4}{4}$ meter with the dotted line acting as a secondary indication for the $\frac{7}{8}$ time signature of the lower parts
- the viola and cello barlines act in the exactly the opposite way with the solid lines referring to the primary time signature of their lower parts, and the dotted line indicating the secondary pulse in the upper instruments
- in the use of the primary solid lines for each pair of instruments, no conflict occurs with the given time signatures
- it is in the the use of secondary dotted lines for each pair of instruments, that a conflict of subdivision arises between their durational note-groupings and their given time signature
- when this conflict arises, dotted lines act as secondary pulse indicators

Hiller consistently indicates the dominant meter of each pair of instruments with solid lines, while using a dotted line for the secondary, conflicting pulse.

A further example, taken from Variation Twelve, bar 116, of the same quartet clearly illustrates this method of barline positioning. Example 25.

Example 25. Polymeter, primary and secondary barlines
Hiller, String Quartet No. 5 (in Quarter Tones) (1962), Movement V, Variation Twelve, bars 116-119

M Variation Twelve (Quartetto miniaturò)
Allegro ($\text{♩} = 120$)
Adagio ($\text{♩} = 110$)
Scherzando ($\text{♩} = 50$)
Risoluto ($\text{♩} = 90$)

The image shows a musical score for Variation Twelve, bars 116-119. It consists of four staves. The top staff is for Violins 1 and 2, with a time signature of 4/4 and a solid barline. The second and third staves are for Viola and Cello, with a time signature of 7/8 and a dotted barline. The bottom staff is for the double bass, with a time signature of 4/4 and a solid barline. The score includes various dynamics such as *mf*, *f*, *dim.*, and *crusc.* and is marked with a 'M' in a box.

Comment

An investigation into the use of secondary barlines shows, interestingly, that contemporary composers in the early decades of this century either used the modified barline for clarification of certain pertinent musical structures or, alternatively, found its use unnecessary within the context of their compositional procedures.

- Bartók uses modified barline indicators in only two of his six quartets: String Quartets No. 3 (1927) and No. 5 (1934).
- Webern makes some use of them as shown above: *Sechs Bagatellen* (1924)
- while neither Schoenberg nor Hindemith use any barline modifications.

Beaming

The common notational practise of joining notes in groups according to the metrical sense, which allows for a correct rhythmic 'reading' in a beat by beat system, has been generally used for centuries. However, in earlier periods, unequal combinations of note-values were often joined together indiscriminately and the beams even crossed the barlines. Towards the end of the 19th century there arose certain modifications in the customary methods of beaming when composers, such as Brahms, used beams and slurs across the barline to indicate rhythmic phrasing outside those indicated by the time. Not surprisingly, these intended markings were mostly 'corrected' by the contemporary engravers of the time, and an enduring system of change failed to develop in the last decades of the 19th century.

Changing concepts of Beaming - the Reasons

In notation, certain procedures survive simply because they feel 'comfortable and right' and any change might create problems of one sort or another for the conventional music reader. However, the purpose of notation is to convey a message clearly and concisely and, in the matter of beaming, composers of this century initially developed a way that created new freedoms within the system without discarding the points of reference such as barlines and time signatures. Therefore, of necessity, changes were structured so as to place emphasis on both visual clarity and musical meaning. Twentieth century musicians, in their desire to escape the rhythmic attitudes of the earlier centuries, began to draw on nationalistic and ethnic rhythmic practices to avoid the predictable and unadventurous patterns that became standardised in the Classical and Romantic periods. Thus a fresh

approach to rhythm was impregnated with the spirit of the age - emancipated from those of preceding centuries, influenced by the exotic - which resulted in the injection of a new and vital rhythmic sense into Western Music. This approach, in turn, affected musical notation and beaming in particular.

In times of rapid change rules become obsolete, and that which had originally been codified as traditionally 'correct' in organised musical syntax, became notationally unrealistic. Thus the precise 'fixing' of 'one meaning to one symbol' gradually became more flexible and allowed for an infinite number of variations of meaning that arose within the context of use. Composers in the 20th century, who still use conventional notation, have made important variations to the meaning of traditional symbols. In the modifications made to beaming in particular, a primary cause has been the prevalence of syncopated rhythms, followed by other factors such as the use of ostinato-like patterns and rhythmic imitation involving two or more instrumental parts. When, too, a conflict arises between meter and rhythmic phrasing, an adjustment is made to the traditional method of beaming to clarify the musical meaning between the various parts.

Among the many beaming practices used in the 20th century, the earliest solution was to carry the beam across the barline to give visual support to, and make more explicit, the intended vacillating rhythms, ostinato phrasings and imitative patterns. This practice continues today.


Beams were later modified for various other reasons and their functions and uses received considerable attention from contemporary composers resulting in a variety of different meanings that are of crucial importance to 20th century notation.

Many of the following examples occurred in the early decades of the 20th century and it is interesting to observe that significant contemporary composers of the *genre* - Hindemith, Bartók and Schoenberg - made use of beaming across the barline to demonstrate their respective innovative use of rhythm - an approach in Hindemith's earliest quartets, significantly seen, at the time, as a 'most personal individual quality with peculiarly built, independent rhythm....'¹⁵⁶ On the other hand, the brevity of Webern's chamber music limited his use of beaming and made it secondary to his musical and compositional philosophies. It is only in the third movement of the Op. 28, (1939) that Webern has used a two note intervallic grouping beamed across the barline. Bartók, in particular, made extensive use of beams to highlight imaginative groupings traceable to the rhythmic energy of folk music. In this use he displays not only unfamiliar durational patterns, but also a new approach to highlight a

¹⁵⁶ Einstein, Alfred, Paul Hindemith, in *Music and Letters*, II, No. 3, 1926, p. 23. (Hereafter, Einstein, *Modern Music*)

variety of commonly used standard musical techniques, such as the *ostinato* pattern in conjunction with other techniques - sequences, phrases and articulation.

Early use of Beaming and Slurs: 1900 -

An early use of changed beaming function was made by the innovative American composer Charles Ives who, in his Second String Quartet, composed between 1907-1913, and published in 1954, used beams to reinforce the slur within a rhythmic pattern by continuing to join the notes across the barline thus : . However this technique appears only in: Movement II, between bars: 16-17, and does not constitute an enduring approach to the changed function of beaming.

Again, it is interesting to note that despite Ives isolation from the main development in Western Music, 'what was possible in a culture that lacked a tradition has now become possible in Europe with it's centuries - old tradition,¹⁵⁷ - but some years later. The metamorphosis in beaming, initiated in earnest by Stravinsky's general approach and by Bartók's particular use in the *genre* of the string quartet, has taken on significant notational proportions in the second half of this century.

Functional Variations to traditional beaming

Many practices of traditional beaming were transformed in 20th century notation. Discussed below are the various adjustments found in the string quartets under review, from the earliest beaming modification seen in the Ives Second Quartet (1907-1913), mentioned previously, and that of the Schoenberg quartet No. 1, Op. 7 (1904-1905) - highlighting an *ostinato* pattern - to the modifications found up to the late decade of the 1980s.

Beaming to accentuate *ostinato* pattern

The historical development of the *ostinato* as a 'clearly defined phrase that is repeated persistently, usually in immediate succession, throughout a composition or a section' appears as the 'earliest examples in compositions of the 13th century, e.g. in the motet "*En mon chant Ommes*" [MS Munich, gallo-romm, 42: c1230].'¹⁵⁸

Far from disposing of the *ostinato*, which has been recognised as a musical procedure for over 700 years, 20th century composers have significantly extended yet another traditional practice which in its historical development, has undergone many transformations.

¹⁵⁷ Bray, Units 23-25, p. 101.

¹⁵⁸ Apel, Harvard Dictionary, p. 635, *ostinato*

The appeal of *ostinato* technique to twentieth century composers from Debussy to avant-garde composers lies in the need for unity created by the virtual abandonment of functional chord progressions to shape phrases and define tonality.¹⁵⁹

Bartók and Hindemith charted a course that used tonality - no matter how freely applied - as a point of reference, and made particular use of *ostinato* figures as a centralising factor to their quartets through the presentation of fiercely energetic rhythms and a language harmonically advanced in its use of dissonance. It is from the very first quartet of each set respectively, that these *ostinati* take on significant alterations. There is evidence too, as previously mentioned, of this particular variation in Schoenberg's first quartet.

The following examples centre on the various ways composers make intelligible and clarifying modifications to the beaming of *ostinato*-like figures across the barline which frequently result in a displacement of the normal recurrence of the beat. Example 26.

Ostinato across barline

Example 26. Rhythmic *Ostinato* patterns slurred across barline
Schoenberg, *Quartet No. 1, Op. 7* (1907), Movement 1, bars 45-48

The musical score for Example 26 consists of two systems of four staves each. The first system covers bars 45 to 47, and the second system covers bars 48 to 50. The music is in G major and 3/4 time. The first system shows a rhythmic pattern of eighth notes slurred across bar lines. The second system continues this pattern with various slurs and accents. Dynamics include *p* (piano) and *ff* (fortissimo). The score is for Violin I, Violin II, Viola, and Cello/Double Bass.

¹⁵⁹ Wittlich, *Aspects*, p. 123

Slurring continues across the barline to identify the two rhythmic *ostinato*-like patterns shown predominantly in Violin 1 (bars 48-49) and Viola (bars 47-50) parts.

Beaming across barline/chromatically rising *ostinato* pattern

Hindemith's extensive use of the *ostinato* device in almost every movement of the first five quartets as a unifying compositional device, - (in the sixth there is limited use of this technique) - is first seen in quartet No. 1, Op. 10 (1919) - as a beaming modification to emphasise a chromatically rising *ostinato* pattern in the cello part shown against the other parts as follows: Example 27.

- cello chromatically rising *ostinato* pattern
- violin 2 chromatic octaves rising per bar
- viola chromatic octaves rising per bar
- violin 1 rising sequences of three note motif

Example 27. Beaming across barline / chromatically rising *ostinato* pattern
Hindemith, Quartet No. 1, Op. 10 (1919), Movement 3, bars 55-58

The image shows a musical score for four staves: Violin 1, Violin 2, Viola, and Cello. The key signature is three flats (B-flat, E-flat, A-flat). The Cello part is circled in red. The score includes the instruction 'molto cresc.' repeated four times. The Cello part features a chromatically rising ostinato pattern, while the other parts feature chromatic octaves rising per bar and rising sequences of three note motifs.

Double *Ostinati* patterns

Bartók makes use of another combination of *ostinati* beamed across the barlines in his Quartet No. 5, (1943) Movement 1, where, in this case, two *ostinati* patterns are beamed simultaneously to conveniently highlight the two disparate *ostinati* patterns which occur without a conflict of rhythm or accent.

- violin 1 and 2 rising and descending pattern
- viola and cello mostly repeated note pattern

Imitative *ostinati* in inversion

In Schoenberg's Quartet No. 4 Op. 37 (1939), Movement 2, bars 486-487, two imitation *ostinati* patterns appear between violin 2 and viola, the latter beamed in inversion across the barline. However, despite the use of this new symbol there is no accent displacement in the three beat intervallic and rhythmic motif which, surprisingly, retains the traditional use of the accent within a simple quadruple time signature ($\frac{4}{4}$) in conflict to the manner in which it is beamed. Example 28.

Example 28. Imitative *ostinati* in inversion
Schoenberg, Quartet No. 4. Op. 37 (1939), Movement 2, bars 486-487.

The image shows a musical score for two staves, violin 2 and viola, across three measures: 486, 487, and 488. The time signature is 4/4. In measure 486, the violin 2 part has a circled motif of eighth notes. In measure 487, the viola part has the same motif beamed in inversion across the barline. In measure 488, both parts play the motif. Dynamics include *pp* and *H*.

Non-functional use of *Ostinati*

The music of the American composer Morton Feldman, achieves its tension through extreme delicacy of nuance by exploiting minute contrasts of timbre and register. The dynamic range of his six minute String Quartet Structures (1951) is firmly held with the directive which appears at the beginning of the score: *Soft As Possible* with no further dynamic changes shown. Contrasts in *timbre* are achieved by playing either *arco* or *pizzicato* - often as single notes alternately between the four instruments - and to add to the overall delicacy of the dynamic level, there is absolute silence in many bars. The purpose of the string quartet is to induce a state of complete passiveness with a combination of almost inaudible sounds, gently shifting *timbre*, and imperceptible, slender changes of what may doubtfully be called the harmonic and melodic consonants and dissonances.

Feldman makes use of a double *ostinato* figure consisting of the following groups of quavers per bar (bars 118-165): Example 29.

- three quavers (♪♪♪) : violin 1 contained within a single bar
- four quavers (♪♪♪♪) : violin 2 beamed across the barline with the the last quaver in one bar and the remaining three joined across to the next bar
- pedal point single notes played alternately at an interval of a seventh : viola and cello

Example 29. Non-functional double *ostinati* figure
Feldman, Structures for String quartet (1951), bars 118 - 126

Discounting the philosophical intent of this quartet as a whole, the use of two conflicting *ostinati* patterns would normally result in an accent displacement of one of the patterns. Here however, the total lack of rhythmic pulse negates any idea of accent elimination or displacement through the beaming of the lower *ostinato* figure across the barline, and further, unlike the functional *ostinati* of the quartets of Hindemith and Bartók, these figures bear no relationship to tonality, rhythm or melody.

The term pedal point, in Viola and Cello, is used in the traditional sense of meaning: ‘... a long note held, normally in the bass...[which] represents one of the most natural sources of dissonance, inasmuch as the held note blends easily with every chordal combination,’¹⁶⁰ but, contrary to the traditional use of the *pedal point*, it’s purpose here has no harmonic function.

Throughout the decades, contemporary composers have continued to beam *ostinato* patterns across the barline to facilitate an easier reading of the unit. Listed below are additional quartets where this practice is found :

¹⁶⁰ Apel, Harvard Dictionary, p. 651


Composer	Quartet	Date
■ Prokofiev	No. 2	1948
■ Sculthorpe	No. 8	1970
■ Tschaikowsky	in A	1971
■ Crosse	Studies..	1976

The *ostinato* pattern has taken on many modification in the context of 20th century music and its exclusive identification, in the traditional sense, has changed. Single and multiple *ostinati* are now found with the following adjustments.

- intervallic modification
- in counterpoint
- with conflicting rhythmic patterns
- causing displacement of accent
- in imitation

all of which are capable of being beamed across the barline.

Beaming incorporating Rests

Another modern innovation involves the inclusion of rests contained within an extended beam of grouped notes to show the beat units e.g. (). The sense and logic behind this practice lies in the fact that all the symbols beamed are easily and readily equated as a whole unit. It is interesting to note that, of the composers discussed in the early decades of this century, Bartók's use of this method of beaming appears for the first time only in the later Quartet No.5 (1934), and not in any other quartet, while Schoenberg includes it in the last Quartet No. 4 (1939). Hindemith found no use for this particular alteration and Webern incorporated rests into beaming across the barline in the Op. 28 (1939).

The following example, taken from Hiller's String Quartet No. 5 (in Quarter Tones) (1962), spans the century almost halfway between Bartók's first showing and the 1990s where beaming incorporating rests is still in use. Example 30.

Example 30. Beaming incorporating rests
 Hiller, Quartet No. 5 (in Quarter Tones) (1962), Variation IV, bars 182-183

The image shows a musical score for four staves, likely representing different instruments in a quartet. The score is marked 'Molto agitato' and includes dynamic markings such as 'ss', 'ss dim.', and 'pp'. The notation features complex beaming and rests, illustrating the concept of incorporating rests into beams. The score is divided into two measures, with the first measure starting at bar 182. The notation includes various rhythmic values and rests, with some rests being beamed together to indicate their subdivision.

Composers continue to incorporate rests into beams, assigning them their proper beats in order to facilitate an immediate and accurate reading of the subdivision of the pulse.

This practice is found in the quartets listed below :

Composer	Quartet	Date
■ Powell	Filigree..	1965
■ Druckman	No. 2	1966
■ Ferneyhough	Sonatas...	1967
■ Crumb	Black Angles	1970
■ Tschaikowsky	No. 1	1971
■ Szokolay	No. 1	1973
■ Schmidt	Zweites ...	1979
■ Brandmuller	No. 1	1983
■ Dillon		1983
■ Brandmuller	No. 2	1985
■ Reynolds		1989

Beaming and Sequences: Melodic and Rhythmic

A sequence is generally taken to mean the repetition of a definite group of notes or chords in different positions of the scale, and not that of an earlier meaning of a church poem closely related to the hymn species that sprang up in the middle of the 9th century, which was firmly established by Pope Nicolas I before his death in 867.

There are basically two types of commonly used sequences - melodic and harmonic. The first occurs when the repetition of a short musical phrase occurs melodically at another pitch and the second, called harmonic or polyphonic, is when the repetitions are found in all the parts. A tonal or diatonic pattern is formed when the sequence is changed to include an accidental, however, when it is

preserved exactly, it is called real. Many sequences in fact became modulatory in practice.

The importance of the sequence as an element of continuation was recognised early in Western church music and short sequential passages are found in Gregorian Chant. For example 'in a standard cadence of the responsories of mode 8 which, like all sequential formation of plainsong, is slightly irregular (note the groupings of the neumes),'¹⁶¹ illustrated as follows:

Example 31. Gregorian Chant, *Prosa ad sequentia*
Irregular note groupings



Melodic sequences, or long melismas (*melodiae longissimae*), continued to develop throughout the centuries, from the rigid polyphonic formations of the 12th century through to the madrigals and *caccia* (musical hunt or canon) of the 14th century and on to those of the 15th century where 'masterly handling of the sequence in a variety of ways'¹⁶² was demonstrated by the Netherlands contrapuntalist Obrecht. (Obrecht was also known by a variety of related names and spellings and his exact birth date is said to be c. 1430* or alternately c. 1452*; his date of death seems equally uncertain. Ulrich & Pisk put it at 1505 but no other confirmation of this date was found.)¹⁶³

From the 17th to 19th centuries the harmonic sequence became well established as a means of imaginative development both in the episodes of fugues and in movements designed in 1st-movement-sonata-form. During the late 18th century this practice became exaggerated and lesser composers began to use a fashionable form of sequence known as the *rosalia*, a term coined from an Italian popular song of the time, '*Rosalia, mia cara*',¹⁶⁴ which contained a facile symmetry of inferior melodic and harmonic passages. The *rosalia* became a questionable alternative to the powerful sequential process.

In contemporary music of the second half of this century sequences, in the true harmonic and modulatory sense, have generally become redundant through tonality's loss of functional dominance. The melodic sequence, too, finds little place in compositional procedures today, as the extended melodic line, developed to such a high form in the 19th century, lost its fascination for composers

¹⁶¹ Apel, *Harvard Dictionary*, p. 763.

¹⁶² *Ibid.*, p. 763

¹⁶³ c. 1430 * Riemann, *Dictionary of Music*, p. 352; c. 1452* Ulrich & Pisk, *History of Music and Musical Style*, p. 122

¹⁶⁴ Apel, *Harvard Dictionary*, p. 741

early in the first decades of the 20th century. Schoenberg, Varèse and even Stravinsky demonstrate this point in many of their respective compositions.

Melodic sequences only continue to be evident in contemporary music where tonality is still an important structural feature. It is not surprising, therefore, that the melodic sequence is found almost exclusively in the first half of 20th century music. The use of this sequence - combined with a modern approach to beaming - has not been found in this investigation. Rhythmic sequences continue to be significantly practised to clarify patterns in polymetric and other rhythmically or durationally disparate textures. In the early decades of this century beaming, like slurs, acquired a notational freedom to pass across the barline, thereby highlighting and maintaining the effect of visual and musical continuity by the use of an innovative approach to beaming.

The example below illustrates Hindemith's use of short slurs across the barline, a practice which preceded beamed phrases, to show motivic conflict of articulation and phrasing within the rhythmic subdivision of the beat. These slurs, however, are not phrase indicators. Example 32.

Example 32. Slur across barline : conflict articulation and subdivision of beat
Hindemith, Quartet No. 1. Op. 10 (1919), Movement 3, bars 288-291

Wieder langsamer werden

290 *sempre dim.*

sempre dim.

sempre dim.

sempre dim.

- violin 2 and viola are notated with a motif of descending arpeggio intervals slurred across the barline, in conflict with the subdivision of beat. This practice was extended later to beaming and sequence.

In 20th century music there is often not much distinction to be found between what can successfully be defined as either an exclusively rhythmic or melodic motif, and consequently there is an overlapping of these categories, the distinction of which is often ambiguous. The following example, however, shows a clear distinction of a rhythmic sequence as the two different motifs, found in the

Violin 2, and Viola and Cello parts respectively, display an energy that is obviously driven by their rhythmic content and not by the melodic. Example 33.


Example 33. Beaming of rhythmic sequence across barline
Hindemith, Quartet No. 3. Op. 22 (1923), Movement 2, bar 100-101

Allmählich ins erste Zeitmaß übergehen

Beaming of indicators of metric division changed to indicators of rhythmic groupings

In music where metric irregularities are equally applied to an entire texture, changing time signatures, also known as variable time signatures, are usually notated to accommodate the inconsistent use of groupings. These rhythmic formations are generally capable of being beamed in the customary manner. However, traditional notation fails to cope with the demands made when irregularities are inconsistently found throughout the composition or where different irregularities occur simultaneously in the various parts. It has therefore become necessary to alter the function of beaming from indicators of metric subdivision to indicators of rhythmic groupings when the use of normally grouped rhythms is impractical, or when the irregularities cannot not easily be recognised .

Bartók made particular use of this changed function as clearly shown in various movements of both Quartet No. 4 (1928) and Quartet No. 5 (1934), Movement 1, bars 119-126. The example below, taken from the earlier quartet, shows: Example 34.

- a ($\frac{2}{4}$) pulse (bars 157-160), albeit with irregular subdivisions of the customary accent, which includes a four semi-quaver motif () beamed across the barline.
- At (bar 161) the rhythmic groupings of the simple duple time change to an alternating imitative pattern of four semiquavers followed by six semiquavers in all the parts, thus

- altering the function, through extended beams, from metric indicators to rhythmic indicators where, in this case, an additional aspect of beamed phrase grouping is also revealed.

Example 34. Extended beaming changing metric indicators to rhythmic indicators
Bartók, Quartet No. 4 (1928), bars 157-164

Contemporary composers who make use of beaming to change metric groups to rhythmic indicators include the following:

Composer	Quartet	Date
■ Ferneyhough	Sonatas	1967
■ Hubler	No. 3	1982-4
■ Dillon	St.Qt.	1983
■ Gielen	Stqtt.	1983

Beaming and Elimination of Accent

The contemporary practice of beaming also leads to the elimination of accent and the obscuring of the pulse. This elimination and obscuring is not entirely new in the 20th century as it is found, for example, in vocal recitative of former periods. True to its origins of a vocal style designed to imitate and emphasize the natural inflections of speech, and developed further to disregard the purely musical

principles of phrase and rhythm, the recitative depended for its effect on the use of free *tempo* and the improvisational use of ornamentation - both obligatory and non-obligatory - to impart the most convincing and musicianly interpretation of style. Many passages were not dependent merely on bar sub-division as a point of departure and gained subtleties of articulation, *tempo* and cadence through the fluid use of phrase inflection and expansion. Thus melody developed to such a point where it was eminently capable of reflecting the content of the text.

Phrase flexibility carried over to instrumental playing and Francesco Geminiani, in the *Art of Playing on the Violin*, London, 1751, p. 9, warns about regular stressing of the beat:¹⁶⁵

If by your manner of bowing you lay a particular Stress on the Note at the Beginning of every Bar, you alter and spoil the Air of the Piece, and except where the Composer intended it there are very few Instances in which it is not very disagreeable.

However, what is new to this century is not the elimination of accent as such, but an extensive application of the new beaming technique which arose as a direct result of the multiple rhythmic irregularities that have emerged. The wide variety of strikingly complex rhythms used to form asynchronous pulse groupings result in not only the obscuring of accent, but also the concealing of the pulse.

This beaming technique is found in a variety of contemporary quartets and Bartók, particularly, makes extensive use of beaming to eliminate the accent in all his string quartets. However, it is not always the exclusive use of this new method that accounts for the obscuring of accent, meter and pulse. Example 35 demonstrates this point.

Asynchronous/Arhythmic Group Beaming

Elimination of pulse

The contemporary Polish born composer Penderecki (1933-) in his atmospheric, textured *Quartetto per Archi* No. 2 (1968), uses the string quartet to generate intensely expressive effects by exploiting the *timbral* nature of the four instruments. With a combination of the following compositional 'tools' he creates a fine balance of *timbral* layering with a constant vacillating sound by using techniques,

¹⁶⁵ Donnington, *Early Music*, p. 421

amongst others, such as:

- precise traditional notation
- a new durational symbol of horizontal lines extended and beamed from the notehead note clusters
- *glissandi* (both regular and irregular)
- indeterminate pitch
- quarter tones
- a variety of new complex and diverse pitch and rhythm symbols all alternating and interacting throughout the movement

It is in the *Vivace* section that Penderecki beams traditional notation in an irregular grouping of cluster-generated notes across the barline. The following example demonstrates: Example 35

- asynchronous : arhythmic cluster note groupings
- irregular note groupings structured between the four instruments in a single bar as follows.

Violin 1:	three groups	consisting of	12: 21: 14
Violin 2:	three groups		15: 19: 15
Viola :	four groups		9: 19: 8: 11
Cello :	four groups		7: 8: 10: 5

Example 35. Asynchronous arhythmic note groupings
Penderecki, *Quartetto per Archi* (1968), page 14, line 3

The image shows a musical score for a string quartet. It consists of four staves: Violin 1 (vn), Violin 2 (vn), Viola (vi), and Cello (vc). The score is marked 'legato' at the top and 'sul pp' (pianissimo) for each instrument. The notation is highly complex, featuring dense clusters of notes that are asynchronous across the instruments. The notes are beamed together, creating a web of static sound clusters. The rhythm is irregular, with no time signature indicated. The score is for a single bar, as indicated by the caption.

The above example shows a characteristic feature throughout the quartet of asynchronous arhythmic note-groupings, the numbers of which change constantly and irregularly between the four instruments resulting in a web of static sound clusters, without accent or pulse. The composer purposely creates this effect by omitting to use a time signature and without further indicating any other factors

Example 36. Multi note-groupings beamed for visual simultaneity of pulse
Ligeti, *Quartet No. 2* (1968), bars 62 and part 63

pochiss. meno mosso (♩ = 68)
tutta la forza, wie verrückt / as though crazy
al tallone, "schwerer Springbogen" / al tallone, "heavy bouncing bow"

Ferocissimo

al tallone, "schwerer Springbogen" / al tallone, "heavy bouncing bow"

al tallone, "schwerer Springbogen" / al tallone, "heavy bouncing bow"

al tallone, "schwerer Springbogen" I.

al tallone, "heavy bouncing bow"

- bar 62 violin 1 has groupings of 4: 5: 6: 7: notes per beam
- violin 2 has groupings of 5: 4: 5: 6: notes per beam
- viola has groupings of 6: 5: 4: 5: notes per beam
- cello has groupings of 7: 6: 5: 4: notes per beam

These groupings of varying numbers per beam, all seemingly creating simultaneity of pulse, are often played chromatically, and are a feature throughout the quartet. Coupled with the instruction *leggierissimo all corda (sul tasto)* and *minimum bow pressure throughout*, they produce a 'shimmering' of sound that appears never to occur asymmetrically between the four parts at anytime in the composition. It 'looks' almost as if Ligeti has retrieved a pulse within the meter of complex groupings.

However, this visual representation of pulse and meter between the four parts is deceptive and of no practical purpose whatsoever, as Ligeti's instructions in the score provide contrary indications as follows:

- the figurations are played as fast as possible; the rhythm within a figuration will be irregular
- depending on the difficulty of execution, change of register, etc., play in a virtuoso, "hazardous" manner

The instructions for bars 27-36, which again are written down in simultaneous beaming groups between the four parts, require the following

- entrances of the figurations are metrically fixed after entering, however, the figuration is played as fast as possible, independent of the metre and the bar boundaries and also

independent of the other instruments.

- occasionally - when a long figuration is to be played - the “bar boundaries” are delayed; the simultaneity of the “bars” is gradually thrown into disorder until ... there is no metrical regulation whatsoever.¹⁶⁶

This provides a clear example of deceptively notated beams creating a conflict between what is written down and what is to be played.

Beaming to indicate phrases

Phrases in a musical composition consist of a series of short sections of various lengths, each more or less complete in itself. It is in the inter-dependence of these phrases and upon their connection with one another - coupled with other factors of proper accentuation, variety of attack and the use of *crescendi and diminuendi* - that the intelligibility of music depends.

The notational symbol to indicate phrases has differed throughout the centuries. Early phrase indications were marked with a *corona* or pause sign (\frown) - in Germany the term *fermata* is used - and similarly, when placed over a rest sign it had the same effect of adding an interval of silence to the time.

About 1600, Emilio de' Cavalieri wrote in *Rappresentatione di Anima, e di Corpo*, Rome, of a new sign:

‘The sign S. indicates the *incoronata*, which is to serve for taking breath and to give time for making some gesture’¹⁶⁷

Later, and in France, François Couperin (1668-1733) used a comma (,). He wrote in the preface to *Troisieme Livre de Pieces*, Paris, 1722 :

‘.... this [sign] is to mark the ends of melodies (chants) and of our harmonic periods and to make it understood it is necessary to separate the end of a melody (chant) before passing on to that which follows.’¹⁶⁸

¹⁶⁶ Ligeti, in Score, *String Quartet No. 2* (1968), Mainz: B. Schott's Sohne.

¹⁶⁷ Donnington, *Early Music*, p. 471.

¹⁶⁸ Donnington, *Early Music*, p. 471.

The symbol for a slur, commonly found in music of c. 1620 to 1750 to indicate balanced phrase units, and which continued to be used to indicate all manner of phrase lengths, is the same sign used to indicate a *legato*. Generally, composers such as Mozart and Beethoven were not too specific about notating slurs as it was expected that performers of the day would know how to divide the melodic phrases.

It is interesting to note that J.P.A. Schultz was, perhaps, the first to observe that phrase markings often extended over the barline. (in Sulzer's *Allgemeine Theorie der schonen Kunste*, 2 vols., 1771,'74.)¹⁶⁹ This extension of the slur sign provided continuity of line as does beaming across the barline in contemporary music.

Ives, as mentioned earlier, first showed the importance of slurring and beaming across the barline in the early Quartet No. 2 (1907-1913).

Henry Cowell in his Quartet (1956) bars 40-41, continued the slur across the barline of the cello part to emphasise the four note *legato* phrase and again (at bars 50-51) in Violin 2 which then proceeds conventionally beamed as part of a phrase in counterpoint with Violin 1, shown in the following example: Example 37.

Example 37. *Slur across the barline - legato phrase*
Cowell, Movement for String Quartet (1934), bars 50-51

The image shows a musical score for four staves. The first staff is the Violin 1 part, the second is Violin 2, the third is Viola, and the fourth is Cello. A slur is drawn across the barline in the second and fourth staves. The dynamic marking (mf) is written below the second, third, and fourth staves. The number 50 is circled above the first staff.

Phrase beaming was also used by:

Composer	Quartet	Date
■ Ives	No. 2	1907-
■ Carter	Fantasia	1951
■ Skalkottas	No. 4	1968

However, in the above mentioned quartets this type of beaming appears only very briefly and does not represent a feature that is significantly inherent in the quartets' phrase construction.

Traditional syntax - other uses

In general, beaming across the barline clarifies many uses of traditional musical syntax, for example in:

■	imitation of rhythmic and intervallic patterns	Bartók No. 3	(1927)
		Hiller	(1962)
■	highlighting repetition	Bartók No. 6	(1934)
		Brandmuller	(1983)
■	repeated accompanying motif	Prokofiev No. 2	(1948)
■	imitation of motif	Bartók No. 3	(1927)

Comment

Heinrich Schenker (1868-1935) the German composer, pianist, writer and teacher, editor, archivist and theoritician, who developed the Schenkerian method of graph notation,¹⁷⁰ wrote in the Preface to the last Beethoven Piano Sonatas¹⁷¹ about 'the deeply meaningful play of beams'. This 'meaningfulness' is aptly demonstrated in the above discussion, showing just how the changing technique of beaming plays a significant role in the articulation and clarification of certain aspects of 20th century music.

Rudimentary theory books, of necessity, still teach a beat-by-beat beaming as an absolute rule of good notational practice, but even in the early decades of this century composers ignored the supposed rule with the greatest freedom.

The American Charles Ives rebelled early in his compositional life against almost every 19th century musical tradition and this tendency included, at times, an occasional irreverent approach to the use of traditional notation. He was one of the first 'contemporary' musicians to write without regular barlines or time signatures, simply placing the former only when and where he considered them necessary.

¹⁷⁰ For further reading see Dunsby and Whittall, Music Analysis.

¹⁷¹ Universal Edition.

In the first decade of the 20th century Ives included in his Quartet No. 2 (1907-1913) the innovative beaming of notes across the barline. It is probably safe to say that this new symbol escaped elimination by publishers of early 20th century music due merely to the fact that the quartet's date of first publication was in 1954. Without this fact, it might not have survived as an early, if brief, example of new beaming within the *genre* of the string quartet this century.

Béla Bartók experimented early in his quartets with untried rhythmic possibilities and found inspiration for these in the songs and dances of the borderlands of European culture. Out of this unspoiled, vigorous folk music 'came the rhythms of an elemental power that tapped fresh sources of feeling and imagination,'¹⁷² and the pounding, hammering rhythms of primitive art that emerged in the first decades of the century, enabled 20th century composers of the time to disregard the standardisation of meter, so hostile to their artistic expression.

As a result, new categories of metric structures emerged, grouped most frequently as follows:

- unusual metric structures with regularly varied pulse groups
Bartók No. 5 (1934) Scherzo bar: 9
- unusual metric structures with irregularly varied pulse groups
Hindemith No. 3 (1923) Movement 2 bars: 1-8
- unusual metric structures with nonsynchronous pulse groups
Bartók No. 2 (1920) Movement 2 bars after no. 41
- unusual metric structures with aspects of changing pulse rate or *tempo*
Carter No. 1 (1952) Movement 1
- metric structures with nonsynchronous pulse
Bartók (many examples)

The categories above and others provided a catalyst for a change in notation which led Bartók in particular to expand, convert and extend to beaming that which, in earlier periods, had applied to the slur. These extensions demonstrate an adjusted role to the musical usage of such functions as:

- complex rhythms
- accent shifting
- asymmetric meters
- changing time signatures

- metric indicators changing to rhythmic indicators
- ostinato patterns
- repeated motifs
- motive imitation
- inclusion of rests

With an adjusted approach to standard beaming the clarification and highlighting of imaginative rhythmic groupings was, nevertheless, still able to be notated precisely within the framework of traditionally used symbols.

These adjustments are, in fact, most remarkable because they deviate with only minor departures from conventional notation in effective ways to structure a whole new concept to the joining of common and uncommon durational patterns.

In the early decades too, Bartók's contemporaries in the *genre*, Hindemith and Schoenberg - and to a lesser extent Webern - also reorganised what they considered to be unsuitable notation in the matter of beaming, and adjusted standard practices to suit their particular needs.

In 1980 Kurt Stone expressed the opinion that the innovative methods of 'the frequent meter changes in Stravinsky the beamings and phrases [of] Bartók proved too inefficient to survive, especially in orchestral and ensemble music.'¹⁷³ He suggested, further, that consequently more and more composers restored the beams to their former function as metric indicators (beaming by beat- units), reduced meter changes to an essential minimum, largely abandoned conflicting simultaneous time signatures, and instead used accents and occasional rhythmic cue lines to show the different metric stresses. However, this investigation of contemporary examples, shown in the preceding discussion, underlines the fact that modern compositions in the *genre*, when using traditional notation, continue to yield additional examples of this practical and subtle method of beaming.

Duration

Duration has for the last three-hundred-and-fifty years been standardised, understood and accepted in Western music as a 'time notation' where each individual note and rest, representing sound and silence, is assigned a definite symbol to denote a precise length within a sequence of time. These durational spans are specified and governed by such factors as barlines, time signatures and tempi

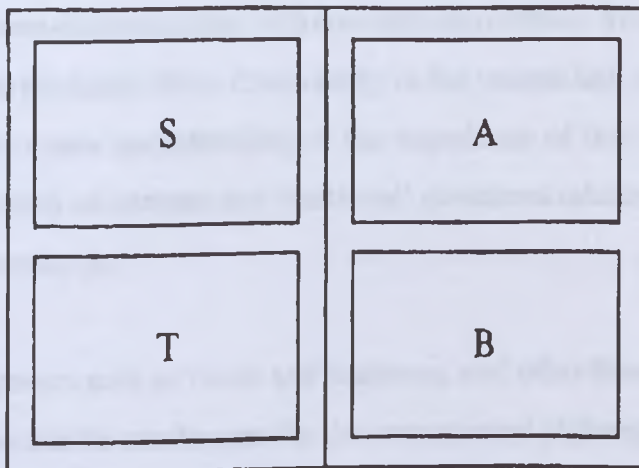
¹⁷³ Stone, *Music Notation in the Twentieth Century*, p. 87.

which create an unambiguous order of unchanged time relations that have remained in use from the 16th century to the second half of the 20th century.

It was the spread of polyphony in the 14th and 15th centuries that made necessary the adjustments to the mathematically imprecise time specifications of Medieval notators. There arose a need for rhythmic standardisation of duration symbols, as different contexts allowed for different time values to be attributed to a variety of notes. However, what was *not* deemed necessary, then, was the synchronisation and vertical alignment of parts of scores which, in that period, were never designed to be read as a coherent whole.

Apel explains that before c.1225 score arrangement was used exclusively for writing down polyphonic music but with the development of the motet (c.1225) this arrangement was discarded for a method in which the parts were notated separately, usually on two facing pages of the book. As shown in the following drawing, an arrangement of music in four parts was used in choirbooks of the 15th and 16th centuries. This system saved space and catered for the difference between the texted upper parts and the textless tenor with its few long notes written in ligatures.¹⁷⁴

Apel ponders: ‘... because the large repertory of 13th -16th century vocal music ... has survived only in the form of individual parts, one might wonder how musicians could compose such strictly polyphonic and highly complex works ... without making a score.’¹⁷⁵



¹⁷⁴ Apel, *Harvard Dictionary*, p. 759

¹⁷⁵ *Ibid.*, p. 759

About 1600 the development of orchestral music and the acceptance of the thoroughbass led to the general adoption of barlines in the score. Nevertheless, a great deal of latitude was practised in part printing, and the accurate vertical alignment of notes, sub divisible within a single beat, did not become more exact until the printing of music in the late 18th century - and even then it was still imprecise, with an acceptable amount of latitude permissible.

Earlier, little attempt was made to align the beat-by-beat subdivisions of parts and even in a composition intended for a single player - for example on a keyboard - vertical displacement of notes was accepted as normal practice. Later, publishers came to regulate precisely the vertical and horizontal layout of music with a combination of black and white noteheads and spacing to signify the lengths of the beats. This resulted in the establishing and regulating of time notation with sufficient explicitness to enable performers to perceive and interpret accurately, the intentioned rhythmic subdivisions of the beat.

Demise of Conventional Rhythm Symbols

Conventional notation proved to be quite adequate for a system that was pulse-generated and pulse-dominated with clearly visible and subdivisible durational symbols and, while providing a certain framework of rhythmic control, it nevertheless does not provide means to describe pulse-less or a-metrical rhythmic structures.

Although there had been dissatisfactions with conventional notation's capabilities to adequately serve and clarify expanded rhythmic ideas, it was early in the second half of this century that it became acutely apparent that a new understanding of the experience of time perception was emerging to create a multifariousness of intricate and 'irrational' durational relationships that made a change in rhythmic notation inevitable.

Certain Italian composers such as Nono and Maderna, and other European contemporaries, felt it necessary to create a suitable mechanism for the new musical philosophies of the Fifties. For them the obliteration of all musical memory was imperative, and in the use of the predetermined principles of total organisation in all the parameters, the *tabula rasa* for the eradication of all familiar rhythmic shapes was found - this was their particular solution.

However, not all composers found this extension to be a completely satisfactory rhythmic solution. Milton Babbitt (1916 -), the American composer, explains in a comprehensive article on his String

Quartet No. 3 (1969-1970)¹⁷⁶, the differences distinguishing his treatment of the twelve-tone system - as related to all the musical dimensions - from those of the European integral serialists. Babbitt recorded the disappointment which followed his early acquaintance with this fashion in 1955, and the essence of his critical comments on European integral serialism is as follows:

Mathematics - or, more correctly, arithmetic - is used as a compositional device, resulting in the most literal sort of 'programme music,' whose course is determined by a numerical, rather than a narrative or descriptive 'programme' rhythm is independent of and thus separable from the pitch; this is described and justified as a 'polyphony' of components, though polyphony is customarily understood to involve, among other things, a principle of organised simultaneity, while here the mere fact of simultaneity is termed 'polyphony'.¹⁷⁷

The fundamental differences between Babbitt's use of integral serialism and that of the Europeans are:

- the pitch dimension is accorded first importance as a structural determinant
- pitch and rhythmic structures are both articulated explicitly in the surface of the music, and not numerologically manipulated at a 'pre-compositional' stage.

Despite the rhythmic innovations of integral serialism, in retrospect there is certain criticism and lack of enthusiasm for using the designatory terms 'total' or 'integral serialism', not because such terms are in themselves inappropriate, but simply that they have associations with a short-lived and long-discarded fashion of European music which flourished briefly in the early and middle fifties.

Measured durational extensions, within the capabilities of traditional notation, were becoming exhausted. For example, the 1950s contrasting works of Boulez' integral serialism, discussed in Appendix 1, and the fragmented use of nonmetric durations by Luigi Nono in *La terra e la compagna* (1958) for soprano and tenor solos, 24-part mixed chorus, 4 flutes, trumpets and trombones, testify respectively to the rhythmic extremities of notational exactitude and inexactitude.

Example 38.

¹⁷⁶ Arnold, Stephen & Hair, Graham, An Introduction and a Study. String Quartet No. 3, in *Perspectives of New Music*, Vol. 14, No. 2, 1976, pp. 155-186. (Hereafter, Arnold & Hair, String Quartet No. 3)

¹⁷⁷ *Ibid.*, p. 165

No string quartet of the 1950s period under discussion exhibits these unconventional approaches to notation.

Example 38. Aperiodic, Nonmetric Durations

Nono, Ensemble Music, *La terra e la Compagna* (1958), bars 79-82

The image shows a musical score for two vocal parts: Soprano (div. a 6) and Alto (div. a 6). The score is in 4/8 time and consists of two systems of four staves each. The top system is for Soprano and the bottom system is for Alto. The music is characterized by aperiodic and nonmetric durations, with various dynamic markings (ppp, mp, p, f) and performance instructions (rall., accel.). The score includes lyrics such as 'Ter...', 'e', 'ne...', and 'ra'.

These opposing works demonstrate the limitation traditional notation imposed on the evolutionary rhythmic processes (and on other parameters) that began to evolve in the 1950s. Conventional notation was unable to satisfactorily cope when musical demands were directed towards either uncompromising notational exactitudes, or the contrasting elements of chance.

Rhythmic Plurality

In the decade of the 1950s and beyond, duration came to exist in a plurality of diverse attitudes and applications whereby :

- electronic programming successfully subdivided and combined rhythmic beats of great complexity
- multiple patterns existed totally independent of any metric framework
- a tendency developed in the opposite direction where less notational precision incorporating a certain sense of interpretative freedom arose

Kurt Stone wrote in (1963):

'No other aspect of contemporary notation is more desperately in need of fundamental revision than that of rhythm.'¹⁷⁸ He explains that most of to-day's rhythmic structures are far more complex - as well as rigid, or conversely free and flexible - than the pulse-generated and pulse-orientated rhythms of the past.¹⁷⁹

Stone deplors the fact that traditional rhythmic notation is severely limited by 'a system which operates with only one single geometric progression of all primary durations : 2, 4, 6, 8, 16 etc.,'¹⁸⁰ and when rhythm deviates from these simple divisions and shifts merely to a need for a tri-partite sub-division, notation requires a selection of devices. These include dots, ties, brackets with small numerals to denote triplets in duple time and *vice versa*, and the same rhythmic adjustment for quadruplets and quintuplets etc. The intermediate values of 3: 5: 7: etc. derived from the nearest standard symbol, are confusing and can stand for differing values. Karkoschka reinforces this complaint about the restrictive bipartite durational values with the accepted symbol twice as big or small as the next sub-division e.g. (◦ = ◦ ◦).

This restriction was recognised as early as 1917 by Henry Cowell who, in his book **New Musical Resources** (1930), wrote about the whole-note unit which, being accepted as a fundamental measure of time, provides only the 'liberty to divide a whole note into two halves, a half-note into two quarters, a quarter into two eighth-notes, and so on'¹⁸¹. He complains further that the subdivision of the whole note into three notes of equal length requires 'the clumsy expedient of writing the figure 3 over three successive half notes filling a measure'¹⁸² and contends, further, that this method might be justifiable if the use of such notes are of rare occurrence.

Cowell found a 'practical solution' to the dilemma in his piano piece, Fabric¹⁸³, which incorporated noteheads 'inspired by the old American note shapes,'^{184 185} which originated in England as an easy notational method for song reading in which only four of the six Guidonian syllables were used on the staff: *fa-sol-la*, representing c-d-e and the corresponding identical intervals f-g-a, with *mi* used for the seventh degree of the scale. In rural America before the 1800s this *fasola* system, as it was called, took the form of the letters, F,S,L, F,S,L, being placed on the staff for easy identification. This was later developed further into an unorthodox notational system by William Little and William

¹⁷⁸ Stone, Kurt, Problems and Methods of Notation, in *Perspectives of Music*, Spring, No. 2, 1963, p. 16 (Hereafter, Stone, Problems and Methods of Notation).

¹⁷⁹ *Ibid.*, p. 16.

¹⁸⁰ *Ibid.*, p. 16.

¹⁸¹ Cowell, H., New Musical Resources, New York: A.A. Knopf, 1930, p. 49.

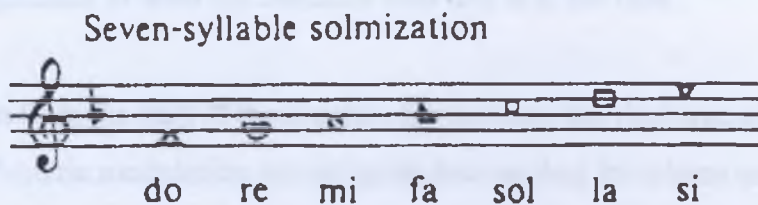
¹⁸² *Ibid.*, p. 49.

¹⁸³ Cowell's Fabric, is published with detailed explanation by Breitkopf Publications, Inc., New York, 1922.

¹⁸⁴ Stone, Problems and Methods of Notation, p. 17.

¹⁸⁵ Cowell explains his use of this type of notation in the Preface to the piano work Fabric.

Smith (Philadelphia, 1801).¹⁸⁶ Known as shape-note ('character', 'patent' or 'buckwheat notes'), the four-syllable system was gradually superseded by a seven-syllable solmization, and by 1846 Jesse B. Aikin of Philadelphia published a notation in his *Christian Minstrel* in which he retained the four-note shapes of Little and Smith and expanded the symbols as follows:



The restrictive rhythmic subdivision continued to be a problem, and the American composer and teacher, John Macivar Perkins (1935-) wrote later in an article entitled *Note Values* (1965) about the assault new notational developments were making on the '... mechanical symmetry, endless bipartite divisions, "tickiness", metrical rigidity, one-at-a-time *tempo* limitation and poverty of duration and speed relationships which served Mozart so well, but which seem now so intolerably and irrelevantly restrictive'.¹⁸⁷

Another composer, Andras Szentkiralyi said in 1973:

The traditional division and multiplication of note value by two penned my musical thoughts within too narrow limits. Furthermore, when I tried to step outside these limits, traditional notation of rhythm became impossible, too rigid, or at least too complex.¹⁸⁸

He, too, recognized that the constant or simultaneous use of different complex rhythmic figures ultimately resulted in making the performers' task particularly difficult, with an inability to perform the work with ease or, alternatively, interpret it superficially or inaccurately. Thus the exploration of unconventional rhythmic ideas and the attendant problems of notation and realisation continued to develop, and Szentkiralyi's point about the constant or simultaneous use of different complex rhythmic figures is particularly evident in, for example, Elliott Carter's use of rhythm in his two early string quartets of 1951 and 1952 respectively. With the introduction of metric modulation into his quartets (explained earlier) Carter provided an ingenious solution to the use of multiple time and *tempo* changes, but in the second quartet there is a realisation of a complex selection of independent

¹⁸⁶ *The New Groves Dictionary of Music and Musicians*, ed. Stanley Sadie, London: Macmillan Publishers, 1989, Vol. 13, p. 224. (Hereafter, *New Groves*)

¹⁸⁷ Perkins, John, Macivar, *Note Values*, in *Perspectives in New Music*, Spring/Summer, 1965, p. 47.

¹⁸⁸ Szentkiralyi, Andras, *An Attempt to modernise Notation*, in *The Music Review*, Vol., 34, No. 2, 1973, p. 100.

rhythms between the four parts, each possessing its own unique rhythmic associations that dominate immediately from the introduction (bars 1-10). The visual rhythmic relationship between the parts presents a difficulty in score reading as it represents a complex of widely different and distinctive rhythmic levels, '.... creating a pool of specific *tempi* which can weave in and out of the texture at any given moment regardless of what the common beat unit is at the time.'¹⁸⁹

Example 39, taken from the start of the quartet, demonstrates the rhythmic complexity of each part. The principles of metric modulation are not given here as they have been explained earlier.

Example 39. Rhythmic complexity within traditional notation

Carter, *Quartet No. 2* (1959), Movement 1, Introduction, bars 1-10

The musical score for Example 39 shows the first 10 bars of the introduction of Carter's Quartet No. 2. The tempo is marked as quarter note = 105. The time signature changes from 3/4 to 4/4 in bar 10. The Cello part has a dotted line indicating rhythmic freedom. Dynamics range from fortissimo (f) to pianissimo (pp).

- the *tempo* in the first 10 bars is ♩ = 105
- variable time signature maintains a crotchet denominator for nine of the first ten bars: changing thus: 3: 4: 5: 4:
4
- where in bar 10 the change is to ($\frac{9}{16}$), and thus in terms of metric modulation reorganises from simple to compound time
- no clear pulse is discernible as
- the cello entry has a certain amount of rhythmic freedom built into its part as the dotted line

¹⁸⁹ Gass, Glenn, *Elliot Carter's Second String Quartet: Aspects of Time and Rhythm*, in *Indiana Theory Review*, Vol. 4, No. 3, 1981, p. 17

over a group of notes signifies:

the phrase is played as a continuous *ritardando* or *accelerando*

with

- the first and last notes of these phrases (bars 1 and 5) to be held for their respective full value
- the 1st violin entry again reveals no pulse (bars 2-4)
- the 2nd violin entry creates a pulse that moves into a syncopated *pizzicato* rhythm of quaver notes (♩) within a ($\frac{4}{4}$) time signature related to a *tempo* (♩ = 105) (bar 4)
- the cello entry (bar 5) again has a flexibility of pulse as shown by the dotted line
- pulse and *tempo* is fluid in bar 8 as
- the 2nd violin entry of a double stopping major third relates to the principle of metric modulation, existing in a dual relationship of time
- the *tempo* and pulse rate start at (♩ = 120) : and modulate through to (♩ = ♩ = 140)

This polymetric diversity and independence in the four parts is exhibited again in the opening of movement 2 in such a way that the variable time signatures and barlines have no traditional functions and act as references for the beamed note groupings which appear to be of primary consideration.

Comment

It is not necessarily the technique of metric modulation that creates the ambiguity of pulse in Carter's Second Quartet. It is, rather, the contrasting and complex multi-levelled rhythmic combinations that pervade and mould the entire work into a quartet, which, played mostly at a very fast *tempo* with the parts frequently entering on notes that are fractions of the theoretical 'beats' after rests, combined with a lack of accents, make it difficult for the listener to perceive a rhythmic assembling from bar to bar.

The widely varied and layered linear technique results in the negation of any harmonic indications.

Together with other composers simultaneous compositional practices of total serialism and a-periodic metrication, Carter's use of such varied rhythmic language emphasised the extent of the problems contemporary composers were about to encounter in notating elements of free rhythms with exactness, or alternately, precise rhythms with a metric continuity essential to the characteristic of rhythm. What started to emerge were tangible notational problems, and what had promised to be the answer now became part of the problem.

Coexisting rhythmic ideas challenged notational limitations by placing emphasis on expansion of resources, on flexibility and on revolutionary ideas. The question was not ‘ whether notation is inadequate for contemporary use ?’, but rather the conviction expressed, as Karkoschka clearly points out, that ‘ modern music is being extremely distorted by traditional notation [which] grossly misrepresents present-day music and generally restricts our efficiency by presenting obstacles to our eyes and powers of logic.’¹⁹⁰

New Rhythmic Symbols and Meanings

The problem of duration has received considerable attention from contemporary composers, resulting in the development of diverse symbols and systems which, although not necessarily mutually exclusive and also not absolutely uniform, emerge to transcribe the same musical intentions into systems that share related concepts. Some contain elements of traditional notation, while others cannot be notated within the capabilities of conventional notation.

It is important to point out that, almost without exception, the various categories of new notation occur in conjunction with multiple notational types. Often a variety of new and old symbols are used concurrently within a single composition, specifically chosen by each composer to convey the vital and integral characteristics for each individual work.

Proportionate Notation

Generally, the category of proportional notation incorporates a system whereby duration is indicated through the horizontal spacing of sounds and silences. Unlike traditional notation where duration is indicated primarily by the note/rest type representing a value, with relatively little importance placed on the positions - one to another - spatial or proportional notation depends solely on the relative spacing of the symbols to convey the full information on duration. An important element contributing to the development of proportionate notations is the need to escape from a pulse generated time frame into one that has no references to a background pulse.

However, proportionate spacing alone does not provide a complete answer to the complexities of contemporary music, but within this concept various modifications of space and symbol have been devised for additional clarity.

¹⁹⁰ Karkoschka, *Notation in New Music*, p. 9

The main categories of proportionate notation are individually discussed below:

Proportionate Spacing with Conventional Notation:

In this category, traditional notation is generally used without barlines, time signatures or new symbols, resulting in the approximate rhythmic relationships shown by the notehead spacing. A simple example of this use of notation can be seen in the American composer of French birth, Christian Wolff's (1934-) quartet Exercises Out Of Songs (1975), based on the tune of a Chinese folk song which 'in the 1940s was used for the revolutionary song "Workers and Peasants are one Family"'¹⁹¹

Wolff took up American citizenship in 1947, studied classics at Harvard University, and through his association with John Cage in the early 1950s was influenced by the older composer's philosophies and pursuit of non-intention. His music incorporates ideas of performer participation through the use of improvisation, choices of *timbre* and the reactions of one player to another, all of which contribute actively and creatively to the flexibility of his compositions. Later, around 1968, he endeavoured to awaken sympathy for his revolutionary political ideas through his music. For Wolff, Cornelius Cardew (1936-1981) the British composer and Maoist, and other politically motivated contemporary musicians who thought like them, progress meant that music should relinquish all its own hopes and histories in order to serve the 'cause' and take a stand on the side of the people by making a positive contribution to the revolutionary movement.

Rhythmically this string quartet is flexible, and the composer's instructions state:

In general, the music can be regarded as material for flexible use
players are free to make changes of *tempo* the few specifications
are not intended to be restrictive.'¹⁹²

In certain sections the hand-written score has traditional symbols, spatially set out, without time signatures and with only a perfunctory use of barlines; while in other sections there are traditional notes, barlines and the occasional use of a key signature. Time signatures are never shown.

¹⁹¹ See Wolff, String Quartet Exercises Out of Songs, New York: C.F. Peters Corporation, 1977. Preface to Score. (Hereafter, Wolff, String Quartet, 1975)
¹⁹² *Ibid.*, composer's notes.

Notice, too, in the example following, the idiosyncratic use of irregular beams, drawn in such a way that they move either up or down in direct relationship to the pitch of the note groupings.

Example 40.

Example 40. Conventional symbols and Space notation
Wolff, String Quartet Exercises Out of Songs (1975), bar 22

The image shows a musical score for Example 40, consisting of four staves. The first staff is a treble clef with a key signature of one sharp (F#). The second and third staves are also treble clefs. The fourth staff is a bass clef. The music features irregular beams that curve upwards or downwards, often grouping notes in a way that suggests a specific spatial or pitch relationship. There are several instances of notes with a '5' above them, indicating a fifth finger. The notation is dense and rhythmic, with many sixteenth and thirty-second notes.

- no other quartet, wholly in traditional notation uses spatial notation in this way

Spatial notation: Traditional notation: single notes

Implied interaction between notation and sound

Another fairly uncomplicated use of proportional notation, using traditional symbols, occurs in sections of the Japanese born composer Toshiro Mayuzumi's (1929-) string quartet Prelude (1964). The first section of this 12 minute quartet, is pulseless, without rests, time signatures or barlines. The almost continuous use of the same 'note values' (16th) for the entire section achieves a delicate, transparent, Eastern texture, and implies an intended correlation of subtlety and delicacy between notation and sound, especially achieved by the use of this particular application of spatial notation.

Japanese born Mayuzumi went directly to *Le Conservatoire de Paris* for a year, after studying at the Tokyo University of Art and Music from 1945-1951, returning to Japan in 1952.

It seems as if the composer is creating a relationship between Eastern and Western sound in the two sections of the quartet, with the first maintaining delicate textures as reflected in the sparing use of spatial notation, and second section utilizing the more traditional Western concepts of note-values, rhythmic groupings and rests. Example 41.

John S. Weissmann comments in *The Music Quarterly* : 'Oriental sources may have been responsible for his melodic or motivic inspiration the music reminding one at time of certain passages in Bartók and even Debussy'.¹⁹³

The following example shows Mayuzumi's use of spaced, simple, long notes, each played with a *fermata*, with the duration ' chosen by the performers in consideration of the order of appearances of the sound produced by the other performers there should be no interruption between the notes of each performer [unless] indicated by rests or by a coma.'¹⁹⁴

Example 41. Spatial Notation: Interaction between notation and sound
Mayuzumi, *String Quartet Prelude* (1964), line 1

The musical score for Example 41 is titled "Very Slowly" and includes the following performance instructions: *pp*, *gva*, *sul pont.*, *pizz.*, *arco (sul pont.)*, and *loco*. The notation features long, spaced-out notes with fermatas, indicating that the duration of each note is chosen by the performers.

Further examples of single, conventional notes, placed spatially occur as follows, surrounded by a variety of mixed notational symbols: Examples 42-49.

Example 42. Proportional Notation : Single notes spatially
Von Biel, *Quartett für Streicher* (1964), line 1, Violins 1 and 2

The musical score for Example 42 shows two staves labeled "Violine". The notation includes dynamic markings such as *f* and *z*, and features single notes placed spatially with proportional notation.

- begins very briefly with various types of harmonics in the violins, proportioned per seconds within a barless line
- is the only example of single spatial notes within a score of radically new notational symbols

Example 42

Example 43. Proportional Notation: Single notes
Gistelincq, *Van De Aarde.....* (1966), *Koraal* section

The image shows a musical score for four staves. Each staff begins with the dynamic marking 'mf sempre' (except for the bottom staff which has 'p sempre'). The notation consists of stemless notes (dots) on a five-line staff. Above the notes are various symbols: a cross, a plus sign, a cross with a plus sign, and a circle with a plus sign. The notes are arranged in a way that suggests a specific pitch and duration. The score is divided into four measures by vertical bar lines.

- in the *Koraal* section single stemless notes of the same duration appear between the four parts
- Example 43.

Example 44. Proportional Notation : Single notes
Karkoschka, *Quattrologie* (1966), line 2, between 7-13 seconds

The image shows a musical score for four staves. The notation is minimalist, featuring stemless notes and various symbols like crosses and plus signs above the notes. The dynamics are marked 'ppp' and 'molto vibrato'. The music is divided into two measures by a vertical bar line. The bottom staff has the instruction 'poco a poco senza vibrato' and the top staff has 'poco a poco con molto vibrato'. The score is marked with '(7)' at the beginning.

- spatially notated black single notes in Violin 2 and Viola without barlines, spaced and marked per seconds
- Karkoschka uses spaced single stemless notes in various places in the composition Example 44
- after No. 9, p. 7, the same category appears as double stoppings in all four parts of the quartet as shown below Example 45

Example 45. Proportional Notation : Separated spaced double stopped notes in all four parts
Karkoschka, *Quattrologe* (1966), after No. 9, p. 7

The image shows a musical score for four staves, labeled (6) at the top left. The notation is a form of proportional notation where notes are spaced out rather than grouped by bar lines. The staves contain various dynamic markings: *f* *decresc.*, *p* *cresc.*, *ff*, *p* *sub.*, *cresc.*, and *fff* *decresc.*. The notes are represented by stems and flags, with some having stems that are not connected to the note heads, indicating a specific rhythmic or spatial placement.

Example 46. Single Proportional Notation and conventional groupings combined between the parts
Bredemeyer, *Streichquartett* (1968), line 3, all instruments

The image shows a musical score for four staves, labeled line 3. The notation combines proportional notation (spaced notes) with conventional groupings (beamed notes). The staves contain various dynamic markings: *pizz.*, *forz.*, *arco*, and *fz*. The notes are represented by stems and flags, with some having stems that are not connected to the note heads, indicating a specific rhythmic or spatial placement.

- a good example of spatial and traditional notation intermingled between the parts
- Violin 1 and Cello : combination of proportional and traditional groupings
- Violin 2 and Viola : exclusive use of spatial single notes Example 46

Example 47. Proportional Notation : Single notes
 Crosse, Studies for String Quartet Set (1976), *Recitativo*, at I

- surrounded by new and traditional notational symbols, single spaced proportional notation occurs in different sections. This example is taken at the letter I.

Globokar, in the quartet *Discours VI* (1982), displays a variety of new durational symbols and makes only very brief use of conventional single notes spaced proportionally (*Discours* p.19)

The particular performing instructions of this quartet, commissioned in 1982 for the Witten Festival of Contemporary Chamber Music, require the members of the quartet to act as musicians, speakers and mimes with thirty-one ways to perform the music, the music and the text, or the text alone. For example, the composer intersperses separate numbers - ringed (from 4-31) within the score, which specifically require the musicians to become vocal in different ways - either articulate or indistinct.

The assortment includes:

Instruction	Number
■ speak in a hoarse voice	9
■ percussive voice	19
■ speak loudly with mouth closed	22
■ yell while inhaling or exhaling (jerky)	27

Other instructions are shown by the use of a capital letter (from A-K), each of which is placed in a square to signify a directive. These include for example :

- F Va. = "I am looking for keys in my pockets, then for a bill fold, and perhaps a handkerchief."
- Vc = "A young lady is talking to me in a language I don't understand."

- G Vn I = "Look, I am standing up and want to talk but I can't."
Va = "I am kneeling and starting to pray"

- H Vn I = "I am holding out my hands, my arms to her."
Va = "I am putting my foot under her skirt and lift it."

The following example shows F : G : H : in the score: Example 48.

Example 48. Posture instructions at Letters : F : G : H:
Globokar, *Discours VI* (1982), Lines 4-6, page 15

The image shows three staves of musical notation for Violin II (VI. II). Each staff includes a box with a posture instruction and a circled letter (F, G, or H) in a square box. The first staff (labeled 17) has the instruction "FRAPPER DU PIED" (hit the foot) and "VOIX RYTHMÉE" (rhythmic voice), with notes marked "pizz." and "arco". The second staff (labeled 16) has the instruction "DIRE CHAQUE MOT SUR UNE HAUTEUR DIFFÉRENTE" (say each word on a different pitch), with notes marked "pizz." and "arco". The third staff (labeled 15) has the instruction "ANNONCE EXUBÉRANTE" (exuberant announcement), with notes marked "arco" and "pizz.". The letters F, G, and H are placed in square boxes to the right of each staff, corresponding to the posture instructions.

Vinko Globokar (1934-), a Yugoslavian composer and trombonist who studied at both Ljubljana and Paris conservatories, worked closely with Stockhausen, Kagel and Berio. His extraordinary instrumental virtuosity prompted Berio to write *Sequenza V* (1966), one of a series of *Sequenza* compositions numbered I-X, each of which was written with a particular soloist in mind to demonstrate, particularly in the earlier pieces, the versatility of the instrument (or voice as in the case of *Sequenza III* composed for Cathy Berberian), with new techniques and effects ingrained in the music of the 'time', and not used merely as embellishments or for mere technical feats.

In the 1960s, postwar composers extended the challenging scores of Boulez and Stockhausen into an area of compositional technique that paralleled a rapid extension of extreme and unprecedented demands made on the performer. There coexisted a new virtuosity made up of the fusion of the

inherent quality of the music itself and the technical capabilities of the instrument, as well as an attitude, amongst others, that sought to engage performers in free improvisation. Globokar belonged to both 'camps', firstly as a performer, who by the very nature of having works dedicated to him, was required to display incredible virtuosity as a trombonist and secondly, as a composer, whose musical attitudes demanded :

... a need for liberation ... a search for a new musical aesthetic, a provocation, a wish to work collectively, to develop instruments, to amuse themselves, at political or social engagements, the wish to belong to an elite capable of improvising, a way of evaluating themselves, a way of expressing themselves not only through sounds but through physical comportments, a need to create a contact (and the most direct possible) with the audience, a need to give free rein to his imagination (without being obliged to spend hours of reflection at a worktable), and many other things.¹⁹⁵

While this manifesto has many aspects of liberating performers and creating a climate for improvisation, there are certain points that could easily be reversed.

One that Griffiths considers to be important is that audiences can be brought into closer contact when there is some shared framework of discourse - and he says, further, that the survival of improvisation '... appears to have depended on the evolution of attunements within ensembles and between ensembles and audiences. He maintains that the eclipse of improvisation may have come from the recognition that its promises were over optimistic'.¹⁹⁶

In Globokar's quartet the deliberate employment of words and verbal sounds show a certain detachment from the music without any real justification for their being included in the score - it seems as if this work belongs to a category that is as much theatre as music but without really expressing a dramatic situation. It is, rather, 'a situation' in which the quartet players find themselves.

In the quarterly journal of the Music Library Association, Daniel Avshalomov of *The American String Quartet*¹⁹⁷ reviews certain contemporary quartets, including Globokar's *Discours VI*, and designates

¹⁹⁵ "Ils improvisent ... improvisent ... improvisons," in *Musique en jeu*, 6, 1972, p. 14.

¹⁹⁶ Griffiths, *Modern Music and After*, p. 205.

¹⁹⁷ Avshalomov, D., *Music Reviews - String Quartets*, in *MLA Notes, Quarterly Journal Music Library Association*, No. 2, 1987, p. 371. (Hereafter, Avshalomov, *Music Reviews*.)

the theatrical endeavours of this quartet as belonging to a category called "Performance Art" which the critic calls '.... another sorry aim.'

He starts the critique by saying:

Vinko Globokar's *Discours VI* purports to be a work for string quartet.

It is not.

He writes further about the kinds of vocal sounds the members of the quartet are asked to produce.

The musician whose training, taste and technique have been directed toward the development ofinstrumental voices will find himself ill-equipped for *Discourse VI*. Would it not be simpler to train actors in the limited instrumental skills the score demands?

Technically the work is a failure.¹⁹⁸

Avshalomov wonders whether the quartet 'yearns mightily for recognition of its iconoclasm and its daring dismantling of the staid protocols of music-making and concert-going ; for novel effect at any price as the only way to the exalted status of the *cutting edge of the vanguard*'¹⁹⁹, and reminds the composer that twenty years back, every aspect of musical composition and performance was being examined onstage in light of the heightened and idealized awareness of individual creativity of those times.

Avshalomov concludes his critique by saying openly:

Historically the work is a failure

It would be surprising to hear of performances of this piece anywhere after its premier.²⁰⁰

Michael Gielen's quartet, *Un Vieux Souvenir*, composed a year later in 1983 includes 186 separate instructions of new string techniques, new notational symbols , vocal sounds and requests which, effectively, place this quartet in the category of music theatre, as discussed above . He requires a whole variety of 'dramatic' movements from the players and one of many - Number 113 - requests that the musicians:

Stamp both feet loudly. Ossia: Sit frozen with outstretched arms.

Grand gesture !

¹⁹⁸ Avshalomov, *Music Review*, p.371.

¹⁹⁹ *Ibid.*, p.371.

²⁰⁰ *Ibid.*, p.371.

The instructions are either written in the score or, alternatively, referenced with a coded number where the special instruction is required; the numbers 1-186 and the respective instructions are found on a separate sheet. The selected text is taken from two Charles Baudelaire poems entitled respectively: *Une Charogne: (A Carrion)* and *Le Cygne (The Swan)*

Example 49. Proportional Notation : Single notes groupings.
Coeck, *Graphismes* (1983), line 1

- the three movements of this quartet are composed in traditional notes - single or of varying durations and
- on the first line single notes are proportioned separately between the parts and placed within a time span of 60"
- no barlines appear throughout the quartet and the duration of every line is consistently timed at 60". Example 49

New Durational Symbols and Extended Beams

Extended beams attached to, or placed after notes, or alternatively without any noteheads at all is a contemporary method of 'time notation' which substitutes conventional note/rest durational values for beams of various lengths, stretching from very small extensions to protracted horizontal lines. It has become an important contemporary method of notating duration .

American Innovation

It was the American Earle Brown , and his fellow countryman Morton Feldman (in Projection I. for solo cello (1950)), who first used completely new shapes - in the form of geometric symbols - to identify duration amongst other musical parameters.

As discussed in a earlier chapter, Brown was particularly influenced by the members of a New York school of visual arts which produced such artists as Jackson Pollock (1912-1956) who's paint splashed canvasses conveyed a type of spontaneity and directness. It was also in the 'mobiles' of the sculptor Alexander Calder (1898-1976) which moved around to form a variety of shapes, that Brown found the integral but unpredictable 'floating variations' that he sought for music.²⁰¹ Cage wrote admiringly of the fantastic aesthetic accomplishment of these artists who started to explore their own sensibilities, their own plastic language with that complete independence from other art, that complete security to work with that which was unknown to them.²⁰²

They felt no close ties with Europe and their art forms were, therefore, products of the raw soil of an America that was to forge its own future. Notationally, this was true of Feldman and Brown in their respective use of new notational symbols. Brown's aim, in particular, was not the empty space of Cage, nor the quiet space of Feldman, and neither the obliteration of the composers' intent, nor the liberation of the performer from it, but 'the creation of a well-made piece, one that would have a sure identity for all the variability of form and detail introduced by means of indeterminate notation.'²⁰³ This he achieved by creating a new notation that well forged it's own future by providing graphic proportional notation that was to become closely associated with non-metric successions of durations without any fixed or rigid co-ordination between the sounds but, rather, with deliberate flexibility which accords the performer varying degrees of interpretative freedom.

In visual terms, graphic scores of the 1950s resemble the artworks of an earlier European period that emerged around 1917 called 'art of determined relations' or 'constructivism'. Brindle comments on a distinct resemblance between some of Brown's scores and certain pictures of Piet Mondrian, Bart van der Leck, Gerrit Rietveld and others. He says, too, that there is a strong affinity between Brown's Folio score of (1952) and van der Leck's Geometrical Composition of 1917.²⁰⁴ Whether Brown was aware of this is not known.

However, it was not until the String Quartet of 1970 that Brown used his new innovative beamed durations in the *genre*, although earlier, another composer, Marek Kopelent , had utilized spatial beams as durational symbols throughout his third string quartet, 3. Quartetto (1963), first recorded by Cologne Radio in February 1964.

²⁰¹ Nyman, Experimental Music.

²⁰² Cage, History of Experimental Music in the United States, in Silence, p.

²⁰³ Griffiths, Modern Music and After, p.95.

²⁰⁴ Brindle, The New Music, p.89.

Proportional Spacing and Beaming

Extended Beaming and Noteheads

The starting point of each note is shown by a stemless notehead, followed by a continuous line. Of the quartets under discussion, Kopolent's use in the following example demonstrates the earliest use of extended durational beams (1963) Example 50.

Example 50. Duration : Proportional extended stemless noteheads
Kopolent, *String Quartet No. 3. Quartetto* (1963), page 7

The image shows a musical score for a string quartet. It consists of four staves: Violin I (top), Violin II, Viola, and Cello/Double Bass (bottom). The music is written in a key with one sharp (F#) and a common time signature. The score is marked 'poco a poco crescendo' at the beginning and 'ff' (fortissimo) towards the end. The notes are represented by stemless noteheads, and their durations are indicated by horizontal beams. Vertical dotted lines are placed at regular intervals, corresponding to the duration of each note. The beams are placed between these lines, and the stems extend from the noteheads to the beams. The notes are numbered 32 through 46, with a final measure marked 'ff'.

- the composer requires the use of free rhythm throughout
- duration is shown with the beamed notes placed between vertical dotted lines
- each spaced to correspond to a specified number of seconds and thus regulate the proportional spacing of the beams

Other contemporary composers using beamed stemless symbols in combination with traditional or new notational symbols :

Composer	Quartet	Date	Comment
Becker	No. 2	1967	duration per seconds
Rihm	No.3	1976	only in a separate section marked <i>Zwischenspiel</i> (Interlude) which lasts ca 1'-1.30' marked <i>Senza tempo</i> .
Heyn	<i>Sirenes</i>	1983	note/s attached to beams used very sparingly in this single movement quartet

Example 51. Beamed Stemless Notes, Double Stoppings
 Heyn, *Sirenes*, (1983), bar 166

The image shows a musical score for four instruments: Violin I (VN I), Violin II (VN II), Viola (vld), and Violoncello (VC). The score is divided into two measures, 65 and 66. Measure 65 is in 4/4 time with a tempo of ♩ = 65. Measure 66 is in 3/4 time with a tempo of ♩ = 57. The notation features beamed stemless notes and double stoppings, which are indicated by dotted lines. Performance instructions include 'slow down trem. grad.', 'poco', and 'ppp (p) ordn. tasto'.

- beamed stemless notes in double stoppings within a time span shown with dotted lines
- tempo : ♩ = 57 and a time signature of $\frac{3}{4}$
- a combination of new symbols and traditional notes. Example 51

Beaming without noteheads

Proportionate beams are also shown without noteheads with the length of the beam indicating duration.

In his *String Quartet* (1970) Earle Brown makes extensive use of beamed proportional notation which consists mostly of symbols of the very shortest duration. Visually, these symbols have almost the same appearance as ordinary 'crotchets', but the modification to square 'noteheads' places them in the new category of proportionally beamed notation, albeit of the shortest duration. Example 52.

Example 52. Proportional Notation: Single notes beamed : Short duration
Brown, *String Quartet* (1970), 'bar' 2

The image shows a musical score for a string quartet, specifically 'bar' 2. It consists of four staves, each representing a different string part: A string, Violin (V), C string, and C string. The notation is proportional, with notes beamed together. The score is divided into two sections: the first section is 20 units long, and the second section is 40 units long. Dynamics are indicated by arrows and text: 'ppp' (pianissimo) and 'mp' (mezzo-piano). Specific notes are marked with 'D ends here', 'C# ends here', 'C ends here', and 'B ends here'. The notation includes various symbols and markings, such as 'NAT.' and 'string', which are part of the composer's 'time notation' system.

- at the outset of this quartet, and in many other sections, single spaced notes are beamed for the shortest duration. In the example above they relate to a time span of 40" per section

The various durational concepts the composer creates in this quartet have special significance. His first use of new symbols in *Folio* (1952-3) constituted a crucial and radical liberation for certain contemporary composers from, what was seen by some to be, an obsolete notational system, limiting the personal element in rhythm and generally reducing the creative opportunities for musical expression and form. Brown states in the preface to the score that the new term called "time-notation" for the compositional approach to pitch, duration, technique and dynamics, found specifically in this quartet, is an extension and development of the revolutionary "graphic" notation of his earlier work.

Brown's explains his expectations of the players' realisation of "time notation" :

It is a "time-notation" in that the performer's relationship to the score and their actual sound in performance are realised in terms of the performer's "time sense perception" of the relationships defined by the score, and not in terms of a rational metric system of additive units. The durations are organised visually in their complete space-time of sounding and are in precise relation to the space-time of the score.²⁰⁵

There is a predominance of notational flexibility built into this quartet, both in the separate parts and in the relationships between the ensemble parts. It clearly represents sound relationships that are completely independent of a strict pulse or metric system. In performance, however, Brown states that a precise translation of the spatial relationships is not expected but rather a relative realisation made more spontaneous through the involvement of the performers' subtly changing perceptions of the spatial relationships.²⁰⁶ As such, he suggests a chronometer be used in rehearsals until the timings and section changes become intuitive, based on 'knowing-by-ear' the changes and section sound characteristics, by the time of performance.

The whole quartet has a quality of relativity in most areas except where the composer specially stipulates simultaneousness of entry indicated by an arrow, and as such maintains a spontaneity of performer process and balance between the areas of flexibility 'while maintaining the basic shape and character of the work.'²⁰⁷

The composition is scored on three pages and, almost without exception, most 'bars' contain beamed durations of the shortest value.

Generally in the quartets researched, only one other composer in addition to Brown, uses durational beaming without stems or noteheads - Volker Heyns' quartet *Sirenes* (1983) has 179 bars and a playing time of about sixteen minutes. In the first eighty-eight bars predominantly noteless, stemless, durational beams occur, while in the remaining ninety-one bars mostly traditional proportional note values combined with new durational symbols are used.

Beaming with noteheads and stems: separate and joined.

Other uses of traditional symbols in proportionate notation show a shift to stemmed, black notes, or alternatively, to either black or white stemmed noteheads, to show relatively long or short values respectively. They represent both pitch and durational indicators by virtue of the noteheads and the attached beams of varying lengths. The proportional note spacing shown in the example below conveys the relative rhythmic interaction within the context of the music as a whole, while the beams indicate the specific durations.

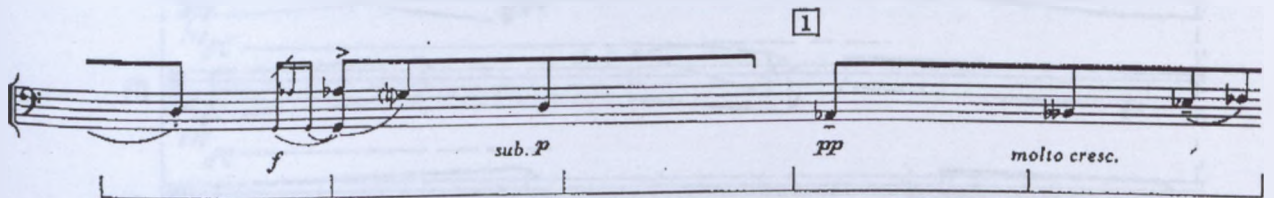
²⁰⁶ Brown, E., Score, *String Quartet*, Universal Edition, 1970, Composer's notes

²⁰⁷ *Ibid*

The Australian composer Peter Sculthorpe (1929-), who sought to be specifically Australian by using aborigine folklore and the music of neighbouring territories, uses in his String Quartet No. 8 (1969), Section I, only proportional black notes, stemmed and beamed, within a time indicator of approximately 3" division per beat, which accurately represents the length and note relationships. Despite falling into the category of proportionate notation, there is, in this quartet, a type of built-in accuracy of duration in that, not only is there a time span marked below the staff in regular seconds, but in addition a duration indicator in the form of a short downward stroke at the end of each beam, marks a more accurate note/time relationship within the proportionate notation (♪).

The second and fourth movements have conventional note values, variable time signatures and barlines, while in the first, third and fifth spatial beamed black noteheads are used. Example 53.

Example 53 Proportional Notation: Exact Beaming of Black stemmed notes
Sculthorpe, String Quartet No. 8 (1969), Section I, line 3



- indicators for precise cut-off point
- downward short stroke Section I : Line 3

Keleman in his string quartet, Motion (1969), is another composer using a short curved downward stroke at the end of the beam to show cessation of sound. This symbol is found consistently, amongst others, for indicating sound duration throughout the quartet. Playing time, c. 12 m

Indicating short duration at end of beamed noteheads

When a very short duration - too short in fact to warrant a beam - is intended for the last note of a progression of two or more notes, then a flag is attached to the stem, sometimes accompanied by a staccato above or below the notehead, to show the brevity of duration, as shown in the example below. Example 54.

If a short note occurs alone, unconnected to a beam, it is often shown with a slanted 'beamlet' attached to the right side of the stem.

From the selection of quartets under discussion only one, that of the American composer Jacob Druckman (1928 -), shows the use of the flagged note to represent a very short sound at the end of a beamed grouping of notes. This is illustrated in the following example taken from his String Quartet No. 2 (1966).

Example 54. Symbol to indicate brevity at end of beamed note-grouping
Druckman, String Quartet No. 2 (1966), (on) Page 12, Figure 13

The image shows a musical score for a string quartet, labeled '13' in a box. It consists of four staves, each with a different clef (treble, alto, tenor, and bass). The notes are beamed together in groups. At the end of one of these groups, there is a note with a slanted beamlet attached to its right side, indicating a very short sound. Above the first staff, there is a long horizontal arrow pointing to the right, with a small note and a sharp sign above it. The score includes various musical notations such as dynamics (ppp, p), articulation (acc), and fingering (II).

Although Druckman views the concert hall as a type of theatre where a concert, for him, is a dramatic ritual, and in his instrumental works he is involved with the actual presence of the performers theatrically as well as musically. The performance instructions of this string quartet require no theatrically inspired effects.

Beamed Notehead Extension for Continuous Pitch

Sustained durations of the same pitch, continued from one line to another, are shown in different ways. A common use is to continue the beam to the end of the line, attach an arrowhead to it, then without re-notating the pitch continue the beam into the next line and across the barline/s for the required duration of the sound.

Penderecki's use of this notation is shown in the following example. Example 55.

Example 55. Sustained pitch across line : Beamed with an arrowhead
 Penderecki, *Quartetto No.2.* (1968), page 18, two bars before *Lento* in all parts

The image shows a musical score for four string instruments: Violin 1 (vn 1), Violin 2 (vn 2), Viola (vl), and Violoncello (vc). Each staff contains a series of notes beamed together across four measures. The notes are connected by a continuous line with arrowheads pointing to the right, indicating a sustained pitch across bar lines. The dynamic marking *(fff)* is written below the cello staff. The notation is in a high register, with notes on the upper lines of the staves.

Another method of indicating a continuation of pitch from one line to another is just to continue the line/beam across the barline to the next line without the use of an arrowhead. Some composers re-notate the pitch at the beginning of each bar, or line, and others merely continue the beam without it. Heinz Holliger makes extensive use of the last method in his quartet *String Quartet* (1973), while Becker in his *String Quartet No. 2* (1967) re-notates the pitch at the beginning of each bar.

Legato/Non Legato

Duration symbols beamed and stemmed show two distinct arrangements:

- each duration stemmed and beamed separately to represent *non legato*
- a series of notes joined together to represent *legato*

Legato and *non legato* durations found in other quartets are as follows:

Composer	Quartet	Date	Comment
Kolopent	No. 3	1963	<i>legato</i> and <i>non legato</i>
Druckman	No. 2	1966	sporadically : <i>legato</i> and <i>non legato</i>

Druckman's use of this category of beamed spatial notation is a good example of how clearly it functions on the various staves of a composite work, despite the overlapping of the durations seen in the example below. He mixes proportional beamed durations and conventional notation but makes more extensive use of traditional rhythmic note values and groupings combined with barlines and variable time signatures than of the new method of durational beaming. Example 56.

Example 56. Proportional Notation: Noteheads beamed and stemmed
 Druckman, String Quartet No. 2 (1966), in Line 1

Vertical Lines as Connectors

In the case of voice crossing between parts or for *legato*, a vertical connector between the notes is used. The following two examples illustrate firstly, Kopolent's use of dotted connecting lines indicating an unbroken stream of *legato* durations of various lengths passed variously between the four instruments, and secondly and alternatively, *non legato* durational beams without the connecting vertical lines. Example 57.

Examples 57. Proportional Notation: beamed *legato* and *non legato*
 Kopolent, String Quartet No. 3 (1963), page 6 and page 7
 Beamed *legato*, p.6

Beamed *non legato*, p. 7

poco a poco crescendo

32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 *ff*

Duration and Slurs

Within the concept of proportional spacing where rhythm is indicated by the spacing of the noteheads, extended slurs can be used to indicate the duration of longer notes. Attached to the end of the slur is a note of selected duration to show the point and length of cessation of sound. Example 58.

Example 58. Duration and Slurs
Bredemeyer, *Streichquartett* (1968), page 4, line 3, Violins 1 and 2

- this single example found in the quartet is used in a barless, meterless section of spatially proportioned notes
- the duration of the dotted semibreves in Violins 1 and 2, is inexact
- slurs are attached to the notes to indicate their length within the proportional spacing of the other parts, *and* the short note attached at the end of the slur shows the brevity of sound at the point of arrival. The rests appear sometime after the cessation of the notes and bear no relationship to the time span of the preceding semibreves as the 'bar' is a-rhythmic.

- Bredemeyer uses slurring to show both duration and the point of cessation

In the quartets under investigation, no quartet other than the Bredemeyer displays the use of this method of extending the duration of a note

Beamed Spatial Notation: Advantages and Disadvantages

Advantages

Beamed Spatial Notation:

There are certain advantages of beamed spatial notation

- an immediate visual picture of the duration of tones
- only one kind of horizontal line needed to show duration: (either a single beam or an extension of the notehead)
- the system makes available an unlimited number of durations, which in traditional notation are strictly confined to specific symbols contained within in that system
- continuity of beam shows a graphical line of legato
- rests become superfluous - the blank spaces relate to rests
- beams introduce a whole new concept, by-bypassing conventional dots and ties
- the use of additional numbers for irregular note groupings is negated
- more flexible synchronisation of parts as these are only approximations

Disadvantages

There are certain disadvantages in beamed proportionate notation:

- a disadvantage arises when two parts, within the same range, appear on a single stave. Even the use of connectors (as described in the Kopolent quartet) to show the progression of the separate voices creates confusion with a proliferation of existing vertical and horizontal lines. This makes score reading of duos or trios, played within the same intervallic range, virtually impossible. This notation is thus best suited to vocal and instrumental music with a single horizontal progression of notes
- another disadvantage is in ensemble playing. A single player within an ensemble group cannot

relate to the parts of the other performers in the matter of durational relationships if traditional durations are not used, or if the player does not have sight of the full score. The proportional relationships between the single player, in a string quartet for example, and the correlation needed between the other ensemble players, is irrelevant without access to a full score which allows a player to place his spatial requirements within the context of the score as a whole

- problems could arise with the use of accidentals. If needed for very short durations, for example, in intervals of a horizontal second, played at a very fast *tempo*, or in specific microtonal variations of pitch in fast passages, then the short extenders leave very little space for the incorporation of accidentals. A compromise by way of a sudden change to conventional symbols is not really successful as the odd use of a traditional pitch/duration symbol within a proliferation of spatial symbols creates confusing visual concepts for the reader. Notational changes function more favourably when used alternatively, within larger sections of a single work, when the need is for either metrical and non-metrical durations is required.

The following extract from Brown's *String Quartet (1970)* shows an organisational problem that could arise if accidentals were required in the Viola part : Bars 1 and 3. Example 59

Example 59. Problem of using accidentals in adjacent intervals
Brown, *String Quartet (1970)*, page 1, bars 1 and 3, Viola

The Heyn example following, taken from the string quartet *Sirenes (1983)*, shows the accommodation of microtonal accidentals with suitable spacing. Example 60.

Example 60. Microtonal accidentals adequately spaced
 Heyn, *Sirenes* (1983), bar 63

The image shows a page of a musical score for a string quartet, specifically bar 63. The score is divided into four systems, each representing a different instrument: Violin I (I), Violin II (II), Viola (Vcl), and Violoncello (Vcl). Each system has four staves (I, II, III, IV). The notation includes various microtonal accidentals (flats) and performance instructions such as 'Sin sempre', 'ordn.', 'andapando', 'medium speed bowing', 'extreme fast bowing', and dynamics like 'pp', 'mf', and 'f'. The page number '16' is visible at the bottom center.

- Kurt Stone states a further disadvantage of the proportional beaming:

‘.... it poses another problem : page turns in instrumental parts’.²⁰⁸

In conventionally notated music, the rhythmic explicitness of the subdivision of the page remains unaffected. ‘This remarkable horizontal flexibility is indispensable for making good page turns possible. Proportional notation lacks this flexibility’,²⁰⁹ despite the fundamental supposition of it being essentially approximate in duration and thus having the versatility to accommodate the imprecise timing needed for page turns.

²⁰⁸ Stone, *Problems and Methods of Notation*, pp. 22-23.
²⁰⁹ *Ibid.*, p. 23.

Spatial Notation and Superimposed Numbers

Proportional Notation and Superimposed Indicators

At times, composers superimpose signs to indicate the duration of groups of notes, single notes or phrases. When used, they are more commonly found in flexible passages within traditionally notated works, or sections thereof, with additional instructions given by the composer to clarify further the proportional relationships of note groupings within a particular section of a composition.

An apt example is found at the outset of Powell's String Quartet *Filigree Setting* (1965). The following example sets out very simply the purpose of the additional numbers placed below the grouping of notes. Example 61.

Example 61. Additional numbers: Specific function
Powell, *Filigree Settings* (1965), page 2, 'bar' 1, Violin 1

The image shows a musical score for the first bar of the Violin I part in Powell's *Filigree Settings*. The score includes staves for Violin I (V.I.), Violin II (V.II), Viola (Va.), and Violoncello (Vc.).

- V.I. Staff:** Starts with a slur over notes. Above the slur is the instruction *lento, accel. poco a poco*. Below the slur is *ad lib.*. Below the notes are proportional numbers: 5, 3, 3, 4, 3, 2, 2, 1. A dashed line connects the slur to a diagram of a violin fingerboard.
- V.II Staff:** Features a section marked *[Free right hand]* with a *rit.* marking. A diagram shows a violin fingerboard with notes and a *rit.* marking.
- Va. Staff:** Starts with *arco ord.* and *ppp*. Below the notes is the instruction *as quickly and delicately as possible*.
- Vc. Staff:** Starts with *arco* and *ppp*. Below the notes is the instruction *as quickly and delicately as possible*.

Additional annotations include: *Va. I (cue Vn. II)*, *Vn. II sul E*, *accel.*, *clear, delicate, marcato with one finger*, *[take bow]*, and *pizz.*

- in Violin 1: Powell uses single stemmed notes, proportionally spaced within a slur with additional numbers ranging from 5 to 1 placed below to indicate the proportional spacing of one note to the other
- the addition of proportional numbers, to reinforce the spatial design of the grouping of notes in Violin 1 is of particular importance here
- in the composer's notes he gives the following instructions:

Sets of numbers placed beneath these symbolsrepresent relative durational values, with each unit value chosen in each case by the individual player.

Example 62. 15th Century Fragmented Notation
Bande Cordier, Musical Heart from the *Chantilly Codex c 1400*



The Powell example is taken from the section that begins the quartet and illustrates a modified contemporary reintroduction of ingenious complications of 15th century notation within the 20th century concept of fragmented notation. Example 62.

Comment

An investigation into the string quartets post-1945 shows the development of new and radically unconventional durational concepts. It became necessary for composers to disregard the former practices of a 'system-of-signs' now incapable of expressing the complete range of note values and relationships needed to describe the many faceted contemporary rhythmic ideas.

Proportional notation and beaming evolved as one method of notation to describe 'unconventional' rhythmic and durational phenomena in music that contained nonmetric successions of duration. It was devised to express rhythmic flexibility or durational vagueness requiring less precision of coordination of parts and to allow the performer varying degrees of interpretative freedom. It cannot be adapted to the 'beat' structured notation which has been fundamental to centuries of Western Art

music, but nevertheless functions in contemporary compositions alongside conventional notation.

Durational beams are sometimes used in conjunction with equi-distant tactus strokes, the speed of which is governed either by a metronome mark or marked in seconds or multiples thereof. However, if the music is without pulse or if the pulse keeps changing in different sections, then the strokes merely function as a neutral frame to co-ordinate the relative proportionate durations one to another.

Generally, the relative lengths of the beams are proportionally executed within a single score, and the noteheads attached to beams are now mostly merely pitch indicators, devoid of the former all important colour/durational equation. Black notes are mostly preferred and a change of notehead colour does not commonly relate to duration. Not all composers have forsaken the comparative use of white notes (relatively long) versus black notes (shorter). They continue to be practised as a valuable visual tool when relationships between longer or shorter durations are needed.

Each composer has formulated a notation to cope with his specific needs, and the procedures that emerged are categorised mainly as follows:

Type	Composer	Date
■ Spatial notation using traditional notation in one way or another	Mayasumi	1964
	van Biel	1965
	Gisterlinck	1966
	Karkoshka	1966
	Bredemeyer	1968
	Globokar	1982
■ Beaming with noteheads attached	Kopolent	1983
	Becker	1967
	Rihm	1976
	Heyn	1983
■ Beaming with noteheads and stems	Sculthorpe	1969
	Kelemen	1969
■ Beaming without any attachments	Brown	1970

- Beaming for sustained pitch Penderecki 1968
- Beaming across from one line to another Holliger 1973
- Other symbols with a variety of rhythmic Druckman 1966
specific meanings
- Slurs (used infrequently) Bredemeyer 1968

The above analysis shows, too, that the earliest use of beamed spatial notation in string quartets post-1945 occurs in Kopolent's *Quartetto 3* (1963). Despite Brown's innovative use of graphic notation in his piano work, *December* (1952), based on a concept of proportional notation, it is only later in his *String Quartet* (1970) that proportional beaming appears throughout the work.

The conceptualisation of unconventional proportional notation is open to a variety of deliberate and meaningful adaptations and extensions to conventional rhythmic symbols, as well as having the dimensions for the devising of totally new concepts of durational representation.

Kurt Stone issues a word of caution when he argues that '.... no matter how cumbersome and alien [traditional notation] is as a graphic vehicle for today's music, [it] is still the only method which ensures that the performer will be able to reproduce exactly what he sees.'²¹⁰

The fact that contemporary musical trends have moved away from reproducing exactly what is written in the score and that exactness is no longer desirable in much of today's music, makes Stone's point less incisive. However, he does make the important observation that 'human beings simply do not seem to possess a space perception equal in acuity to their pulse perception even the counting of a neutral tactus i.e. a pulse unrelated to the actual meter or rhythm, is extremely difficult if the notes themselves do not symbolise countable time values.'²¹¹

Despite the effectiveness and durational flexibility of spatial and beamed notations which are used in a variety of ways, traditional symbols are generally not totally abandoned but are retained and used alternately in conjunction with various classifications of proportionate spacing. This occurs when a need arises for both non-metrical and metrical sections within a single work.

²¹⁰ Stone, K. *Problems and Methods of Notation*, in *Perspectives of New Music*, No. 2, 1963, p. 22 (Hereafter, Stone, *Problems of Notation*)

²¹¹ Stone, *Problems of Notation*, p. 22.

This investigation into the use of proportionate notation in string quartets post 1945, shows that it has become an important contemporary method of notating duration.

Modification of Traditional Indicators in Contemporary

Irregular Rhythmic Groupings

Clarifying Notes and/or Numbers

Where strict rhythm, containing a proliferation of notes coupled with fast *tempi*, is required, certain composers have adopted the opposite approach to proportional notation in the continued use of conventional notation to accommodate complex inter-relationships of symmetrical and non-symmetrical groupings. Proportional notation hardly serves a purpose here.

In recent years different practices, using modified aspects of traditional notation, have developed to clarify metric units and complex 'grouplets' of notes. In the first decades of the century, earlier discussions showed that the use of irregular note groupings were modified mostly by the use of a variety of new nonmetric beaming methods and/or frequent changes of time signatures. Certain contemporary quartets exhibit extremely complex irregular rhythmic patterns and extensions are made to maintain and clarify the structure of the 'beat-unit' groupings within the context of the whole.

A new selection of note and/or number ratios has developed to lend visual support to the irregular rhythmic usage in the 20th century. These modifications clarify certain rhythmic developments, such as:

- vacillating rhythms
- irregular groupings where the subdivision is not explicit, or where
- irregular groups appear across the barline or
- where irregular groupings appear within other irregular groups

Use of Small Figures

For centuries the conventional use of small *italic* figures, incorporated within slurs, have been used to denote irregular subdivisions of the beat. The early 'straightforward' irregular quintuplet, for example, requires only the addition of a single small number (5) to be placed within a slur. 20th century combinations of irregular groupings are endless and reveal complexities that create great difficulties for the performer, with multiple arrangements often easier to notate than play. Certain

groupings are not readily clarified by any notational adjustments and, on occasions, composer's rhythmic and *tempo* markings cause confusion, especially when no explanatory notes are provided. The following example, taken from Fisher's String Quartet No. 1 (1961-1962), demonstrates this last point. Example 63

Example 63. Irregular rhythmic groupings: Ambiguity of Intent
Fisher, String Quartet No. 1 (1961-1962), bars 203-204.

Section 4)c $\text{♩} = 54$

senza sord. ($\text{♩} = 30.9$)

senza sord. ($\text{♩} = 123.4$)

senza sord. ($\text{♩} = 151.3$)

senza sord. ($\text{♩} = 92.8$)

mf *f* *mf* *ff* *ff* *p* *sfz* *f*

pizz.

In playing this quartet musicians are faced with a series of complex rhythmic groupings. Within the bars and phrases different *tempi* markings appear throughout the movement, incorporating a variety of separate motivic and segmental sub-divisions. The composer explains that these metric indications '.... serve as more than an arithmetic convenience to the performers,²¹² the complexities of which seem to require a better knowledge of mathematics than of music for a satisfactory solution. At bar 204, despite certain requirements being easily explained, others arise that are both complex and obscure. Those readily understood are:

- all parts have (7/16) time signature
- each of the four parts add up accurately to the requirement of (7/16) per bar
- the overall metric indication is $\text{♩} = 54$
- all parts start together with each voice playing a different rhythmic motivic segment

The above rhythmic aspects are quite straightforward, *except* that the further requirements listed below make for difficulties of execution:

- in each separate part there are varied speed indications for the different rhythmic motivic segments coupled with corresponding *fractional tempi* markings, and
- what is intended by the fractional varying *tempi* metronome markings of the disparate segments, between the parts at Bar 203, is not easily discernible

These composite difficulties make for a somewhat obscure understanding of the relationship between the parts. Thus the interpretation and performance of the the various *tempi* is complex

Throughout this quartet Fisher uses varied rhythmic/*tempi* markings without explanatory notes, making an immediate 'acceptable reading' of the interaction between the parts beyond the powers of standard quartet players.

In fact, in giving a summary of what is required of new symbols, Karkoschka suggests that as far as possible, a symbol should be able to indicate its meaning directly and without explanation.²¹³ In Fisher's example, the symbols may not be entirely new but the rhythmic concepts are, and as such should be able to be interpreted 'directly and without explanation' - unfortunately they are not.

A profuse use of irregular rhythmic groupings is aptly displayed in the quartets of the British composer Brian Ferneyhough (1943 -)

- Sonatas (1967)
- String Quartet No.2 (1980)
- Adagissimo (1983)

The exceedingly complex music has a proliferation of notes that seem to encourage a frantic virtuosity which borders on the limits of technical feasibility. Contained within a single bar of the Second String Quartet (1980), for example, are many irregular, complex rhythmic structures and groupings which vary from beat to beat. These continue unabated throughout to impose severe constraints on the players' ability to perform precisely what is wanted. For example, an irregular subdivision of hemi-demi-semi-quavers (shown as (-----19:16-----) with a crotchet note placed above) is written together with a selection of different groupings in a single bar, (bar 38).

Example 64

²¹³ Karkoschka, *Notation in New Music*, p.5.

H.F. I haven't any idea what they expect; but I do know that, short of electro-mechanical reproduction, they will get an approximation.²¹⁵

A case in point could be Ferneyhough's example shown earlier, (with the numerical ratio of (19=16)) together with a whole variety of irregular number equations used throughout the Quartet No. 2 (1980). However, Paul Griffiths says of these temporal complexities that the novel time signatures, [for example, (1/8: bar 3, String Quartet No. 2)] and the high speeds and irrational rhythms ensure that the work lives up to the difficulty of its Lisztian eponym difficulty is intrinsic to the music.²¹⁶ There can be no debate about the fact that when looking at the score of this particular quartet - from which the previous example is taken - the use of short note values gives the score an alarming appearance, added to which, judgements of pitch, duration and exceedingly fine dynamic markings are demanded which add further levels of distinction and demands from the players. But, on reflection, there seems to be no other satisfactory way to notate such rhythmic complexities.

Addition of Clarifying Notes and/or Numbers

Number ratios placed over a group of note values are now commonly used and appear in a variety of ways:

- **double figure equations - numerals only:** both numerals refer to the same note value with the first defining the irregular and the second the regular note values within the group: e.g. (| $\frac{8}{8}$ -----16:13----- |)

The double-figure method is often used to show unequal units within structured time of great complexity and is mostly carefully notated to show the precise location in the bar. This category is found in the following quartets:

Composer	Quartet	Year	Examples
Ferneyhough	Sonatas	1967	extensive use of fairly simple equations
	Second	1980	extensive use of many varying complex equations as a stylistic characteristic
Dillon	String Quartet	1983	extensive use of many varied equations e.g. in bar 108 the following ratios are grouped together

²¹⁵ Cole, H., *Sounds and Signs*, p.62.
²¹⁶ Griffiths, *Modern Music and After*, p.303.

			Violin 1: 13:10
			Violin 2: 18:12
			Viola: 6:5
			Cello: 6:5
			in demi-semi-quavers (♩)
			time signature: 9/16
Hübler	3 <i>Streichqt.</i>	1982-4	extensive use of Double notation figures <i>e.g.</i> on p. 6, Viola line 3 has the following double figure ratios : 7:4 relating to (♩) 11:10 relating to (♩) 7:6 relating to (♩) 11:6 relating to (♩) no time signature
Brewaeyes	String Quartet	1989	use of traditional equations also more complex <i>e.g.</i> bar 169 : Violin1 : 15:16 (♩) bar 185 : Violin 1 : 14:15 (♩) Viola : 9:8 (♩) Cello : 17:15 (♩) time signature (♩)

■ **equations - double numerals coupled to note values:** double number ratios related to a

note value : *e.g.*

(♩)

(-----19:15-----)

Composer

Quartet

Year

Examples

Ferneyhough

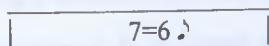
Second St.Qt. 1980

extensive use of varying ratios and
notes values, described above

■ Certain French composers substitute the colon for the word *pour* but it is not found in the quartets under discussion. Other variations of writing the ratios include

- using the (=) sign in place of the colon with or without a note value added

e.g.



- Some composers, shown below, use double figure ratios with the same use of a note value attached to each figure e.g. (5 ♩ = 4 ♩)

Composer	Quartet	Year	Examples
Wyschnegradsky	<i>Pour Quatour</i>	1970	exclusive use of double figure each with a single note value
Huber, N.,	<i>Doubles</i>	1987	exclusive use of double figure ratio each notated with the same note value e.g. bar 32: 5 ♩ = 3 ♩ in all four parts

- **single numerals and notes : irregular note groupings:** within a single bar, where each grouplet has a different number of notes or values, single numbers are used, combined with the respective note values in order to clarify the specific rhythmic structures within the whole. The following example aptly illustrates this method of notating complex rhythms.

Example 65. Single number Indicators for Note Groupings
Ferneyhough, *Second String Quartet* (1980), bar 77-79.

The image shows a complex musical score for a string quartet, specifically bars 77-79 of the Second String Quartet by Ferneyhough. The score is written for four instruments: Violin I (Vln I), Violin II (Vln II), Viola (Vla), and Cello. Each staff contains dense musical notation with various rhythmic groupings indicated by single numerals (1, 2, 3, 4, 5) and notes. Performance instructions are written above the staves, including 'ancora irato e tumultuoso' and 'un poco più fluido'. The score is highly detailed, with many dynamic markings and articulation symbols.

- each instrument has a complex number of conflicting rhythmic groupings

- notated specifically within the requirements of varying time signatures, for example bar 77 - 2/8: bar 78 - 5/8: bar 79 - 1/8:
- the groups consist of a variety of notes ranging from quavers (♫) : semi-quavers (♫) : demi-semi-quavers (♫) to hemi-demi-semi-quavers (♫) each with the relevant figure related to a quaver (♫) placed above the groupings

Ferneyhough makes extensive use of this method of notating strict and complex rhythmic groupings. Almost every bar of this 164 bar quartet has some form of complex number/note ratio.

Apart from Ferneyhough no other composer makes extensive use of using this numerical/note equation.

- **single numbers indicating inconsistent groupings without note values:** some composers simply place only the relevant single number above or below the dissimilar arrangements to indicate the number of notes per time spacing.

The example following is taken from Becker's *String Quartet No. 2* (1967) and demonstrates three unusual aspects of 20th century rhythmic practice:

Example 66. Notating Irregular Rhythmic Groupings
Becker, *Streichquartett II* (1967), bar 16-17

The image shows a musical score for four staves: Violin I (VI), Violin II (VH), Viola (VL), and Violoncello (VC). The score is in 2/2 time and includes markings for 'presto', 'pizz.', and 'fff'. Bar numbers 16 and 17 are indicated. The score demonstrates complex rhythmic groupings with various note values and time signatures.

- a time signature of 1/2
- five different note-groupings : violin1 (12)
in a single bar : violin 2 (9) - with two notes beamed from preceding bar
: viola (11) and(10) of which 7 notes are in groupings with

the remaining 3 notes beamed across to the following bar
: cello (13)

The entries of each instrument occur at different times within the bar. The 20th century practices are

: unusual time signature
: beaming across barline
: different groupings to make a composite bar of dissimilar entries

Another composer who writes irregular inconsistent groupings within a single bar with single numbers is Ligeti.

Composer	Quartet	Year	Examples
Ligeti	String Quartet No. 2	1968	extensively used in Movements 1:3:5 e.g. Mov. 1 bar 78 Violin 1: 9: 10: 11:10 Violin 2: 10: 9: 11 :10 Viola: 9: 10: 9: 10 Cello: 8: 9: 10 : 9 varied groups of (♩)s

■ **double figure ratios/beaming across barline.** Discussed earlier, beaming is often used to circumvent the problem of grouping versus meter. Other modern innovations show cross barline groupings with the added relevant figure/ratios shown above or below, beamed exactly as the pattern would be heard

To illustrate the above point the following example, taken from Dillon's String Quartet (1985) (total 327 bars), demonstrates this use of beaming and double figure ratios.

Example 67. Beaming across barline and Double figure ratio
Dillon, String Quartet (1983), bars 124-126.

- viola : the beaming of two demi-semi-quaver (♩) note-groupings takes place across bars 124 -125 and another grouping across bars 125-126
- the double figure ratios are (17:14) and (13:10) placed above each group, found with
- varying meters at: (bar 124: 6/8 -----bar125: 7/16 -----bar 126:2/16)

Dillon makes extensive use throughout the quartet of the double figure ratio coupled with cross bar beaming. These occur with constantly varying time signatures.

Comment

The foregoing discussion has shown that composers who continue to use traditional notation have had to make modifications and extensions to conventional usage to clarify, for practical application, irregular and complicated rhythmic structures. When the music requires an exact interpretation, clearer ways have had to be found to facilitate direct and quick reading of the score. So far, no other method of notating rhythm adequately reveals the detailed and complicated irregular sub-divisions of the beat contained within such radically devised time structures. With the use of numerals, ratios and note values, the irregularities can both be recognised and labelled. It is a form of notation that subscribes to Karkoschka's view that the requirement of the signs of any new notational developments must evolve from the visual sense and 'must be apparent as the direct translation of the auditory event'²¹⁷ The adjustments to numbers, ratios and notes, in spite of being only slight extensions to traditional notation, nevertheless, fit neatly into this

demand; and while not being new in the true sense, are applicable only to complex rhythmic structures of the 20th century.

Summary: Rhythmic Notation

The results of this investigation into the rhythmic notation of selected string quartets in the 20th century show, firstly, the prominence given in the early decades to intricate, inconsistent, irregular rhythmic meters, to groupings and the unpredictable use of time signatures, as demonstrated in many of the quartets of Bartók and Hindemith. This rhythmic spontaneity resulted in the reorganisation of traditional notation and remains part of determinate notation which, in contemporary use, continues to be structured within the inherited framework of:

time signatures

meter

barlines

beaming

rest signs

number ratios

By contrast, and for quite different reasons, changes in and the reorganisation of rhythmic notation became essential to describe a totally new and different perception of time space from that of traditional notation. Complete reorganisation of the symbols was based, not on the so-called 'rules' of good notational practice, but on the need to characterize symbols that indicated a freedom from all association with metric exactness.

Diverse rhythmic concepts emerged with the most prominent systems falling into two main categories:

- Determinate - towards rhythmic exactitude
- Indeterminate - towards pulseless, a-metrical rhythms

Extensions and Additions to Traditional Notation

Time Signature

This investigation shows that *time signatures* are used generally in quartets where conventional notation is critical to the composers' intentions. However, when a combination of traditional noteheads occurs within proportionate notation, then time signatures are dispensed with altogether. When used, time signatures do not necessarily subscribe to the conventional positioning on the staff and extensions are often arbitrary with respect to the placement, size and equation of time signatures.

Numerator and Denominator

Another consequence of contemporary thinking extends time signatures to a wide variety of combinations using the smaller units (-semi-quavers ♪ and demi-semi-quavers ♪) as the *denominators*, with *numerators* consisting of an equally unusual selection of numbers ranging from 1- to the desired figure. At an opposite extreme, even more uncommon time indicators appear, for example, where a single large number, placed in each of the four parts, takes up the whole staff. The use of a X - within standard notation - totally replaces any 'time signature' and shows a need to disregard any common meter or simultaneity between the parts.

Irregular Rhythms

Vacillating and irregular rhythms, which began in the early quartets of the century, continue to be used and produce a whole *variety of meter* adjustments with new and complex combinations included in variable, mixed, fractional and polymeters. The groupings are further clarified by the use of *irregular numbers and ratios*.

Beaming

Starting in the early quartets of the century, changed functions in the *beaming of groups of notes*, particularly across the barline, show support for a diversity of functions, ranging from clarifying such techniques as *ostinati* patterns and rhythmic/melodic imitation and sequences, to acting as slurs in the defining of phrasing; all of which continue to be used and applied to quartets in the later decades of this century in the most direct and uncompromising manner.

What emerges from this research is that when music requires pulse and metric exactness, extensions to time signatures, meter, barlines and group beaming continue to be built on traditional symbols but adjusted to function within contemporary demands, and continue to be used as an

essential component in determinate music to clarify and communicate effectively the many new rhythmic concepts. The representation of numbers and ratios, as well as all other forms of rhythmic notation in its contemporary formulae and context, is decided upon from quartet to quartet, without any deference to traditional practice.

An individual approach is Carter's innovation and implementation of metric modulation as a solution to his particular compositional problems.

Metric Modulation

Carter's *Metric modulation* promotes the linear flow of various dynamic streams - in particular a polyphony of changes of *tempi* - so that the music moves at different rates simultaneously with all the changes deliberately engineered to create constant evolution.

New Principles - Notation of Approximate Values

Proportionate Notation

Quite simply, when metrical regularity is non-existent, other ways have been found to notate the progression of sound. In various applications of *proportionate notation*, the freedom from meter for example, renders redundant the use of time signatures, barlines, and traditional beaming as well as any implications of stress and rhythm.

Spaced noteheads in *proportionate notation* also circumvent the need for either barlines or changing metric indicators. The former durational equations attached to black and white notes is generally discarded in favour of using mostly black notes spaced to affirm the rhythmic relationships within the whole. However, white notes are used sparingly in some contemporary quartets to indicate longer durations.

Extended Beams

Where composers have contemporary a-rhythmic approaches as a condition for musical organisation, Earle Brown's method of *extended beaming*, attached to or without a notehead, has emerged as a strong and lasting method of notating ametrical pulseless sound.

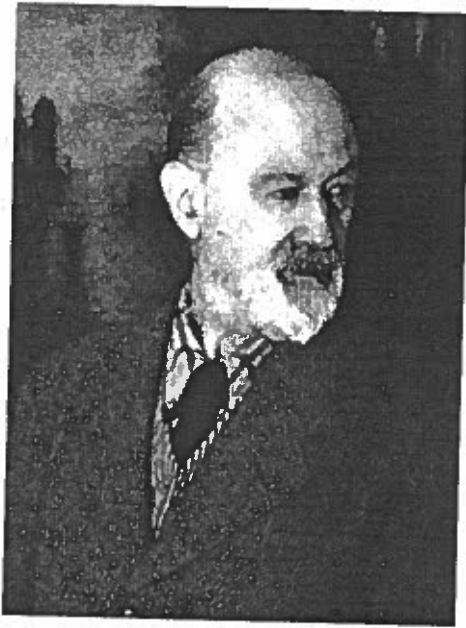
The rhythmic notation shown in this investigation displays two fundamental approaches:

- extreme complexity in much of the determinate notation
- simplicity in much of the indeterminate notation

but generally, there is a symbiotic relationship between determinate and indeterminate rhythmic notation and although indeterminate notation is found exclusively in some quartets, this is not common.

6

PITCH



Charles Ives (1874 - 1954)

I don't like sprucing things up with microtones. It has to be a much more organic process than that music has to come from necessities, not from possibilities.

John Eaton

Chapter Six

PITCH

Microtones : A Brief History

The term microtonality is generally accepted to describe alternative tuning systems of any intervals smaller than the half-tone. These micro-pitches have long been in existence in Oriental music where, for example, in the tuning systems and modes of Javanese music, the general classification has eighteen species of basic types of tunings, with no two gamelan (generic term for an Indonesian orchestra) having precisely the same intervallic structures. 'The individuality of each gamelan tuning derives in part from the practice of stretching or compressing octaves throughout the six-octave compass of the orchestra, so that a unique "tuning pattern" is responsible for the particular character of each ensemble.'²⁴⁸ Microtonal use in Western history is shorter but, nevertheless, goes back to the music of Euripides (c.480-06 B.C.) in ancient Greek times. Later it was used to ornament the *neumes* of Gregorian Chant, and in the 11th and 16th centuries quarter-tones appeared. The concept was extended in the 17th century where, in the Low Countries, Christiaan Huygens' (1629-1695) interest in acoustics led to a 31-note, 5th tone sub-division of the octave, permitting transpositions of the diatonic scales of Just Intonation. To demonstrate the multiple sub-divisions an organ was built, which today stands in the Teyler museum, Haarlem. In France, in 1701, Joseph Sauveuris' (1653-1716) interest in acoustics led him to split the octave into 43 intervals, with specially devised symbols for each pitch. In Italy, the violinist and composer Guiseppe Tartini's (1692-1770) understanding of the complexities of the overtone series resulted in the addition, in 1754, of two quarter-tone pitches and symbols :

(♭ semi-flat) and (♭ sesqui-flat)

Microtonality in the Early 20th century

In the early decades of this century, prior to Schoenberg, Bartók and Varèse' systematic changing of musical style, a significant revival of a much earlier development regarding pitch relationships was being taken by musicians and theorists alike - a renewed interest in microtonality. This interest, according to Apel, was once again being considered when Western music was fast becoming saturated by a state of chromaticism.²⁴⁹ Another strong factor was a conscious awareness of introducing folk

²⁴⁸ *Apel Harvard Dictionary*, p. 436.

²⁴⁹ *Ibid.*, p. 527.

intervals into Western Art music.

From the end of the 19th century, interest in microtones resulted in a series of experiments all over the Western world. In Berlin in 1892 the first known quarter-tone piano was patented by G.A. Behrens-Senegalden. In 1895 the Mexican, Julian Carrillo (1875-1965), born of part Indian extraction, composer, violinist, conductor and inventor experimented with microtonal divisions on a single violin string which resulted in an intense life long interest in new musical tuning systems. In 1930 he formed an orchestra capable of playing exclusively in microtones, and in 1940 patented plans for 15 pianos capable of playing in equal 1/16 : 1/15 : 1/14 tones respectively. The pianos were eventually built and exhibited at the 1958 Exposition in Brussels.²⁵⁰ He wrote eight microtonal string quartets between 1924-1964 and also two without microtones. Carrillo's interest in microtonality led to his devising many notational systems and an early innovation was his use of figures to indicate the octave divided into 96 equal parts. Based on a principle where the figure zero '0' represented the note 'C', all subsequent equal intervals following were numbered consecutively upwards, to a pre-selected total within the octave. For example, a chromatic scale would have the numbers 0-11 as the octave contained eleven semi-tones ; the quarter tone scale 0-23 and so on. The example following, - not taken from a string quartet - nevertheless demonstrates how the notation was applied. Example 94.

Example 94. Numbers representing 96-tone scale
Carrillo, *Prelude á Cristobel Colón* (1922), (published 1934),
for Octavina, Flute, Guitar, Harp, Violin and Cello, page 7

$\text{♩} = 69$

Flauta

Soprano

Violin

Arpa

un poco movido

Flautín

Soprano

Violin

Guitarra

f declamado

poco a poco rall.

p

²⁵⁰ Grove, 5th edition, p. 828-829.

Carrillo's score was the first ever written in 1/16 tones, but this subdivision eventually proved to be more satisfactory for single line instrumentalists or vocalists, and was not practised for chordal writing, complex rhythmic structures or harmonic constructions. This system was, however, not used exclusively as, for example, only a few years after the use of numerical notation, Carrillo adopted a radically different approach by adding a small slash (/) attached to conventional noteheads to indicate the 1/4 tone differences in the *Baluceos* for String Quartet (1927). (♩ ♭♯♯♯♯) : (♩ ♭♭♭♭♭)

In America during the later decades of the 19th century George Ives, the father of the composer Charles Ives, built an instrument consisting of 24 violin strings which could be tuned in different ways. He would pick out quarter tone melodies and have his family sing them, but as Charles relates, 'he gave that up except as a means of punishment.'²⁵¹ These experiences resulted in several quarter-tone compositions between 1903-1914, one of which was for two pianos, tuned a quarter-tone apart, Three Quarter-Tone Pieces (1923), where Ives used a standard staff, notes and amended accidental signs to indicate a quarter and three-quarter tone sharp, as shown :



In 1924 the Czechoslovakian composer, theorist and teacher Alois Hába (1893-1973) established a department of microtonal music at the Prague Conservatory which attracted students from all over the world. It remained open, with an interruption during the war years, until 1951 when it was finally closed down. Hába's intense interest in microtonality extended to teaching and composing, and to realise his new music he pioneered the construction of various instruments which included pianos (1924-31), harmonium (1928 and 1936), clarinet (1924), trumpet (1931) and guitar (1943) in various quarter and sixth-tones. Like Bartók and Carrillo, Hába was influenced by the folk songs heard in his early childhood. Sung by his mother, these Moravian melodic structures traditionally contained intervals smaller than semi-tones and, similarly, Hába included these folk inflections into the Art music of his string quartets. In the preface to his first quarter-tone quartet, No. 2, Op. 7 (1920), he wrote 'It is my concern to permeate the semi-tone system with more delicate nuances, not to abolish it to extend the possibilities of expression already given the old system.' Many of his sixteen string quartets have even numbered microtonal sub-divisions of the octave while the last, No. 16, Op. 98 (1967), is the only one composed in fifth-tones.

The American Harry Partch (1901-1974), who devoted his career to the exploration of unorthodox

²⁵¹ Wood, J., *Microtonality: Aesthetics and Practicality*, in *Musical Times*, June, 1986, p. 328.

musical ideas, was a vociferous advocate of microtonal exploration,²⁵² and a most important figure in the evolution of contemporary notational experimentation. He designed a whole family of strings, as well as unusually tuned keyboard and percussion instruments, and for this array of exotic instruments he developed individual notations - most of which were tuned to his 43 sub-division note scale. To understand these notations, a knowledge of the instruments' design and construction, as well as an understanding of his tuning principles for each particular instrument is required. This is of the utmost importance. Partch occupies a unique position in the investigations into pitch fragmentation and his writings and works influenced many younger American composers to indulge in new means of sound production.

Tuning Systems in Western Music

The history of Western tunings goes back to the monochord experiments made by Pythagoras (570-504 B.C.), when he made a significant sound discovery, establishing a connection between the stopped part and the vibrating section of a string. Musical sounds could now be expressed in ratios of simple mathematical relationships. Throughout the Ages various experiments resulted in different tuning systems : Pure (Just) Intonation : Pythagorean : Meantone and Equal Temperament , all with different basic intervallic measurements realised either as a ratio, which in ancient times was calculated according to the lengths of vibrating strings and later from frequencies, or as an absolute, measured in units. Early calculations were made with the aid of logarithms. Each system was used with certain advantages and disadvantages, discarded and re-instated when, for one reason or another, the historical demands favoured one over the other.

Table 1 following, gives the intervallic comparisons between the semitones of the octave, based on the four tuning systems mentioned above. The supremacy and use of equal temperament lasted from the early eighteenth century until the end of the nineteenth when Adis Hába was the first, in this century, to use the system for micro subdivision. He considered it to be a logical extension of Arnold Schoenberg's serial technique with the 12 equal tones capable of being divided into smaller intervals of equal value, both acoustically and compositionally. Contemporary composers, however, make use of other tuning systems for a variety of different reasons, discussed in a subsequent section.

²⁵² For notation experiments, see, *Contemporary Composers on Contemporary Music*, ed. Schwartz, E., and Childs, Barney, Experimental Music and Recent American Developments, Harry Partch, *Experiments in Notation, On the Horns of Dilemma*, pp. 210- 220. Hereafter Schwartz, *Contemporary Composers*

Contemporary Opinions on Tuning Systems and Microtonal Notation.

Table 1 Comparative Tuning Systems

Interval	From C	Pure Intonation	Pythagorean	Meantone Temperament	Equal Temperament
Semitone	C \sharp	C-C \sharp : 92 C-D \flat : 112 C-D: 204	90	75.5	100
Whole Tone	D	D-E: 182	204	193	200
Minor Third	E \flat	316	294	310.5	300
Minor Third	E	386	408	386	400
Fourth	F	498	498	503.5	500
Augmented Fourth	F \sharp	590	612	579	600
Diminished Fifth	G \flat	610	588	-	600
Fifth	G	702	702	696.5	700
Minor Sixth	A \flat	814	792	G \sharp : 772	800
Major Sixth	A	884	906	889.5	900
Minor Seventh	B \flat	D-C 996 E-D 1018	996	1007	1 000
Major Seventh	B	C-C \flat 1108 C-B 1088	1110	1082.5	1 100
Octave	C	1200	1200	1200	1 200

A scientific method for measuring the exact size of each interval within the octave was introduced by A.J. Ellis (1814-90). It was represented on a logarithmic scale ranging from 1 to 1200 cents. This form of measurement enables comparative positions of the other intervals in the various tuning systems to be measured accurately by adding or subtracting the differing number of cents per interval, thus making a direct comparison possible between the separate intervals of any scale, as well as between the various tuning systems. This is clearly demonstrated in the above Table 1 .

Contemporary Opinions on Tuning Systems and Microtonal Notation

Experimentation with microtonal notation in the early decades of this century took on many developments - from using numerals to replace notes; to enlarging the five line staff to accommodate more than twelve pitches to the octave, (see example 95 following); or adapting traditional signs based on additions and subtractions of accidentals placed before conventionally formed noteheads; or the introduction of a variety of shaped notes, both old and new; to the bypassing of the accepted symbols in preference for individually devised signs. An early isolated, individual device is found in Alban Berg's Chamber Concerto (1925) where a 'Z', placed across the stems of the notes, was accompanied by the appropriate accidentals to indicate a 1/4 and 3/4 tone (\sharp) termed *Zwischentöne*, or in-between tones. This device, and others such as the fraction before the note ($\flat \downarrow \flat \frac{1}{2} \sharp \downarrow \sharp$) to represent a 3/4-tone sharp in Varèse' Hyperprism (1927), or Ives' early symbol of a square notehead for the 1/4-tone raising of the note in Symphony No. 4 (1916), show that notation for unusual pitches was both diverse and varied at that time. No thought was given to the need for standardisation of symbology as the notations were used purely as temporary extensions to the melodic line. Experiments continue today with equal diversity of outcome as there is little agreement on, or acceptance of, either the best way to modify traditional symbols or the most effective and acceptable way to standardise new symbols, conditional on the many and complex tuning systems in use.

Example 95. Nine-lined Staff

Erich von Hornbostel, *Musikalische Tonsysteme*²⁵³ (1927)



²⁵³ Hornbostel, Erich, Moritz, von, *Musikalische Tonsysteme*, in *Handbuch der Physik*, 8, 1927, pp. 425-429.; in Read., 20th Century Microtonal Notation, New York: Greenwood Press, 1930, p16.(Hereafter, Read, Microtonal Notation)

Views of Six contemporary Microtonal American Composers

In the journal *Perspectives of New Music* ²⁵⁴, an interesting interview was conducted by Douglas Keislar with six contemporary microtonal American composers, namely Easley Blackwood, John Eaton, Lou Harrison, Ben Johnston, Joel Mandelbaun and William Schottstaed who, when questioned, expressed their diverse views on all aspects relating to microtonality. The most relevant, for purposes of this investigation, are their answers on notation and tuning systems. It is interesting to quote their remarks fairly extensively as they bear witness to the complexity and hopelessness of ever acquiring a standard microtonal notation.

When asked :

‘What tuning system do you use ?’, ‘How do you notate your music ?’ and
‘Is a general purpose microtonal system possible, or is a multitude of notations inescapable, given the multitude of tunings systems ?’²⁵⁵

Their answers varied as follows:

Johnston, who up to this time has composed nine string quartets in non-standard tunings, said he had developed a system of Just Intonation, as it’s particular basis enabled him to explore a new aspect with each piece ²⁵⁶ which created the opportunities for ‘ a multiplicity of tones a perceptible palette of consonances and dissonances a clear cut harmonic hierarchy or relations [and] an infinite number of infinitely extensive systems of harmony,’²⁵⁷ which he could never exhaust in one or two pieces.

Harrison, explained that his use of many different tunings occurred through his involvement with Asian instruments. For the Chinese zither, the *cheng* or *zheng*, the pentatonic scale is tuned in two different ways, with the major 1/3rd tuned to either the Pythagorean tuning or the ratio of Just Intonation. For the gamelan the various tunings are based on the Just system where, at times, he uses Western instruments tuned to the gamelan frequencies. For keyboard music Harrison prefers what he terms the ‘well temperament’ of Kirnberger (1721-1783). He says emphatically : ‘ I can’t stand equal temperament.’ ²⁵⁸

Schottstaedt prefers to use Pythagorean tuning most of the time, with 24-48 tunings where the extra pitches show up as melodic ‘colorations’ and inflections.

²⁵⁴ Forum : Microtonality Today, ed. Karpen, R., Keislar, D., Kohl, J., in *Perspectives of New Music*, Vol. pp. 173-209 (Hereafter, Keislar, *Microtonality*)

²⁵⁵ *Ibid.*, pp. 177-196.

²⁵⁶ *Ibid.*, p. 180.

²⁵⁷ Johnston, B., *Proportionality and Extended Musical Pitch Relationships*, in *Perspectives of New Music*, Vol. 5, 1966, 22. 112-20.

²⁵⁸ Keislar, *Microtonality*, p. 179.

Most of Eaton's pieces involve 1/4 tones rather than smaller intervals ' because every instrumentalist and singer can hear a quarter tone as a distinct pitch.'²⁵⁹

Following on the above preferences, when asked: ' if a general microtonal notation is possible, or is a multitude of notations inescapable ?'²⁶⁰ it is not surprising that little consensus emerged in their respective answers on the uniformity of notation. In fact, both Blackwood and Johnston doubt if a general solution will be found; Eaton suggests it's going to come, 'but gradually', and Harrison is not attracted to the idea as he 'prefers to use what he wants, when he needs it inventing new ways if necessary.'²⁶¹ Mandelbaum considers that a wide variety of microtonal notations start with standard notation and even ' people with unique needs should start with a general notation with agreed-upon diesis and then add their own individual special-ticket items.'²⁶² He uses a variation of the eminent contemporary Dutch theoretician Adriaan Fokker's notation system of 31 equal-tempered 1/5 tones to the octave where, in his own music, a whole tone is divided into five units which he calls diesis²⁶³. Schottstaedt explains that for instrumentalists, there are ways to use five-line music paper for other tuning systems '(for example, you can get thirteen-tone tuning by assuming that B \sharp isn't C, and so on).'²⁶⁴

Excluded from this discussion are many unexamined contemporary quartets scores, including those of the important American microtonalists just discussed, which contain both newly conceived microtonal systems as well as individually contrived symbols. Ben Johnston, in particular, while retaining the traditional basic signs, uses highly personalised methods of notation by adding plus and minus symbols, arrows and new additional marks to indicate higher or lower microtonal inflections. Another system he practised is the measuring of the relative intervallic sizes of his ratio-structured notation, either in cents or as vibrating ratios placed above the respective notes. These diverse notations from just one composer exhibit the many possibilities of microtonal symbology, as the system serves a variety of diverse functions, depending on the particular purpose and use. These include, amongst others, ornamental elaboration of pitch, increased density of texture, exploitation of novel harmonic relations - all of which result in the octave being subdivided into multiples of twelve (or more for irregular unorthodox divisions) - to provide another source of inspiration for composers. Important additional considerations are the available choices between the number of tuning systems, and whether or not non-traditional systems of tuning imply non-traditional aesthetics. Two ardent exponents of microtonality, firstly Eaton and then Johnston, reflect and comment on the

²⁵⁹ Keislar, *Microtonality*, p. 179.

²⁶⁰ *Ibid.*, p. 196.

²⁶¹ *Ibid.*, p. 196.

²⁶² *Ibid.*, p. 196.

²⁶³ In modern writings on acoustics the term is occasionally used to designate certain theoretical intervals, about a quarter in size.

²⁶⁴ *Ibid.*, p. 196.

last point in the following way:

Eaton: I don't like sprucing things up with microtones. It has to be a much more organic process than that music has to come from necessities, not from possibilities.²⁶⁵

Johnston: I don't like applying a non-traditional tuning system to a traditional style. What bothers me about the music of Alois Hába and Julian Carrillo is that the pieces don't seem unusual at all, just the intonation. The notes sound wrong, because the gestures, structures, and idioms are familiar from a different tuning In a way that's what Hába tried, but it seems to me there's a failure of transformation there.²⁶⁶

Microtonal Notation in Selected Contemporary Quartets

Despite certain scepticism as to whether or not microtonal notation functions adequately on the five-line staff - designed for the seven note scale and already overburdened by twelve - many contemporary composers continue to use symbols based on conventional notation. It is generally understood that the use of logical and unambiguous symbols remains paramount, yet a certain amount of duplication of signs, representing unlike intervallic sub-division of the octave, continues to occur. Not all composers, though, are interested in using microtonality as a basis for compositions and the problem of finding a logical and pragmatic microtonal notation is therefore not a pressing concern. For this reason the comments made by Joseph Yasser in 1932 are as relevant today as then ' much time will elapse before there can be created, besides the new scale and new theory of composition connected with it, new music sufficiently convincing to profoundly alter the musical psychology of mankind and thereby overshadow the grandiose music achievements of past centuries.'²⁶⁷

The extensive contemporary repertoire of microtonal string quartets restricts a comprehensive investigation in this particular research . Attention to the selected quartets, listed below, will uncover which composers have chosen to use the microtonal sub-division of equal temperament, showing their desirability of maintaining a close relationship with the diatonic scale and, alternatively, those who have deviated from it. It will demonstrate too, the extent of conformity and diversity in the symbols adapted and modified from traditional notation, as well as the use of any new signs.

²⁶⁵ Keislar, *Microtonality*, p. 197.

²⁶⁶ *Ibid.*, p. 197.

²⁶⁷ Yasser, J. *A Theory of Evolving Tonality*, New York: American Library of Musicology, 1932, Chapter 11

Table 2: 20th Century Microtonal String Quartets
Chronological use of New Notation

Composer	String Quartet	Date	Symbol	Explanation
Hába	No. 1	1920		1/4 and 3/4 tone sharp
				1/4 and 3/4 tone flat
Carrillo	<i>Balbuceos</i>	1927		1/4 and 3/4 tone sharp
				1/4 and 3/4 tone flat
Bártok	No. 6	1939		1/4 tone flat (only)
Carrillo	<i>Balbuceos</i>	1959		1/4 tone sharp
				1/4 tone flat
Bartolozzi	<i>Per Archi</i>	1960		1/4 and 3/4 tone sharp
				1/4 and 3/4 tone flat
Hiller	No. 5 in	1962		1/4 tone flat
	Quarter Tones			1/4 tone flat i.e. all sharps and flats to be played a 1/4 tone lower irrespective of the accidental

Hiller's string quartet is written throughout for an even-tempered quarter-tone scale. In the composer's foreword he states: All quarter tones are notated by small downward-pointing arrows following notes written in ordinary notation. These arrows mean play the note shown a quarter-tone flat **only downward pointing arrows are used in order to simplify reading the music, shown in the following example. (*my italics).* Example 96.





Example 96. Quarter Tones Notated by Small Downward Pointing Arrows
 Hiller, *String Quartet No. 5. in Quarter Tones* (1962), Var. Three, bars 130-132

(130) a tempo



The musical score consists of four staves. The first staff is marked 'arco'. The second and third staves have dynamic markings 'ss dim.' and 'pp'. The fourth staff has 'ss dim.' and 'pp'. There are also markings '7' and '5' under the notes, likely indicating fingerings or specific quarter tones.

Composer	String Quartet	Date	Symbol	Explanation
Wyschengradsky	<i>Qt. a cordes</i>	1960	\sharp	1/4 tone sharp
			$\sharp\sharp$	3/4 tone sharp
			\flat	1/4 tone flat
			$\flat\flat$	3/4 tone flat
Kopolent	3 <i>Qtto</i>	1963	$\sharp\sharp$	1/4 tone sharp
			$\sharp\flat$	3/4 tone sharp
Kopolent makes no use of either the 1/4 or 3/4 tone flat				
Lutoslawski	St. Qt.	1964	$\sharp\sharp$	1/4 tone sharp
			$\sharp\sharp$	3/4 tone sharp
Cervetti	<i>Zinctum</i>	1967	\flat	1/4 tone sharp
			$\sharp\sharp$	3/4 tone sharp
			\flat	1/4 tone flat
			$\flat\flat$	3/4 tone flat

Penderecki	<i>Otto per Archi</i>	1968	$\sharp\circ$	1/4 tone sharp
			$\sharp\sharp\circ$	3/4 tone sharp
			$\flat\circ$	1/4 tone flat
			$\flat\flat\circ$	3/4 tone flat
Keleman	<i>Motion</i>	1969	$\sharp\flat$	1/4 tone higher
			$\flat\sharp$	1/4 tone lower
Hertel	<i>Imitationen</i>	1975	$\sharp\flat$	1/4 tone sharp
			$\sharp\sharp\flat$	3/4 tone sharp
			$\flat\flat$	1/4 tone flat
			$\flat\flat\flat$	3/4 tone flat
Henze	No. 5	1976-7	$\sharp\flat$	1/4 tone sharp
			$\flat\flat$	1/4 tone flat
			\sharp	rising to 1/4 tone above and returning to normal
			\flat	rising to 1/4 tone above and returning to normal
Schmidt	<i>2 Stgt</i>	1979	$\sharp\flat$	1/4 tone sharp
			$\sharp\sharp\flat$	3/4 tone sharp
Schimdt's use of the arrows eliminate the use for flattened 1/4 tones				
Feneyhough	No. 2	1980	$\sharp\flat$	1/4 tone sharp
			$\sharp\sharp\flat$	3/4 tone sharp
			\flat	1/4 tone lower
			$\flat\flat$	3/4 tone lower





Hübler, K.	<i>3 Stqtt</i>	1982-4		1/4 tone sharp
				3/4 tone sharp
				1/4 tone lower
				3/4 tone lower

Within the same quartet Hübler also uses the 1/3 tone subdivision as follows :




	1/3 tone higher
	1/3 tone lower

Heyn	<i>Sirènes für Stqtt</i>	1983		natural 1/4 tone raised
				natural 1/4 tone lowered
				raise sharp 1/4 tone
				lower flat 1/4 tone

Heyn uses the above symbols in both traditional and beamed notation

Coeck	<i>Graphismes</i>	1983		1/4 tone raised
				1/4 tone lowered
				quasi-chromatic rise per 1/4 tone
				quasi-chromatic lower per 1/4 tone

Coeck uses two types of the 1/4 tone chromatic series of notes depending on whether or not a specific pitch is positioned at the end of the rising or falling line. This determines either a specified or an unspecified close to the series of microtonal inflections.

Dillon	St. Qt.	1985		1/4 tone raised
				3/4 tone raised
				1/4 tone lowered

Dillon does not use a separate sign for the lowered 3/4 tone as it is the enharmonic equivalent of the raised 1/4 tone.

Huber	<i>Doubles, mit einem beweglichen Ton</i>	1987	┌	1/8 tone higher
			+	1/4 tone “
			F	3/8 tone “
			#	1/2 tone “
			##	1/2 tone + 1/8 tone “
			##	3/4 tone “
			##	3/4 tone + 1/8 tone “
			└	1/8 tone lower
			↓	1/4 tone “
			♭	3/8 tone “
			b	1/2 tone “
			♭	1/2 tone + 1/8 tone “
			♭	3/4 tone “
			♭	3/4 tone + 1/8 tone “



As shown above, Huber divides the semi-tones into 1/4 and 1/8 tones and combines the symbols to form composite micro intervals

Braeways	St. Qt.	1989	≠	1/4 tone up
			##	3/4 tone up
			↓	1/4 tone down
			♭	3/4 tone down
Cerha	<i>11 stqtt.</i>	1989-90	♯	all accidentals are raised or lowered a 1/4 tone depending on direction of the arrow
			♯	
			♭	
			♭	
			♯	
			♭	
Reynolds	Coconino ...	1989	♯	1/4 tone up
			##	3/4 tone up
			♭	1/4 tone down


Reynolds has no special sign for the 3/4 flat as he incorporates it enharmonically with the 1/4 sharp using a single symbol.

Indefinite Pitch Adjustment

From the quartets researched, two composers use microtonal inflections that are not specified by a particular degree of rise or fall:



Composer	String Quartet	Date	Symbol	Explanation
Fisher	No. 1	1961-2		slightly higher intonation
				slightly lower intonation

The above notation does not represent quarter tones, but rather deviations of a not precisely determined size, which may reach a maximum of a 1/4 tone. Fisher states: Thus the intervals in a succession of pitches like

 are smaller than a quarter tone; the falling minor second [e.g. A - bA] is divided into three intervals which need not necessarily be the same size on the other hand, the intervals can be quarter-tones.²⁶⁸ The same effect applies to the rising microtones.

It is interesting to note that Ligeti's instructions and symbols are exactly the same as Fisher's. Both quartets are published by different publishing houses - the Ligeti by Schotts and the Fisher by Peters. Considering the many possibilities for the modification of signs, just how the instructions and symbols from the earlier quartet come to be duplicated in the Ligeti quartet, published about six years after Fisher's, remains open to speculation in view of the fact that each quartet is published by a different publishing house. However, Ligeti adds further instructions:

Such immediate successions of micro-tones should be played as far as possible without noticeable *portamento*. The micro-tone deviations should give the impression of distinct - even if not precisely pre-determined - pitches.²⁶⁹

Ligeti	No. 2	1968		slightly higher intonation
				slightly lower intonation

²⁶⁸ Fisher, *String Quartet No. 1*, 1967. Instruction for Performance.

²⁶⁹ Ligeti, *String Quartet No. 2*, (1968), Instructions for performance.

Comment

In the investigation of over one hundred and ten quartets, the following points concerning microtones have emerged:

- twenty-seven quartets use microtones, for which a variety of symbols are found
- only the equal temperament tuning system is found
- Nicolaus Huber specifies microtones into other subdivisions of the octave. He uses 1/4 tones 1/8 tones and multiples thereof in his 1987 quartet: *Doubles, mit einem beweglichen Ton*
- Klaus Hübler uses microtone subdivision of the 1/4, 3/4 and 1/3 higher and lower in the 3 *Streichquartett (1982-3)*
- Hiller's String Quartet No. 5 (1962), is the only one that applies a 1/4 tone subdivision throughout each of the movements of Theme and Variations
- Hiller's String Quartet No. 5, is also the only one that uses the 1/4 tone subdivision throughout each of the movements as a tone row
- quarter-tone subdivision is the most common
- the most frequently used symbols are modifications to traditional accidentals in the following variants:

Table 3: 1/4 Tone and 3/4 Tone Higher

Additions and Subtractions to the Basic Sharp Sign : 1/4 tone Higher :

1/4 tone : (♯)		1/4 tone : (♯)	
Hába	1920	Bartolozzi	1960
Kopolent	1963	Dillon	1985
Lutoslawski	1964	Braeways	1989
Cervetti	1967		
Penderecki	1967		
Wyschnegradsky	1970		
Hertel	1975		
Henze	1976-7		
Ferneyhough	1980		
Hübler	1982-4		
Coeck	1983		
Huber, N.	1987		

Additions and Subtractions to the Basic Sign : 1/4 tone Higher : With Arrows

1/4 tone : various symbols with arrows attached

Hiller	(♯↓)	1962
Keleman	(↓♯♭)	1968
Schmidt	(♭↓)	1976
Heyn	(♭♯)	1983
Reynolds	(♯↓)	1989

Auxiliary Attachments to the Basic Sign : 1/4 tone Higher:

Carrillo	(↓)	1928
Carrillo	(↓)	1959

Additions and Subtractions to the Basic Sharp Sign : 3/4 tone Higher:

3/4 Tone sharp :	(♯♯)	3/4 Tone sharp :	(♯♯)
Bartolozzi	1960	Cervetti	1967
Lutoslawski	1964		
Wyschnegradsky	1970		
Ferneyhough	1980		
Dillon	1985		
Braeways	1989		
Reynolds	1989		
3/4 Tone sharp :	(♯)		
Hába	1920		
3/4 Tone sharp :	(♯)		
Penderecki	1968		
3/4 Tone sharp :	(♯)	3/4 Tone sharp :	(♯)
Kopolent	1963	Lutoslawski	1964
		Hertel	1975
		Hübler	1982-4

Additions and Subtractions to the Basic Sign : 1/4 tone Higher :

With Arrows

3/4 tone : various symbols with arrows attached

Schmidt (♯[↗]) 1979

Signs : 1/8 and 3/8 tone Higher :

1/8 tone Higher

Huber (⌈) 1987

1/2 + 1/8 tone Higher

1/2 + 1/8 tone Higher

Huber (⌈) 1987

3/8 tone Higher

Huber (⌈) 1987

3/4 + 1/8 tone Higher

Huber (⌈) 1987

Comment : Notation Sharpened Microtones

The most widely used accidentals to indicate the 1/4 and 3/4 tone sharp are modifications of the traditional symbols with or without arrows attached. Although there is no general conformity in the use of either microtone inflection, the most favoured for the 1/4 tone sharp is a single slash - a modification of the standard sharp sign (♯) - while for the 3/4 inflection a selection of two or three vertical lines, accompanied by either one, two or three cross slashes. (⌈), (⌈), (⌈), (⌈), (⌈), are most often used. Another method includes arrows attached to the accidental, notehead or note stem. Less common are auxiliary signs, used only by Carillo, in the form of a small slash placed after the note (♯[↗]) for the 1/4 and 3/4 respectively.

Table 4: Modification of Traditional Symbols

single slash/single vertical	(⌈)	1/4 tone most common
single slash/double vertical	(⌈)	1/4 tone fairly uncommon
double slash/single vertical	(⌈)	1/4 tone uncommon
note/accidental with arrow	(various)	1/4 tone fairly uncommon
individual symbols	(various)	1/4 tone very uncommon

single slash/triple vertical	($\#$)	3/4 tone uncommon
single slash/double vertical	($\#$)	3/4 tone uncommon
double slash/triple vertical	($\#$)	3/4 tone fairly uncommon
double slash/single vertical	(\neq)	3/4 tone not found
triple slash/double vertical	($\#$)	3/4 tone fairly common
triple slash/triple vertical	($\#$)	3/4 tone uncommon
note/accidental with arrow	(various)	3/4 tone fairly uncommon
individual symbols	(various)	3/4 tone very uncommon

Comment

The table above gives a fair indication of the most commonly used symbols, and also the confusion created by the use of the same sign for both the 1/4 and 3/4 microtone interval as in the single slash/double vertical $\#$ to indicate either interval. For example the 1/4 tone - Bartolozzi : 3/4 tone - Penderecki.

Table 5: 1/4 Tone and 3/4 Tone Lower

Additions : Subtractions : Modifications to Basic Flat Sign : 1/4 tone Lower :

Hába	(\flat)	1920	Ferneyhough	(\flat)	1980
Carillo	(\flat)	1927	Hübler	(\flat)	1982-4
Carillo	(\flat)	1959	Coeck	(\flat)	1983
Bartolozzi	(\flat)	1960	Dillon	(\flat)	1985
Cervetti	(\flat)	1967	Huber	(\flat)	1987
Penderecki	(\flat)	1968	Braeways	(\flat)	1989
Wyschnegradsky	(\flat)	1970			
Hertel	(\flat)	1975			
Henze	(\flat)	1976-77			

Basic Signs : Notes : with Additional Arrows :**1/4 tone Lower :**

Bártok	(\downarrow)	1939	
Hiller	($\flat\downarrow$)	1962	
Heyn	($\natural\flat$)	1983	\natural = natural : lowered 1/4 tone
			\flat = flat : lowered 1/4 tone
Cerha	($\sharp\downarrow\flat$)	1989-90	\sharp = sharp : lowered 1/4 tone
			\downarrow = flat : lowered 1/4 tone

Auxiliary Attachments to Basic Flat Sign : 1/4 tone Flat/ Lower :

Reynolds	(\downarrow)	1989
----------	------------------	------

Additions and Modifications to Basic Flat Sign : 3/4 tone Flat/ Lower :

Hába	(\natural)	1920	Hertel	(\flat)	1975
Carrillo	(\flat)	1927	Ferneyhough	($\natural\flat$)	1980
Bartolozzi	(\natural)	1960	Hübler	($\natural\flat$)	1982-4
Cervetti	(\flat)	1967	Braeways	($\natural\flat$)	1989
Penderecki	(\flat)	1968			

Auxiliary Attachments to Basic Flat Sign : 3/4 tone Flat/ Lower :

Wyschnegradsky	($\flat\sharp$)
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Basic Signs : Notes : with Additional Arrows :**Lower tones :**

Certain composers use arrows attached to the accidental signs to indicate the lowering of the note, as, for example, when attached to the lower end of the sharp ($\sharp\downarrow$).

These include	Keleman	<i>Motion für Streichquartett, (1969)</i>
	Cerha	<i>11. Streichquartett (1989-90)</i>

Comment : Notation Flattened Microtone

The preferred microtonal subdivision is the lowered 1/4 tone which produces both 1/4 and 3/4 intervals. Similarities occur when symbols are based on the modification of the basic flat sign, as shown in the following list:

Table 6: Flattened Microtone

■	reversed	black or white	(♭)	1/4 tone common
■	double flat back to back	white	(♭♭)	3/4 tone common
■	arrow attached to flat sign:		(♭↓)	1/4 tone uncommon
■	arrow beside/above note or symbol		(↓)	1/4 tone uncommon
■	appendage to flat sign		(♭↓)	1/4 tone uncommon
■	individual symbols			specific

General Comment : Notational Inconsistencies

The 1/4 tone subdivision of the octave of equal temperament, or any other equal subdivision, should be a fairly simple matter to standardise in contemporary notation. Yet, this has proved not to be the case, as unnecessary contradictions and inconsistencies still exist. The recommendations of two internationally constructed committees consisting of theorists, musicologists and composers such as those of the International Musicological Society, that met in Ljubljana, Yugoslavia in 1967 and of the International Conference on New Musical Notation convened in Ghent, Belgium in 1974, failed to agree on a standard symbology for even the most straightforward of subdivisions - that of the 24-tone in equal temperament.^{270 271} It is understandable, however, that confusion and lack of conformity will, for many reasons, arise more readily in the unequal tuning systems, but generally many composers have chosen to exert their independence by devising their own microtonal symbols. This is clearly demonstrated by the inconsistencies and contradictions, shown in the preceding lists, of the most fundamental of subdivisions - the 1/4 and 3/4 tone. Within each category, certain notational inconsistencies are found when, for example the 1/4 and 3/4 tone microtone symbols are

²⁷⁰ Working Committee for Notation (IMS). Report [by] Adriaan D. Fokker, Hans Kox, Joel Mandelbaum, Richard H. Orton, in *International Musicological Society Report of the Tenth Congress*, Ljubljana, 1967, ed. by Dragotin Cvetko, Kassel, 1970.

²⁷¹ International Conference on New Musical Notation Report, in *Interface, Journal of New Music Research*, ed. Herman Sabbe, Kurt Stone, Gerald Warfield, Amsterdam: 1975.

interchangeable in the various quartets. Confusion, too, is caused by the contradiction implied by an arrow attached to an accidental, which requires either the simultaneous lowering of a sharp sign ($\sharp \downarrow$) or conversely, the raising of the pitch when attached to a flat sign ($\flat \uparrow$). Cerha, in his *11. Streichquartett* (1989/90), is a composer in point who makes full use of arrows. Some composers eliminate the use of the 3/4 sign, maintaining that the enharmonic equivalent can be shown by using the raised or lowered 1/4 tone.

Following on from this point, it can be argued that if the acoustical implications and the accustomed diatonic assumptions of the differences between raised or lowered pitches are discounted, then any note may be written in different ways and infer the same pitch, for example: microtone ($D \ 3/4 \sharp$) is equivalent to ($E \ 1/4 \flat$). Neither Dillon, Coeck, nor Henze use 3/4 tone signs, and the early Bartók *No. 5* (1939) uses only the 1/4 flattened tone, while Reynolds finds no use for the 3/4 \flat sign. Lutoslawski in his *String Quartet* (1964), has no specific flattened inflections, using the enharmonic equivalent in the signs for the 1/4 and 3/4 sharpened intervals.

The relatively small number of compositions cited in this section show that the most practised subdivision is the 1/4 tone, maintaining connection with the traditional 12-tone chromatic system and using it as a frame of reference in one way or another. However, within the *genre* of the string quartet, contemporary experimenters have attempted to extend the resources of pitch fragmentation beyond the 'conventional' divisions.^{272 273 274 275} Electronic manipulation has demonstrated intriguing possibilities by allowing the octave to be divided into a whole gamut of irrational components. However many of these combinations are impractical for standard Western instruments, or even for singers or string players.

Composers have displayed a predilection for quarter- tones above all other divisions as these tones, together with third and fifth-tones, are the easiest to produce on conventional instruments or with the voice. These microtones are recognisable to the human ear as well as being the easiest to notate. It is, however, the non-equal subdivisions that offer new elements of structure and notation, aligned to an understanding that the pitch systems - and the positions that the pitches occupy within that system - are of paramount importance for the specific devising and comprehension of new notation. While the quartets of such composers as Ben Johnston, in particular, have not been investigated in this

²⁷² Rasch, R.A., Relations between Multiple Divisions of the Octave and the Traditional Ronal System, in *Interfact, Journal of New Music*, Vol. 14, (1985), pp. 75-108.

²⁷³ Read, Gardiner, *20th Century Microtonal Notation*, New York, Westport, Connecticut, London: Greenwood Press, 1990.

²⁷⁴ Schneider, Sigrun, *Mikrotonne in der Musik des 20. Jahrhunderts*, Bonn: Verlag für systematische Musikwissenschaft GmbH, 1975.

²⁷⁵ Vries, de I., Een tonale ordering in de Kwarttoonsmuziek, in *Mens en Melodie*, 1983, pp. 474-480.

thesis, they nevertheless represent a whole new approach to the potential permutations and notational diversity present in the system of Just Intonation.²⁷⁶

The lack of compatible systems for notating microtonal intervals, and the complexities contained within the various unequal systems, present a barrier for performers who have to spend considerable time and effort mastering the composers' written signs, as well as training the ear to hear subtle pitch transformations. Perceptible differences in the smaller subdivisions are not easily distinguished and therefore it can be questioned as to whether the many different microtonal systems - incompatible with Western musical heritage - will ever be widely adopted by composers and thus condition listeners to accept what they presently perceive as 'out-of-tuneness'. But John Eaton disputes this point when he seriously, but humorously points out that there will be '.... a general expansion of our Western pitch materials in the near future. All ethnic and vernacular traditions use the more natural intervals found in the cracks of the piano keyboard. Our sensibilities have simply exhausted the chromatic scale.'²⁷⁷

Further to this point, Gardner Read writes :

The future potential of further extending or compressing scales of microtonal intervals would seem to be virtually limitless. If there are ultimate boundaries they will be determined by the ability of composers to fashion degrees of pitch fragmentation beyond those already established by practice, and by the cooperation of performers sufficiently skilled to interpret the composers' personalised notation and produce accurately the new microtonés demanded the future development of any expanded or compressed microtonal systems will be of particular interest, even as these musicians seek to further enlarge the tonal resources of their art.²⁷⁸

Accidentals

Altered use in Early Decades of the 20th Century

Accidentals and the important rules that governed them, which had been a significant and disciplined factor governing Western musical syntax for over three hundred years were, in the early decades of the 20th century, either being changed or rejected by the avoidance or abandoning of traditional tonalities.

²⁷⁶ Johnston, Ben, *String Quartet No. 6*.

²⁷⁷ Quoted in, Ewen, David, *American Composers, A Biographical Dictionary*, New York : G.P.Putnam's Sons, 1982, p. 196.

²⁷⁸ Read, *20th-Century Microtonal Notation*, p. 168.

Traditionally the barline automatically cancelled out any accidental contained within it, except where a tied note occurred, but progressively certain rules were either changed or negated in the expanded tonal quartets of both Bartók and Hindemith, as well as in the 12-tone quartets of Schoenberg and Webern. Raised and lowered accidentals appeared in a single bar, without functioning specifically in either the major or minor scale - in the case of expanded tonality - or not at all in the method of the 12-tone row. Both practices lead to the general disappearance of key signatures in most contemporary scores and this loss of constraint, which was implicit in the use of sharps and flats, brought about a period when accidentals were arbitrarily adjusted without thought to the use of diverse individual notational possibilities. This often resulted in confusion and uncertainty of application.

In expanded tonality, changes in accidentals were extensions of traditional notation. An early example of their changing function, taken from Hindemith's String Quartet No. 3 Op. 22 (1922), expands tonality to produce a double degree chord. This harmonic practice, new to the early decades of the 20th century, is found constantly in Hindemith's string quartets, whether at cadence points, at the beginning of a movement or during the progress of the music, and became an inherent part of his musical syntax.

In the example following :

bar 116 : the triad is bi-modal *on* F# containing both

the major sharpened 3rd (A#) and the minor (Ab) : F# / A#-Ab / C

Affected by the changing attitudes to harmonic function, both the natural and sharpened accidentals occur in one chord and constitute a departure, in the early decades of the 20th century, from the accepted 'rules' of standard notation. Example 97 (Bar 116: F# / A# A / C#).

Example 97. Double degree chord - cadence

Hindemith, Quartet No. 3 Op. 22 (1922), Movement 3, bars 114-116

Dissolution of Harmonic Function and Contemporary use of Accidentals

Post World-War II the notating of 'accidentals' took on radically different directions and new concepts emerged to include the following :

- in certain cases accidentals are reduced to a minimum with only the sharp sign notated
- generally accidentals only affect the notes they immediately precede
- cancelling out of an accidental within a bar becomes redundant
- accidentals not cancelled in their own bar are usually cancelled in the following bar
- accidentals are not re-written for repeated notes unless one or more different pitches intervene
- radically new signs are sometimes devised to indicate a raised or lowered note
- in spatial notation the accidental is often placed above the note so as not to alter the spatial relationships ²⁷⁹

Accidentals : Traditional affecting only Preceding Notes

Although the general contemporary trend is towards notating accidentals only when required for a particular note, not all post-war composers subscribe to the regulations suggested by Kurt Stone and widely accepted as being the clearest. To illustrate different approaches *a few random examples* are examined in the continuing discussion.

Performance Notes : Are they Necessary ?

In 1931, before the advent of conferences on proposals for the standardisation of new notation, Szokolay Sándor in his String Quartet No. 1 (1931), notated accidentals without providing performance instructions, creating certain confusion as to whether or not the accidentals used subscribed to standard rules or other newly devised notational principles. The following example contains a selection of important points for discussion. Example 98.

Example 98. No Performance Notes

Sándor, String Quartet No. 1 (1931), bar 53, Violin 1



²⁷⁹ Stone, Music Notation in the Twentieth Century, p. 56.

Using the six quintuplets of the example above, bar 53, the following observations are made:

In traditional notation:

- no sharps once written against a note would be re-written if not cancelled out within a bar - this rule does not apply in this passage (quintuplets 1 and 5).

In contemporary notation:

- under certain conditions all accidentals should be shown but without performance instructions regarding accidentals, discrepancies arise and prompt the following questions:
- should the G# in the second quintuplet have an accidental or should it be presumed to be played as a sharp without cancellation ? : the same applies in group 6
- should the first A of the second quintuplet be notated with a natural (A \natural) as it appears as a natural in group 1?
- why then, is a sharp added to the G# of the third quintuplet if G sharps are presumed in the second grouping without a cancellation occurring ?
- if groups 1 & 2 and groups 5 & 6 are presumed to be the same, why is the first quintuplet of each respective grouping notated with a different selection of accidentals ? e.g.

group 1 : G# /A#/B \flat /A \flat /G#

group 5 : G# /A#/B/A \flat /G#

The answer as to why accidentals are added or suspended in what are, presumably, the same selection of notes could lie in the following explanation

- that the pairs of slurred quintuplets be considered as a unit and thus maintain the accidentals contained within each grouping - without alteration

but even this explanation lacks consistency as accidentals are added and suspended without uniformity, and the contemporary assumptions discussed earlier are also not applied.

Performance Notes

At the 1974, International Conference on New Musical Notation, in Ghent, the suggestion contained in the section headed **General Categories : 1. Pitch** : stated the following with regard to accidentals: 'All scores and parts notated in a system that includes accidentals should contain an indication stating the accidental policy followed.'²⁸⁰ Sándor's composition was too early to take this recommendation into account. Contemporary composers often provide a guide to their particular system. For example Fisher clarifies his use of accidentals in the Performance Notes when he writes:

²⁸⁰ *Interface*, p. 36

1. ACCIDENTALS apply only to the pitches which they immediately precede, except for ties. Parenthesised accidentals are precautionary reminders.Natural signs without parentheses have been freely employed, in spite of their 'theoretical' superfluity, to facilitate reading.²⁸¹

An example of the last point is shown following. Example 99.

Example 99. Contemporary Use of Performance Notes

Fisher, *String Quartet No. 1* (1961 - 2), bar 162 - , Violin 1

Contemporary vs. Traditional : Adding and Cancelling Accidentals

The system of contemporary notation determines that accidentals not cancelled in their own bar are usually cancelled in the following bar. This applies not only to notes on identical pitch levels, but for the entire pitch class, (i. e. at any octave level). Isang Yun's *Streichquartett IV* (1988), bars 151-152 demonstrates the differences in application of accidentals in contemporary procedures from those of traditional practice. Example 100.

Example 100. Consistent Contemporary Adding and Cancelling of Accidentals

Yun, *Streichquartett* (1988), bar 152, Violins 1 & 2

²⁸¹ Fisher, *String Quartet No. 1*, 1961-2, Performance Notes.

Traditional syntax:

Bar 152 Violins 1 & 2 :

- if the 'rules' of traditional syntax are applied, then the sharpened notes in the sextuplet remain consistent throughout
- it would be unnecessary to add naturals (\natural) to the preceding notes F/C: Violin 1: as no sharps are indicated to warrant cancellation

but these two points are negated by principles used in contemporary practise:

Contemporary notation:

Bars 151-152 Violins 1 & 2:

- if the principles of contemporary notation are applied, and the repeated (F \sharp - D \sharp) figuration (bar 152 - Violin 1) is taken to be a duplet, then the sharpened notes are maintained in terms of accidentals not being repeated unless one or more different notes intervene - the duplet is considered to constitute a single motif: also (D \sharp - B Violin 2)
- what would seem to be the superfluous addition of naturals is not the case here, as contemporary notation obligates accidentals - not required in the bar following - to be cancelled if found altered in a previous bar, regardless of the position in which they appear in a multi-staff notation
- the notating of accidentals in bars 151 - 152 follow the above point:
the sharps in bar 151 need to be cancelled in all instruments - bar 152 - when not required. Bar 151: Violin 1 : C \sharp
 Violin 2 : C \sharp
 Viola : F \sharp - G \sharp - C \sharp
 Cello : C \sharp - F \sharp

all of which should be immediately lowered by a natural sign from F \sharp / C \sharp / G \sharp to F \natural / C \natural / G \natural if required in bar 152. This should happen irrespective of the place they occupy on the multi-stave.

However, not all contemporary composers apply this principle.

Inconsistent use of Contemporary Principles in Cancelling Accidentals

Example 101. Inconsistent use in Cancelling Accidentals

Bartolozzi, *Quartetto per Archi* (1960), Movement IV, bars 8-11

The image shows a musical score for four staves: Violin 1, Violin 2, Viola, and Cello. The score covers bars 8 to 11. Above the first staff, there are boxed numbers '9' and '12'. The notation includes various accidentals (sharps, flats, naturals) and cancellations (diagonal lines through notes). A circled number '1' is located at the bottom right of the score.

Bartolozzi does not always apply the suggested contemporary direction that accidentals, not used in a following bar, be cancelled out. For example :

- bars 8-9 Violin 2 the A \flat (bar 8) is cancelled to A \sharp in Violins 1 & 2 (bar 9) subscribing to modern notational practice
- bars 10-11 Violins 1 & 2 the C \sharp and E \flat (bar 11) Violin 2, are *not* cancelled in Violin 1, despite both appearing with accidentals in bar 10
- bar 10 Violins 1 & 2 the D appears as a sharp (D \sharp) in Violin 1 but in Violin 2 *without*

At first glance, the inconsistency of the notation above creates a certain amount of confusion. However, the uniformity with which a composer uses a system can be determined from an overall understanding of his specific use of accidentals within a single composition. In Bartolozzi's quartet the following example reveals that the accidentals apply only to the note they immediately precede, even if not cancelled out, either from the previous bar or within the same bar. Example 102.

Example 102.

Consistent use of Individual Method
 Bartolozzi, *Quartetto per Archi* (1960), Movement IV, bars 3 - 4

The image shows a musical score for four staves: Violin 1, Violin 2, Cello, and Double Bass. The score covers bars 3 and 4. The tempo is marked as quarter note = 82. Dynamics include *pp* (pianissimo) and *p* (piano). A circled number '6' is in the top right corner. The notation shows various accidentals and note values across the staves.

- bars 3 - 4 Violins 1 & 2 the F in Violin 1 and 2 appears without cancellation after the use of an F# in the Cello of the previous bar

From the example above and many others found in the various movements of the quartet, it can be concluded that Bartolozzi subscribes, at times, to certain principles suggested in the notating of contemporary accidentals while at the same time initiating his own specific method which he applies consistently throughout the score.

Accidentals should not be re-written for Repeated Notes unless one or more Different Pitches Intervene

Certain contemporary composers subscribe to this formula but others disregard the arrangement and prefer to notate every note requiring an accidental. Berio, in his *Sincronie*: for String Quartet (1963-4) leaves nothing to chance by placing an accidental, when required, before each note. The example following elucidates this point. Example 103.

Example 103. Accidentals re-written for Repeated Notes
 Berio, *Sincronie* (1963-64), at 5, page 2

The image shows a musical score for Example 103, featuring two staves: Violin 1 (top) and Cello (bottom). The music consists of repeated notes with various accidentals (flats and naturals). Above the Violin 1 staff, there are markings: a circled '5', '(f.92) acc.', 'fff (siccato, all'arco)', and 'mf-fff'. Above the Cello staff, there are markings: '(f.92) fff acc.' and 'mf-fff'. The tempo is marked as '♩ = 114'. The score shows a sequence of notes with flats (b) and naturals (♮) that are re-written to indicate repeated notes.

- in Violin 1 & Cello the repeated notes in the 3rd grouping of semi-quavers (E \flat - Violin 1) and (A \flat - Cello) respectively are notated with repeated flats (\flat) despite having no intervening pitches

Berio makes consistent use of this method, showing all accidentals where needed.

Crumb re-enters an accidental for each note of the passage below, applying the principle that a repeated note, having one or more intervening notes of a different pitch, should show an accidental if needed. Example 104.

Example 104. Accidentals re-written for Repeated Notes
 Crumb, *Black Angels* (1970), Threnody 1, page 4, Violin 2, Viola & Cello

The image shows a musical score for Example 104, featuring three staves: Violin 2 (top), Viola (middle), and Cello (bottom). The music consists of repeated notes with various accidentals (flats and naturals). Above the Violin 2 staff, there are markings: '(sempre sul pont. e glissando)', 'pp', 'fff', 'sub. 200%', 'pp', 'sempre', 'fff', 'sempre', '(ppp)', and 'pianando (sul pont. sempre)'. Above the Viola staff, there are markings: 'pp', 'fff', 'sub. 200%', 'pp', 'sempre', 'fff', 'sempre', 'ppp sempre', and 'pianando (sul pont. sempre)'. Above the Cello staff, there are markings: 'pp', 'fff', 'sub. 200%', 'pp', 'sempre', 'fff', 'sempre', 'ppp sempre', and '(sempre sul pont. e glissando)'. The score shows a sequence of notes with flats (b) and naturals (♮) that are re-written to indicate repeated notes.

Traditionally, the use of accidentals before every note in such a passage would be totally irrelevant.

Lutoslawski, in the String Quartet (1964), also ignores the ruling guide for repeated notes and re-writes all accidentals, irrespective of the place they occupy in the music. The following example demonstrates this point. Example 105.

Example 105. Accidentals re-written for Repeated Notes
Lutoslawski, String Quartet (1964), at ⑨, Cello

Henze notates every accidental irrespective of the suggestion that repeated notes, without intervening notes, need not be re-written. Example 106.

Example 106. Accidentals re-written for Repeated Notes
Henze, String Quartet No. 5 (1976), Movement 1, bars 38 - 42, Cello

Volans, in the II. String Quartet - Hunting: Gathering (1987), also notates accidentals for repeated notes where, for example, in the opening bar of the quartet ten repeated notes in both the Violin1 and Cello parts (F# and C#) respectively - each has an accidental.

Bar 1: Violin 1 : (F#s) | #J #J #J #J #J #J #J #J #J #J |

(No score example given)

Certain composers subscribe to the suggested principle of *not* re-writing the accidental for repeats.

Example 107.

Example 107. Accidentals *not* re-written for Repeated Notes

Rihm, *Drittes Streichquartett* (1976), Movement IV, page 22

The image shows a musical score for a string quartet, specifically Example 107 from Rihm's *Drittes Streichquartett*. The score is written for four staves (Violin I, Violin II, Viola, and Cello/Double Bass). It features a tempo of quarter note = 40 and a time signature of 4/4. The score includes various dynamic markings such as *pppp*, *ppp*, and *ffff*, along with performance instructions like "poco rit" and "morendo in ffff". The score also includes the instruction "Bogen so wegschwenken, das Saite nachklingt." (Bow so far away, so the string rings out). The score is written in a style that does not re-write accidentals for repeated notes.

The following composers do *not* re-write accidentals for repeated notes:

Composer	String Quartet	Date	Explanation
Ligeti	No. 2	1968	Accidentals not re-written for repeated notes
Ferneyhough	2nd St. Qt.	1980	
Hübler	3 Stqtt	1982-4	
Brandmüller	1 Stqtt	1983	
Heyn	<i>Sirènes</i>	1983	
Dillon	<i>St. Qt.</i>	1985	
Brewaeyes	<i>St. Qt.</i>	1988-9	

Proliferation of Accidentals

without Adhering to any Practice

Throughout Holliger's *String Quartet* (1973) the players are confronted with an endless nightmare of accidentals, placed before almost every note which, in fact, negates the contemporary aim - towards minimal use. Example 108.

Example 108. Proliferation of Accidentals without adhering to any Practice
 Holliger, *Streichquartett* (1973), at A 5

The image shows a musical score for a string quartet. It consists of four staves. The top staff has a long horizontal line with the text "abstrakten längeren Bogenstriche mit Akzentbeginn" written above it. Below this line, the four staves contain musical notation with many accidentals (sharps, flats, naturals) placed above the notes. The word "regelmässig" is written below the second and third staves. At the bottom left, there is a dynamic marking "(ppp, sus pout)".

**In Spatial Notation the Accidental is often placed above
 the Note so as not to Alter the Spatial Relationships**

In the string quartets under investigation, the above procedure has not been applied at all. The quartets that utilise spatial notation reveal traditionally placed accidentals - before the altered note.

In Kopolent's string *Quartetto 3* (1963) the spatial notation is positioned in such a way as to accommodate the accidental in the traditional position - immediately before the note it precedes, as shown in the following example. Example 109.

Example 109. Accidentals unaffected by Spatial Notation
 Kopolent, *Quartetto 3* (1963), page 5

The image shows a musical score for a string quartet. It consists of four staves. The top staff has a treble clef and a key signature of one sharp (F#). The score is numbered 1 through 15. The first staff has a dynamic marking "ppp" and the instruction "estrem. sempre". The second staff has the instruction "estrem. sempre". The third staff has the instruction "trem. sempre" and a dynamic marking "ppp". The fourth staff has the instruction "estrem. sempre" and a dynamic marking "ppp".

Cervetti uses a discernibly small number of spatially beamed notes within regular, detached time spaced barlines, which result in ample spacing for the use of accidentals. Example 110.

Example 110. Accidental unaffected by Spatial Notation
Cervetti, *Zinctum* (1967), bars 85-90

The image shows a musical score for four staves. The top staff is marked 'pizz.' and 'c.l.' with a dynamic of 'sf'. The second staff has 'sf=p' and 'mp'. The third staff has 'N quasi s.v.' and 'sf=p'. The bottom staff has 'pizz.' and 'f'. Dynamics include 'mp', 'ff', and 'p'. There are also markings like 'A' and 'A s.v.'.

Penderecki, within a section marked *Vivace*, despite having a number of spatial notes per grouping nevertheless uses all accidentals placed traditionally before the intended notes. Example 111.

Example 111. Accidentals unaffected by Spatial Notation
Penderecki, *Quartetto per Archi No.2* (1968), page 20, line 1

The image shows a musical score for four staves labeled 1, vn, 2, vl, and vc. The notation is dense with many notes and accidentals. There is a 'miss.' marking on the vl staff.

Earl Brown's stemless beamed notes, maintain the conventional positioning of accidentals in his *String Quartet* (1970). While subscribing to certain 20th century practices he uses no cancellation signs and places the accidentals when needed, irrespective of whether they have occurred previously. The following example illustrates these points. Example 112.

Cello - Six 'C's appear on the second space with accidentals placed as follows :

C C C #C C #C

Composer	String Quartet	Date	Symbol	Explanation
Bartók	<u>No. 4</u>	1928	#●●	altered unison e.g. #g#g
		1928	#●●	chromatic dyad e.g. #a#a with reference to two pitch classes within expanded tonality
Pousseur	<i>Ode</i>	1960-1	●	normal note without accidental
			♯●	(also ♯, especially in chords) = note with sharp sign that is, pitch raised half a tone
			♭●	(also ♭) = note with flat sign half a tone lower

Pousseur's important point about the pitch of the notes and 'chromatics' appears in his instructions: 'The pitch indications should not be considered as absolutely tempered, but rather as approximate value.'²⁸²

Following is an example of Pousseur's innovative use of 'chromatics' in the score. Example 114.

Example 114. Individual use of New Accidental Notation

Pousseur, *Ode : Pour Quatuor à Cordes* (1960-61), page 2, Violins 1 & 2 and Viola

6 5 4 3

A₂

²⁸² Pousseur, *Ode : Pour Quatuor à Cordes*, Universal Edition, 1960-61, Explanation of symbols and instructions for performance.

Score Prefixed by Instructions

The following composers use performance notes to clarify the use of semi-tone adjustment . In each case where relevant, the composers' instructions are indicated :

Composer	String Quartet	Date	Explanation
Pousseur	Ode : <i>Pour</i> <i>Quatuor à Cordes</i>	1960-1	For new pitch notation
Fisher	No. 1	1961	
Lutoslawski	St. Qt.	1964	Composer instructs

Accidentals affect only the notes they precede. Notes without always to be understood as natural.

Cervetti	Zinctum	1967	Composer instructs
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Notes without sharp or flat sign should be read as if they were prefixed by a natural. This does not apply to notes in the same bar.

Kelemen	Motion für Stqtt	1969	Composer instructs
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Accidentals are valid for one note only.

Henze	5. Stqtt	1976-77	Composer instructs
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Accidentals apply to one note only.

No quartets after the late 1970s provide accidental notation explanations whether, in general terms, they conform to contemporary proposals or not.

No quartets use only the sharpened accidental throughout as a means of 'chromatically' altering the notes.

Final Comment

Classical and Romantic composers accepted tonality and its association to key signatures and accidentals as a starting point, while in the Baroque period composers had gradually to create the new and complex 'conventions' of tonality and modulation. Later, the Romantics deliberately extended tonality by chromatically altering chords within the diatonic scale which, when expanded further in compositions of Liszt and Wagner, eventually corroded the sense of tonality and tonal coherence. Debussy, by introducing older diatonic modes, the pentatonic and whole tone scales, loosened the Western concept of the major and minor scales as being the only compositional tools, and placed their

relevant accidentals side by side with those of the major and minor scales. Later, Schoenberg came to experience the limits of tonality, and his equal tempered scale of twelve tones represented, for him, the infinite in pitch relationships. He dismissed enharmonic modulation. Bartók and Hindemith on the other hand, opened up infinite enharmonic links by reconciling the possibilities of expanded tonality with the modes and other scale patterns.

As demonstrated in the string quartets discussed in this section, 20th century compositional changes resulted in a disregard for the 'rules' governing the use of traditional accidentals. This was seen, firstly when the accidentals used in expanded tonality included the bi-modal triad within a single chord, as regularly practised in the quartets of Hindemith and Bartók. At the same time, however, despite abandoning the use of key signatures Bartók and Hindemith maintained determinable tonal centres by the continued use of double sharps (x) and double flats (bb). (Bartók No.6 (1939) and Hindemith No. 6 (1945)). Secondly, and by contrast, Schoenberg and Webern turned to atonality and finally developed the all encompassing twelve-tone accidentals which produced intervallic uncertainty and rendered obsolete the use of any tonally related accidentals.

'Accidental' notation took radically different directions from standard practice resulting, gradually, in the formulation of new practices, but the acceptance and application of contemporary suggestions are not always implemented. As discussed in the preceding sections, there is a certain disregard for, or ignorance of, the suggested proposals of contemporary musicologists. This can partly be attributed to the fact that conferences convened to determine the best symbols for contemporary syntax (such as the important International Conference held at Ghent, in October 1974,²⁸³ and also significant publications, including the 1972 English translation of the German composer Erhard Karkoschka's work²⁸⁴ and the earlier 1969 book by Gardner Read²⁸⁵) all came too late to guide composers of the '60s and early '70s. Consequently, these composers devised their own particular methods which often created confusion and uncertainty as to whether or not an accidental, if not cancelled, is required to be played. Consistency, even in the last decades of the century, is not a feature of 20th century notation, but this investigation does show that from the 1980s onwards composers seem to have benefitted from these publications and subscribe more readily to the list of suggestions given in Kurt Stone's *Music Notation in the Twentieth Century*, Chapter II, Pitch, sub-heading Accidentals.²⁸⁶

²⁸⁰ *Interface*

²⁸¹ Karkoschka, *Notation in New Music*.

²⁸² Read, *Music Notation*, 1969.

²⁸³ Stone, *Music Notation in the Twentieth Century*, pp. 54 - 80.

No quartets, post World-War II, uphold the dictates of key signatures, and the resultant arrangement of accidentals described by Apel below has in fact lost it's accepted function:

.... signs used in musical notation to indicate chromatic alterations or to cancel them. The alterations valid for the entire composition are contained within the key signature, while the term "accidentals" refers specifically to those alterations introduced for single notes.' ²⁸⁷

In contemporary terms, as shown in the string quartets discussed, these signs indicate alterations of the 'white' notes without any particular point of reference to tonality, rendering the idea of chromaticism meaningless.

²⁸⁷ Apel, Harvard Dictionary, p. 5.

7

PITCH EXTENSIONS



John Cage (1912 - 1992)

Given the tape recorders, synthesizers, sound systems, and computers we have, we could not reasonably have been expected to keep our minds fixed on the music of earlier centuries

John Cage

Chapter Seven

PITCH EXTENSIONS

From the introduction of staff notation, attributed to Guido d'Arezzo (c. 990-1050), elements of pitch have been contained in the design of lines and spaces. Later, together with the introduction of the clef, duration and key signatures, these components presented a diagram of musical content that, in Western composition, was sustained without notational change from the 17th century until the early decades of the 20th century. But in the 1920s two important stylistic developments restructured the role of pitch (amongst other parameters) in musical syntax and presented a radical negation of the contours of 19th century melody:

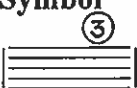
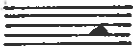
- Schoenberg's dissolution of the key system in the organization of the 12-tone row and
- Varèse's compositional sound masses

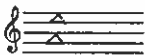
However, in these compositions the innovations revealed no radical contradictions to the notational system other than the invention and appearance of a few new symbols that particularly served Schoenberg's specific needs.

This changed when, in the second half of the century, the novel sounds from electronic studios began to have a profound effect on composers working along more traditional lines, and the experimentation in pitch began to encompass conventional instruments. In the *genre* of the string quartet pitch levels were being sought outside the boundaries previously set by staff notation, and with these changes came the need for new, representative symbols. The examples that follow occur in contemporary postwar string quartets.

Outer Boundaries of Pitch : Highest

Highest Indefinite Pitch

Composer	String Quartet	Date	Symbol	Explanation
Kopolent	<i>Qtto 3</i>	1963		very quick movement at highest extremity
Cervetti	<i>Zinctum</i>	1967		highest possible sound on A string

				doublestops: highest possible pitch of highest possible harmonic indefinite pitch
Penderecki	<i>Qt. per Archi</i>	1968	↑	highest note possible (indeterminate pitch)
			▲ ▲	double stops highest possible pitch on the strings indicated
Sculthorpe	No. 8	1970	⤴	any very high note
			...	
Schmidt	<i>Zweites Stqtt</i>	1979		highest tone = repeated

Comment

New symbols, mostly in the form of upward pointing arrows or triangles, are used to show the highest indefinite pitches. These are placed either on the string for which they are required, or above the stave, which is understood to relate automatically to the highest string. The lowest notes are not variable as the open strings of each respective instrument define a constant lowest pitch.

Glissandi and Portamenti

The *glissando* technique is used for a specific effect on most instruments. It is found, for example, in Mozart's piano *9 Variationen, über "Lison Dormait"* K.V. 264 (1778), with the right hand *glissandi* notated in sixths, and also in the Third Movement of Beethoven's *Waldstein Sonata, Op. 53* (1803-4) where the octave *glissandi* are, according to Apel, '.... almost impossible to perform on modern instruments'²⁸⁸ as the older, lighter actioned keyboards made the execution of this virtuoso effect easier to perform.

Technically and traditionally, a glissando on a stringed instrument - discounting the harp - is produced by sliding the finger up or down the string within a single bow movement. If the slide is rapid then the chromatic notes between any two pitches will not be perceptible, but if done slowly then all the

²⁸⁸ Apel, *Harvard Dictionary*, p. 348.

intermediate steps will be discernible. The *portamento*, on the other hand, is understood to be a short slide between two pitches without distinguishing the intermediate notes; but confusion exists between these two terms which, in violin playing, are often deemed to be interchangeable. In his book, **Violin Playing As I Teach It**,²⁸⁹ the Hungarian born violinist Leopold Auer (1845-1930) subscribes to this ambiguity of terminology and heads one of the sections : The *Portamento* or *Glissando*, writing that in using the *portamento* in a careless way, it :

‘... is the easiest thing in the world to turn this simplest of expressive means into a caricature[and] for the sensitive ear this is nothing short of torture, though, alas, it is a form of cruelty only too often practised on the concert platform’²⁹⁰.

Nevertheless, the terms should not be interchangeable as each requires a different application of the slide. In fact, a further distinction is given in the term ‘chromatic slide’ as used by Ivan Galamain (1903-1981) the Persian born violinist, graduate from the School of Philharmonic Society, Moscow, and teacher at Juillard School of Music in New York. Writing in his post-war 1962 publication **Principles of Violin Playing & Teaching**,²⁹¹ he says the execution of the ‘... left hand [movement] is very similar in technique to the staccato of the right hand’²⁹², with each chromatic note made individually. This particular *glissando*, however, is not new to the 20th century as Niccoló Paganini (1782-1840) used it in the Violin Concerto No. 1 in E_b Major Op. 6, published after his death - sometimes designated to be in (D) as Paganini tuned his violin a half-a-step higher to facilitate the playing of many of the inexplicable technical feats. One example of *scordatura* facilitating technique is found in bar 254 of the E_b Major Violin Concerto where a chromatic *glissando* occurs and is played on one string using a single finger.

Traditionally the accepted *glissando* notation is a straight, thin line placed between the notes concerned, and with the addition of the customary, but not obligatory abbreviation, *gliss*. In contemporary terms, composers have extended the notation and treatment of this single technique in many different ways, devising appropriate symbols, often with extra accompanying words, for the execution of new and novel requirements.

Notwithstanding the foregoing discussion, the technical application of neither the *glissando* nor

²⁸⁹ Auer, Leopold, Violin Playing As I Teach It, London: Duckworth & Co., 1921.

²⁹⁰ Auer, Leopold, Violin Playing As I Teach It, London: Duckworth & Co., 1st edition, 1921. (Hereafter, Auer, Violin Playing)

²⁹¹ Galamain, Ivan Principles of Violin Playing & Teaching, New Jersey : Prentice-Hall, Inc., Englewood Cliffs, 2nd edition, 1985, p. 31. (Hereafter, Galamain, Violin Playing & Teaching)

²⁹² Galamain, Violin Playing & Teaching, p31

portamento is the subject for discussion in this section, but it is rather the contemporary notation used to describe new aspects of pitch organisation.

Glissandi

In each of the following categories the contemporary use of *glissandi* has extended the technique into a classification of complex approaches.

The broad categories include:

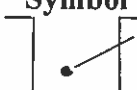
- Ascending, Descending, or both Ascending and Descending, or *vice versa*
- Attached to Notes, to Harmonics, with Definite or Indefinite Pitches
- In Traditional and Spatial Notation, with Conventional or Beamed Notation

Not every *glissando* found is listed below. Instead, illustrated examples are grouped under general headings, with each group containing a selection of different examples to demonstrate the variety found within a single group. These examples also show the fluid and variable approach 20th century composers have explored in using this effect.

Note-to-Note *Glissandi*

Contemporary use in Different Combinations

Example 115. Note-to-Note *Glissando* within Framed Sections of Spatial Notation

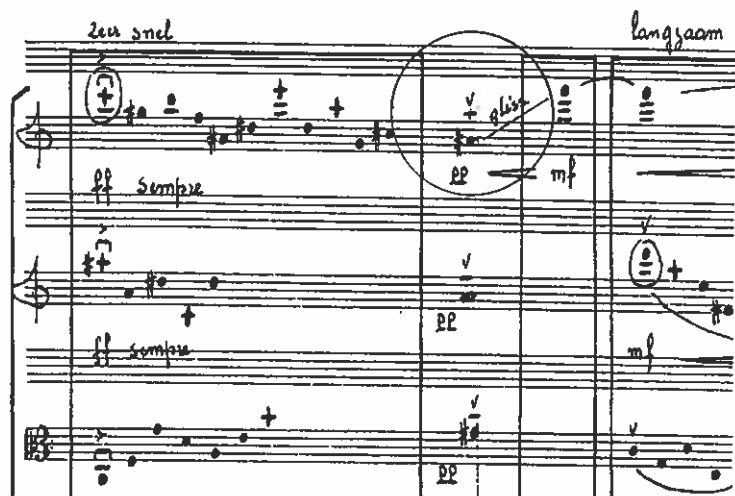
Composer	String Quartet	Date	Symbol
Gistelinc	Qt. with Tenor	1966	

Explanation

The *glissando* takes place within spatially proportioned notes with additional dynamic markings from *pp* < *mf*. Throughout the quartet the notes are encased in blocks or frames, each marked with a separate *tempo* the *glissando* is wedged between two *tempi* indicators connecting two different speeds:

zeer snel and *langzaam*

Element I - Lucas



Example 116. Note-to-Note *Glissando*

Duration : Rhythmic Groupings : Bowing Above in Parenthesis

Composer	String Quartet	Date	Symbol
Lutoslawski	St.Qt.	1964	

Explanation

Lutoslawski notates the *glissandi* in the conventional way but in addition he specifies above, in parenthesis, both the rhythmic groupings and bowing accompanying the *glissandi*

Ex. II Main Movement: Violin 1, at 26

(26)



Example 117. Note-to-Note *Glissando*

Duration : Rhythmic Groupings : Bowing above

Composer	String Quartet	Date	Symbol
Lutoslawski	St.Qt.	1964	

Explanation

Lutoslawski notates the rhythmic groupings and bowing consistently for note-to-note *glissando*

Ex. II Main Movement, Cello, line 4



Example 118. Note-to-Note *Glissando*
 Non-Rhythmic *Tremolo* : Spatial Notation

Composer	String Quartet	Date	Symbol
Kopolent	<i>Otto</i>	1963	(trem.) gliss.

Explanation

gliss. (trem.) marked in conjunction with the rising straight line connecting the two notes in spatial notation

Ex. p. 16, Viola

The image shows two staves of music. The top staff has a treble clef and a key signature of one sharp (F#). A vertical dashed line is drawn through the first measure. The bottom staff has a treble clef and a key signature of one sharp (F#). It starts with a dynamic marking of *p* and a note on the first line. This is followed by a tremolo effect marked *(trem.)* and a dynamic marking of *mp*. A straight line connects the first note to a second note on the second line, with the word *gliss.* written above the line.

Note: The whole quartet is, according to the composer's instructions : 'in free rhythm'²⁹³

Therefore, the *tremolo* is rhythmically undefined

Example 119. Note-to-Note *Glissando*
 Rhythmic *Tremolos*

Composer	String Quartet	Date	Symbol
Lutoslawski	St. Qt.	1964	

Explanation

Rhythmically controlled groups of *glissandoi/tremolos* with lines extending from the first note of each group to first note of the next

Ex. II Main Movement, line 3, Viola,

The image shows three staves of music. The top staff has a treble clef and a key signature of one sharp (F#). It features several groups of notes, each starting with a dynamic marking of *f*. The middle staff has a treble clef and a key signature of one sharp (F#). It features several groups of notes, each starting with a dynamic marking of *f*. The bottom staff has a treble clef and a key signature of one sharp (F#). It features several groups of notes, each starting with a dynamic marking of *p* or *f*. A circle is drawn around the first group of notes in the middle staff.

²⁹³ Kopolent, *3 Quartetto*, Notes on Performance

Example 120. Note-to-Note *Glissando*

Controlled *Tremolo* Groupings : Repeated : Contemporary notation

Composer String Quartet Date Symbol Explanation

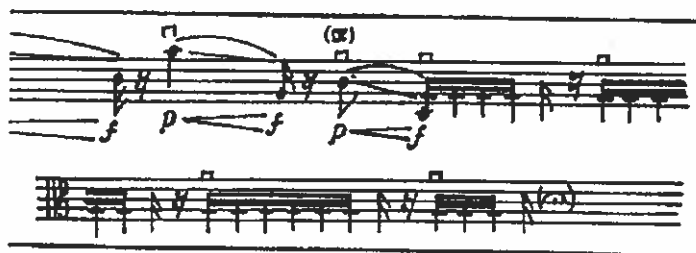
Lutoslawski St.Qt.

1964



The manner of notating the repeated notes without noteheads, within the group of rhythmic *tremolos*, is specific to the 20th century.

Ex. II Main Movement, Viola, at 28



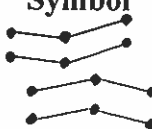
Example 121. Note-to-Note *Glissando*

Double *Glissandi* : Spatial Notation : Bracketed Metronome Time Unit

Composer String Quartet Date Symbol Explanation

Druckmann No. 2

1966



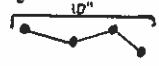
Within spatial notation the asynchronous double *glissandi* are controlled by the metronome mark

$\text{♩} = 96$ bracketed within the duration of a dotted minim $\text{c.} \text{---} \text{c.} \text{---} |$

Ex. All Instruments

**Example 122. Note-to-Note *Glissando*
Controlled by a Time Unit**

Composer **String Quartet** Date **Symbol**
Berio *Sincronie* 1963-4



Explanation

This *glissando* is controlled within a time unit of a maximum of 10'' bracketed placed above the staff
|--10''--|

Ex. All Instruments

Musical score for Example 122, showing a string quartet. A bracketed time unit of 10'' is placed above the staves, indicating the duration of the glissando. The score includes various musical notations such as notes, rests, and dynamics.

**Example 123. Note-to-Note *Glissando*
Glissando of Length Indicated - Fragmented Stave**

Composer **String Quartet** Date **Symbol**
Ferneyhough *Sonatas* 1967



Explanation

The symbol accompanied by the word: *gliss* requires a straightforward slide from one note to another ending at an indeterminate pitch.

Ex. p.20, line 3, bar 204 Violin 2

Musical score for Example 123, showing a fragmented stave. A glissando is indicated by a diagonal line with a wavy line underneath it. The score includes various musical notations such as notes, rests, and dynamics.

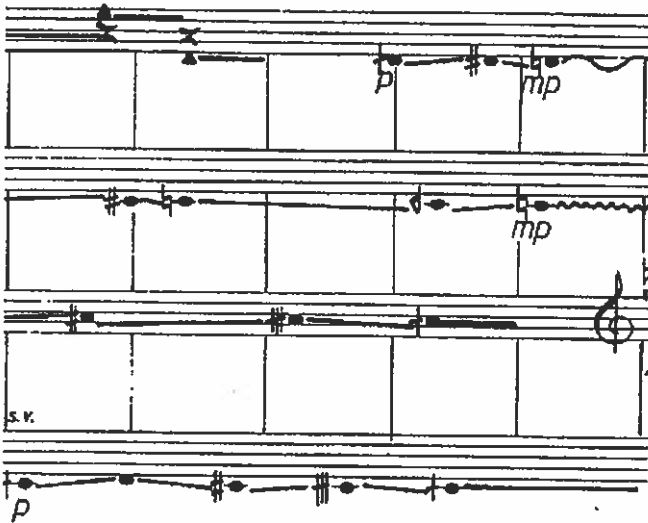
Example 124. Note-to-Note *Glissando*
Including Quarter-Tones : Controlled by Time Unit

Composer String Quartet **Date** Symbol
Cervetti Zinctum 1967

Explanation

Straight line *gliss.* to and from definite pitches including 1/4 tones marked within time unit of 1" per bar |--1"--|

Ex. Violins 1 & 2, Viola & Cello, bars 85-89



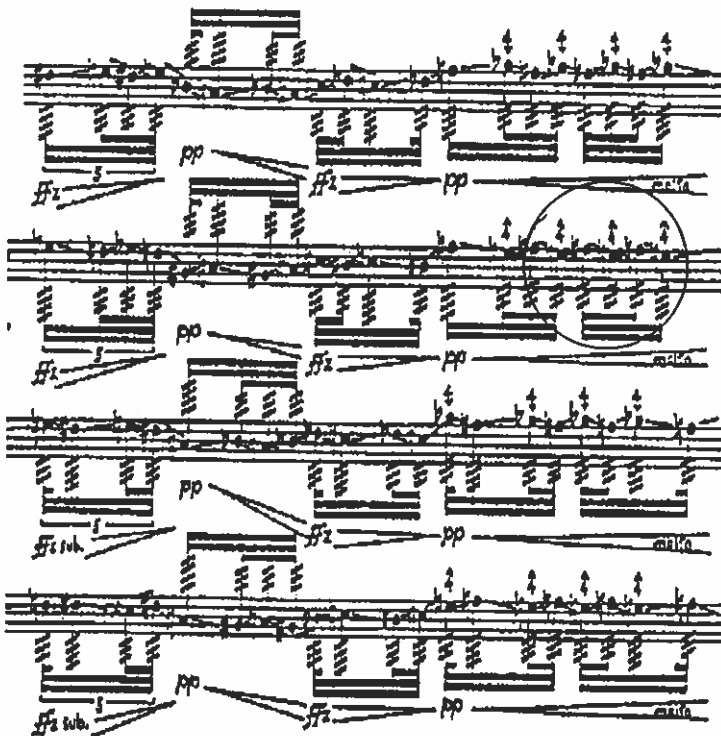
Example 125. Note-to-Note *Glissando*
Including Quarter-Tones : *Tremolos* : Dynamics

Composer String Quartet **Date** Symbol
Crumb Black Angels 1970

Explanation

The *glissandi tremolos*, raised or lowered a 1/4 tone within dynamic variation: 'are continuous, without dwelling on given pitches. The *tremolo* should be extremely rapid.'²⁹⁴

Ex.1 Threnody, p.4, line 2, All Instruments



²⁹⁴ Crumb, *Black Angels*, p.4.

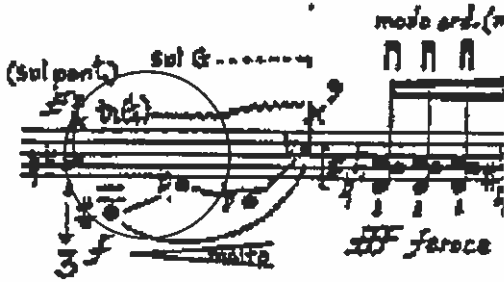
Example 126. Note-to-Note *Glissando*
Including Quarter-Tone Trills : Dynamics

Composer	String Quartet	Date	Symbol
Crumb	Black Angels	1970	

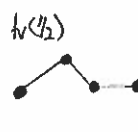
Explanation

The *glissandi* accompanied by trills are raised a (1/4) tone within a *cresc.*:
tr.(1/4)~~~~~

Ex. 4. Devil Music, p.7, Violin 1



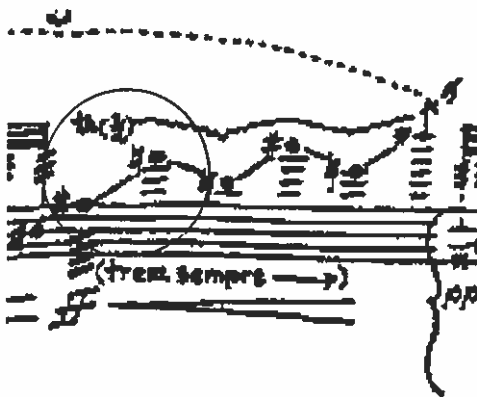
Example 127. Note-to-Note *Glissando*
Including Half-Tone Trills : Tremolos : Dynamics

Composer	String Quartet	Date	Symbol
Crumb	Black Angels	1970	

Explanation


The *glissandi* in trills are raised a (1/2) tone within *tremolos* and *cresc.*:
tr(1/2)~~~~~

Ex. 4. Devil Music, p.8, Violin 1



Example 128. Note-to-Note *Glissando*

Beamed Dynamics : Note-to-*Appoggiatura* : Specific Bowing and Speed

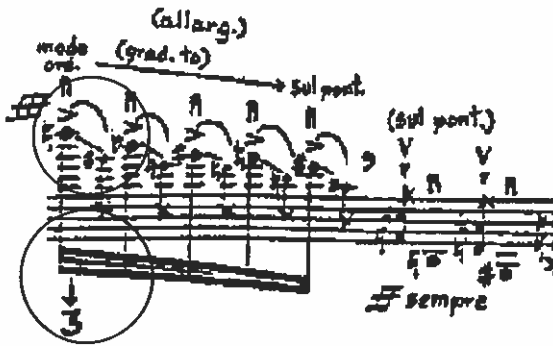
Composer	String Quartet	Date	Symbol
Crumb	Black Angels	1970	

Explanation

Series of descending *gliss.* from note-to-*appoggiatura* attached to a diminishing beam in *decesc.* A series of successive down bows move gradually to *sul pont.* within an (*allarg.*)

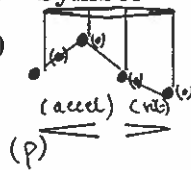
Ex. 4. Devil Music, p.7, line 2,

Violin 1



Example 129. Note-to-Note *Glissando*

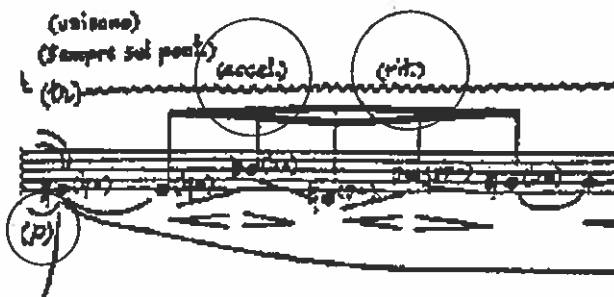
Variations of Speed : Beamed

Composer	String Quartet	Date	Symbol
Crumb	Black Angels	1970	

Explanation

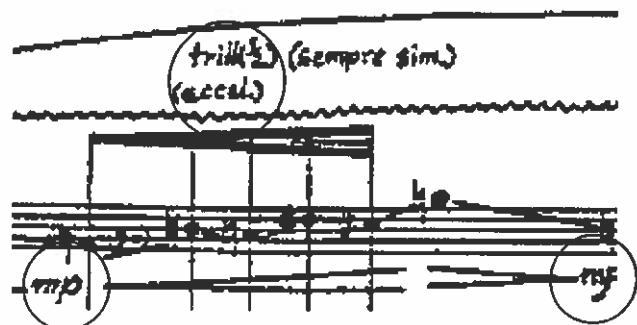
Crumb uses many *gliss.* accompanied by beamed speed changes. At times he uses them in conjunction with grace notes in parenthesis, with trills and/or *tremolos*, and all are associated with a great variety of traditional dynamic markings. The two examples appear on the same page.

Ex. 1



1. (*accel.*) (*rit*)
2. (*accel.*)


Ex. 2

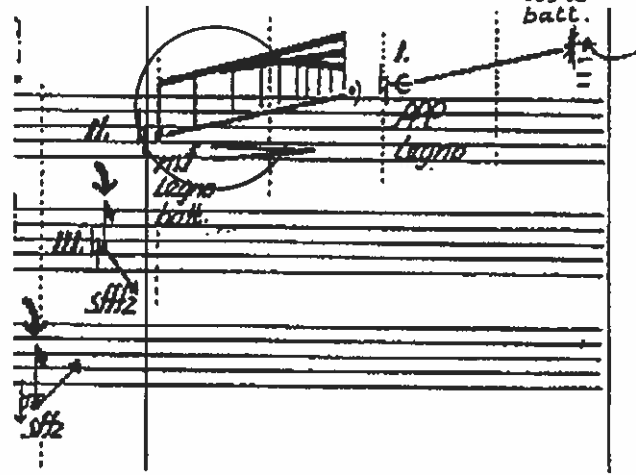


Ex. p. 12

Example 130. Note-to-Note Glissando

Glissando Controlled by Tempo Changes : Accelerando or Ritardando

Composer	String Quartet	Date	Symbol
Heyn	<i>Sirènes</i>	1983	



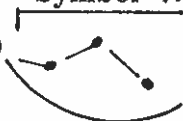
Explanation

Within spatial notation, the spacing of the notes controls the increasing speed of the *gliss.* At the start the beam has a single line which increases to three and coincides with the 'closing-in' of the stems, to signify the increasing speed of the *gliss.* The bowing is : *legno batt.*

Ex. bar 44, Viola

Example 131. Note-to-Note Glissando

Trills Embellished by Grace Notes within Time Unit

Composer	String Quartet	Date	Symbol
Crumb	Black Angels	1970	

Explanation

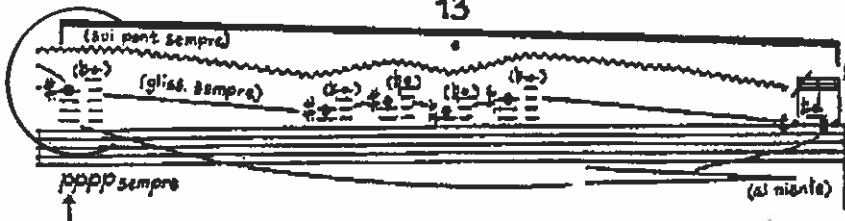
Series of *gliss.* within a single bow ascending and descending from grace notes in parenthesis which form an embellishment to the *gliss.* line within a time unit of

13" : | _____ 13 _____ |

Ex. p.10, E.Violin 1

Solo Obligato: Insect Sounds

13



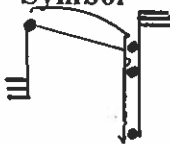
Note: The *glissandi* are executed for a time span of 13" indicated by the square pause sign

Example 132. Note-to-Note *Glissando*
Ending in *Arpeggio*

Composer String Quartet Date Symbol

Ferneyhough No. 2

1980



Explanation

The *gliss.* starts high on the E string (F#) and descends sharply to a (B \flat) on the same string ending in a reversed downward *arpeggiated* chord to open (D)

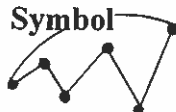
Ex. bar 109, Violin 2

Example 133. Note-to-Note *Glissando*
Increasing Intervals

Composer String Quartet Date Symbol

Heyn *Sirènes*

1983



Explanation

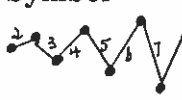
The *gliss.* series occur on all four instruments at the same time. Each has three important aspects:

- 1) & 2) : *legno* [and] *sul la IV*
- 3) After the first pair, each successive *gliss.* increases in intervallic structure

Ex. bar 138, All Instruments

**Example 134. Note-to-Note *Glissando*
Increasing Intervals**

Composer **String Quartet** Date **Symbol** Explanation
 Dillon **St. Qt.** 1985



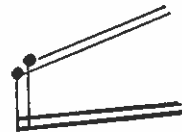
The *glissandi* contain four separate composite requirements, the most significant aspect here is the increasing of intervals per *gliss.* from: (2nd : 3rd : 4th : 5th : 6th : 7th)
 The other requirements are: controlled dynamic instructions, : irregular time grouping of
 | 9:7 | within 7/16 time signature, some use of microtones

Ex. bar 38, Viola

Note-to harmonic *Glissando*

**Example 135. Note-to harmonic *Glissando*
Duration : Rhythmic Groupings : Bowing**

Composer **String Quartet** Date **Symbol** Explanation
 Lutoslawski **St.Qt.** 1964



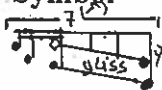
Lutoslawski notates the rhythmic groupings and bowing above the staff for the rising *glissando*

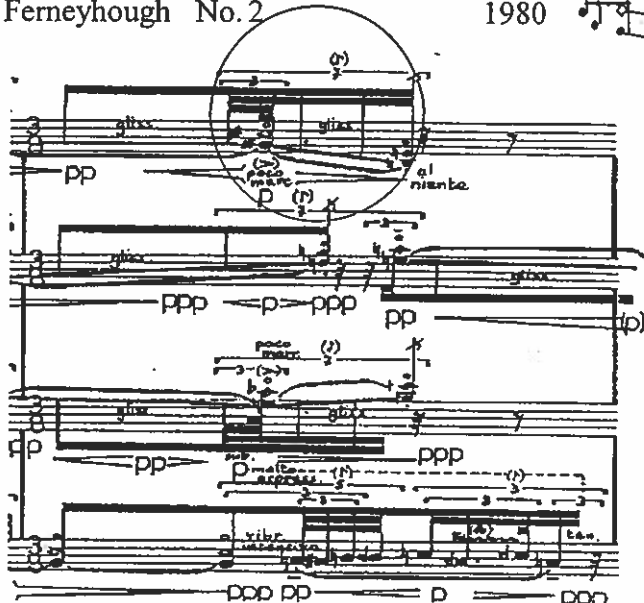
Ex. II Main Movement, Cello, after 44

Note: In the String Quartet (1964), Lutoslawski makes fairly general use of the *glissando* described above throughout the quartet.

Harmonic-to-harmonic *Glissando*

Example 136. Artificial Harmonic-to-harmonic *Glissando*

Composer	String Quartet	Date	Symbol
Ferneyhough No. 2		1980	



Explanation

The single or double artificial harmonic is used in *gliss.* by many contemporary composers in various forms. This example, one of many variations, presents the *gliss.* as part of rhythmic groupings, all ending in *appoggiaturas* in notation that belongs exclusively to the 20th century

Ex. bar 145, Violins 1&2, Viola

Example 137. Harmonic-to-harmonic *Glissando*

Artificial : *Glissando in Diminuendo*

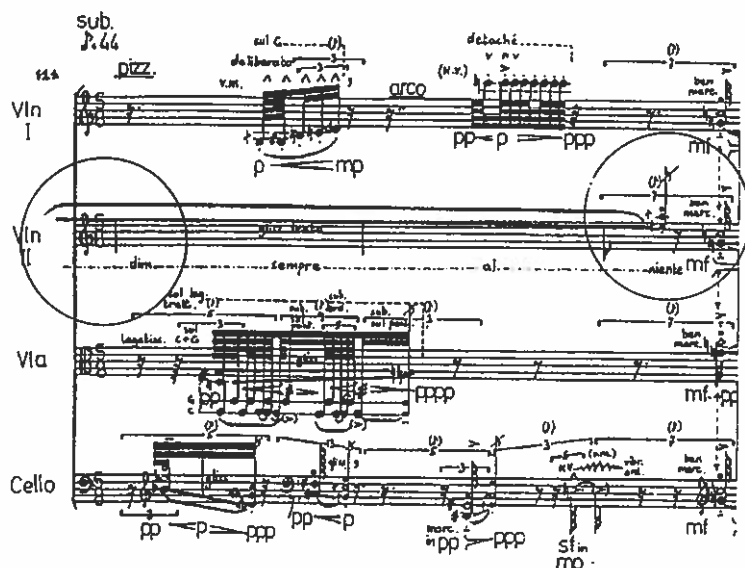
Composer	String Quartet	Date	Symbol
Ferneyhough No. 2		1980	

Explanation

In the process of passing through three different time signatures

(7/8 : 1/8 : 5/8 :) in three bars, the *gliss.* diminishes to: *al. niente* ending in a parenthesised *appoggiatura*

Ex. bars, 43-45, Violin II



Example 138. Harmonic-to-harmonic *Glissando*

New symbols for harmonics : *Pizzicato*

Composer **String Quartet** Date **Symbol**
 Kopolent *Otto* 1960

Explanation

gliss. & *pizz.* and a rising straight line between newly devised square symbols defining the harmonics : this sign □ for that o
Ex. p. 17, Cello

Example 139. Harmonic-to-harmonic *Glissando*

Artificial Harmonics in Quarter-Tones

Composer **String Quartet** Date **Symbol**
 Dillon St. Qt. 1983

Explanation

The artificial harmonic *glissandi* move in 1/4 tones through four different time signatures: (7/16 : 3/8 : 5/8 : 4/8) over five bars: (bars 38-41)

Ex. bars 37-39, Violin I

Note: There is no clarity as to exactly what is meant by the time unit, or to what the (*per 1/4 sek*) relates. However, if one takes into account that in the list of time durations given at the beginning of the quartet, a stemmed white note (\downarrow) is allocated a time unit of between $2,25 \pm 0.5$ seconds, then one may assume that the *per 1/4 sek* is the time that each movement of the *glissando* takes to and from the open-ended pitches.

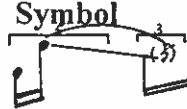
From a Note to a Small note-head

The small note-heads in parenthesis are not articulated and merely mark the final pitch

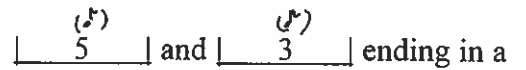
Example 142. From a Note to a Small note-head *Glissando*

Composer String Quartet **Date** **Symbol** **Explanation**

Ferneyhough 2nd St. Qt. 1980



The *gliss.* forms part of two principle rhythmic groupings



The beginning and ending of the *gliss.* is incorporated into and forms part of each rhythmic grouping

Ex. bar 73, Violin 2

Note: This particular *gliss.* ending is used extensively in many contemporary quartets

Note to Open-Ended *Glissando*

The line implies an indeterminate pitch ending

Example 143. Note to Open-Ended *Glissando*

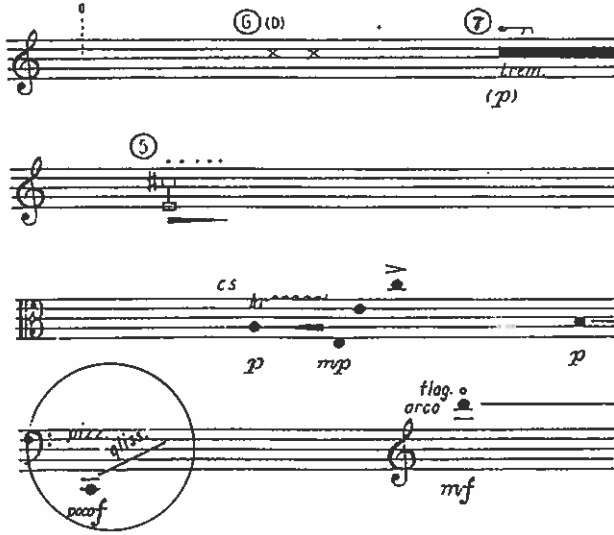
From Definite to Approximate Pitch : Spatial Notation : *Pizzicato* :

Composer	String Quartet	Date	Symbol
Kopolent	<i>Otto</i>	1960	

Explanation

gliss. & pizz. marked
from defined note (C)
to an approximate pitch within spatial
notation

Ex. p. 16, Cello



Example 144. Note to Open-Ended *Glissando*

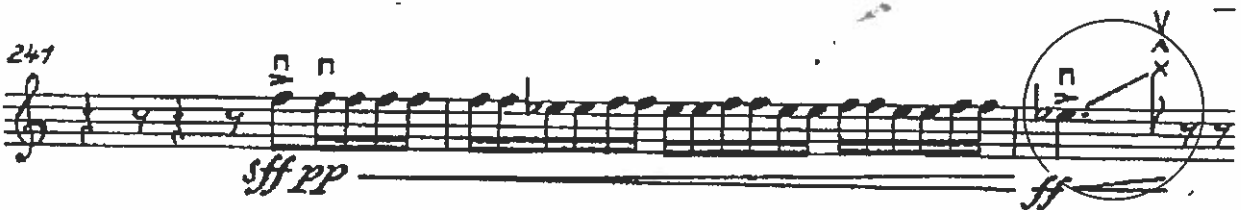
From Definite to Approximate Pitch : Ending Symbol (x)

Composer	String Quartet	Date	Symbol
Kochan	<i>Stqtt</i>	1973-4	

Explanation

The *gliss.* ends in a pitch of little
importance as the symbol (x) implies.
It is different from the sign (+) which
traditionally indicates a left hand *pizz.*


Ex. bar 241, Violine II



Open-Ended *Glissando*

At the end of *gliss.* the line implies an approximate pitch

Example 145. Open-Ended *Glissando* New Symbols

Composer	String Quartet	Date	Symbol
Brandmüller	<i>Erstes Stqtt.</i>	1983	

Explanation

There are two new approaches in this *gliss.* :

1. The *gliss.* descends from the highest note of the Viola A string
 2. Finishing on an open-ended approximate pitch, terminating in a rest
- Ex. bar 317, Viola



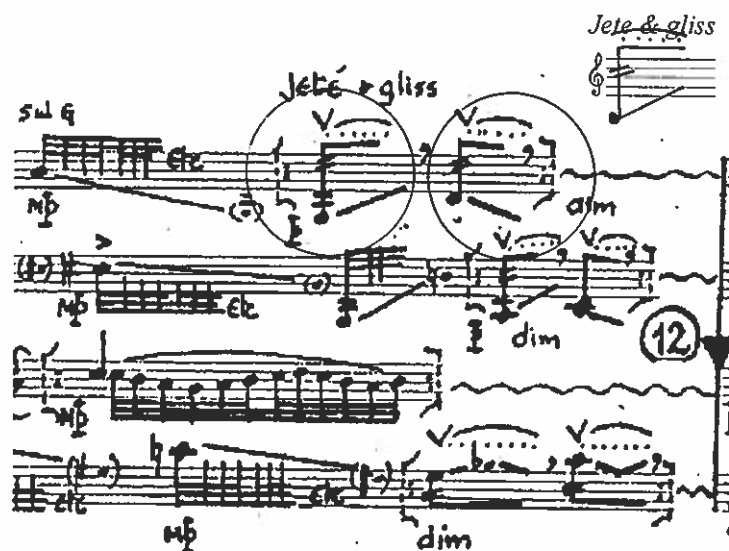
Example 146. Open-Ended *Glissando* *Spiccato Bow*

Composer	String Quartet	Date	Symbol
Crosse	Studies St. Qt.	1976	

Explanation

The *gliss.* Ascends or descends through a succession of *spiccato* up-bows to an approximate pitch.

Ex. p.12 at O, Violins 1&2 and Cello



Note: The French word *Jete* has the same meaning as the Italian *Gettato* found in Ferneyhough's *Second Quartet* (1980), and signifies: 'bounce bow on string (single bow action) whilst executing a *glissando* in the left hand.'²⁹⁵ The difference between the two is that the *glissando* with the *gettato* bowing is written out as an exact rhythmic grouping.

²⁹⁵ Ferneyhough, *Second String Quartet*, Performance Notes.

Glissando Open-Ended with Arrow

Implies the *glissando's* final pitch lies beyond the end of the arrow or is indefinite

Example 147. *Glissando Open-Ended with arrow*

Composer	String Quartet	Date	Symbol
Brown	St. Qt.	1970	

Explanation

In spatial notation the ascending line starts the *gliss.* on a definite pitch (G) ending with an arrow which signifies an indefinite pitch

Ex. Section 6, 'bar' 2, Violin 1

Example 148. *Glissando Open-Ended with arrow*

Composer	String Quartet	Date	Symbol
Hertel	<i>Imitationen</i>	1975	

Explanation

Hertel uses the arrow in traditional notation to effect an indefinite ending to the *gliss.*

Ex. p. 13, before 19, Violin 1

Example 149. Glissando Open-Ended with arrow

Composer **String Quartet** Date **Symbol**
 Heyn *Sirènes* 1983

Explanation

Heyn's series of longer arrows have the same indefinite ending as the *gliss.* described in the previous example. All move to high indefinite pitches : String 1V (G string)

Ex. bar 171, Violin 2.

The musical score for Example 149 consists of four staves. The first staff has a tempo marking of $\text{♩} = 54$ and a measure number of 71. It features a *gliss.* marking with an arrow pointing up, followed by dynamics *p*, *mf*, and *pp*, and performance instructions *tasto*, *cont.*, and *ordin.*. The second staff has a *sfz > p* marking, *Legno*, and a *gliss.* with an arrow pointing up, followed by dynamics *mp* and *pppp*, and the instruction *rit.*. The third and fourth staves also feature *gliss.* markings with arrows pointing up, dynamics *pp* and *pppp*, and the instruction *ordin.*. A circled diagram shows a violin fingerboard with an arrow indicating a glissando from a lower position to a higher one. Handwritten notes above the score read: "short, snappy L-h. pizz. on simult. bowed a-string".

Note: Heyn makes extensive use on all four instruments of the single-note open-ended *gliss.* ending in an arrow, and to a lesser extent that of the double-stopped arrowed *gliss.*

Contoured, Glissando

The *glissando* takes on the contour implied by the line between either definite or indefinite pitches

Example 150. Contoured Glissando Spatial Notation

Composer **String Quartet** Date **Symbol**
 Kopolent *Qtto* 1960

Explanation

gliss. marked in conjunction with a rising and descending contour line to and from pitch levels in spatial notation :

Ex. p. 13 , All Instruments

The musical score for Example 150 shows four staves, each with a *gliss.* marking and a contour line indicating a rise and then a fall in pitch. The dynamics are marked as *ff* at the beginning and *p* at the end of each glissando. A circled diagram shows a contour line that rises and then falls, with the word *gliss.* written above it. A measure number of 135 is indicated at the start of the first staff.

Kopolent

Otto

1960



gliss. Shows the contours of the finger movement

Ex. p. 13, Violin 1 & Cello

Example 151. Contoured Glissando
Dynamic Indicators : Beamed Notation

Composer String Quartet Date Symbol Explanation

Kopolent Otto

1960



gliss. marked in conjunction with beamed *cresc./descresc.*

from *p-ff-p*

the last note of the *gliss.* is defined as (A) and despite the absence of the first note it is implied by the definite pitch (E), of the previous bar

Ex. p.13, Violin 1

Example 152. Contoured Glissando

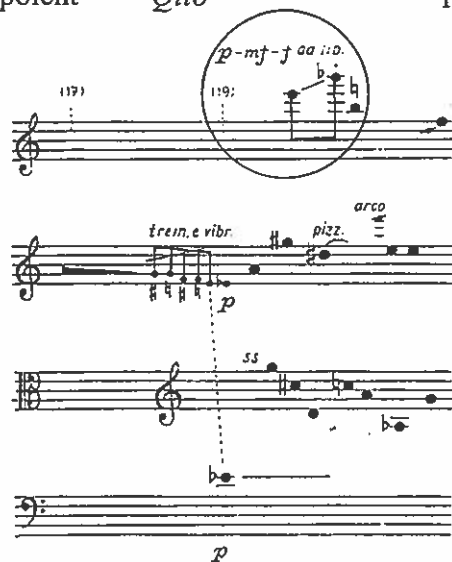
Dynamic Indicators

Composer **String Quartet** Date **Symbol**
 Kopolent *Qtto* 1960 

Explanation

gliss. indicated by a thin upward line from note to note (E to B \flat) which in conjunction with an increasing thickness in the beam and the letters *p-mf-f ad lib.* indicate a *cresc.*

Ex. p. 17, Violin 1



Note: The words *ad lib.* accompanying *p-mf-f*, allows some choice of dynamic gradation within the *glissando*. All Kopolent's *glissandi* occur within beamed spatial notation.

Example 153. Contoured Glissando

Arrows Indicate Continuation After Line Endings

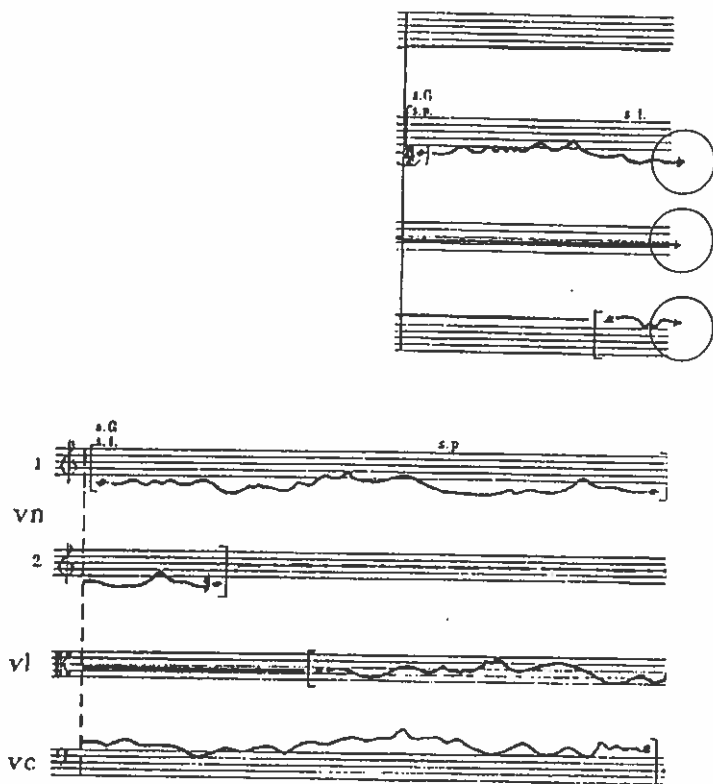
Composer **String Quartet** Date **Symbol**
 Penderecki *Qtto. Per Archi* 1968 

Explanation

These contoured *glissandi* do not cease at the end of the line, as the arrow indicates a continuation to the next. In this instance the *glissandi* move between two definite pitches found at the beginning and end of each part respectively

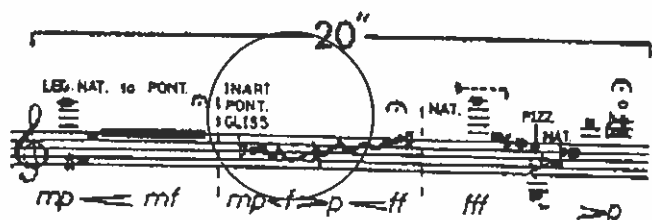
Ex. p. 6, Lines 2 & 3,

Violin 2 and Cello



Example 154. Contoured Glissando
Graphic Design

Composer	String Quartet	Date	Symbol
Brown	St. Qt.	1970	<i>Gliss</i> <i>Wave</i>



Explanation

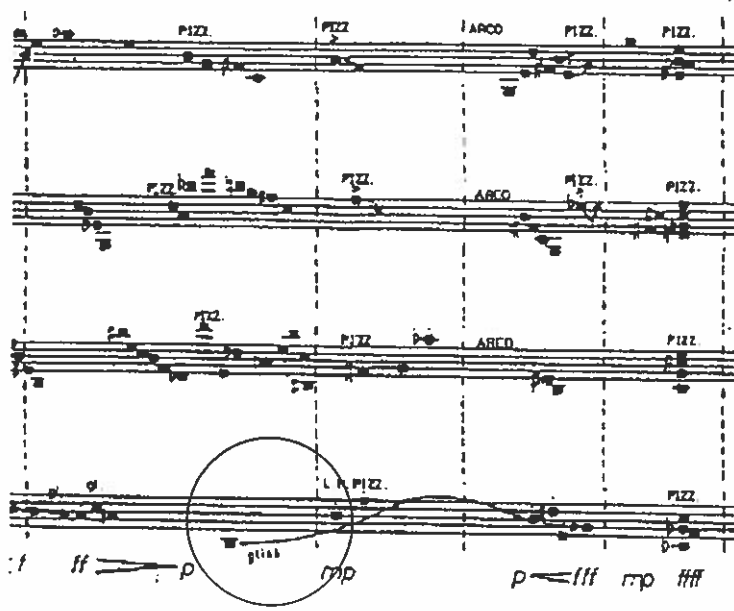
The graphic notation of this contoured *gliss.* has several instructions attached, i.e. *INART. PONT. GLISS.* which, when found, are to be executed with the following specific instructions: 'using whichever given technique in a kind of inarticulate bowing technique; not giving full normal sounding value to the notes, a generally fast, random slurring of bow action, not full *glissandi* unless, "gl" or "gliss" although short 'bending' *glissandi* may be included as implied by the graphics.' The *PONT.* is played 'arco near the bridge: with an extreme nasal sound.'²⁹⁶

Thus, these contours have specific dynamic markings

Ex. Section 7, 'bar' 2, Violin 1

Example 155. Contoured Glissando
Accompanied by Pizzicato

Composer	String Quartet	Date	Symbol
Brown	St. Qt.	1970	<i>gliss</i>



Explanation

While the contoured *gliss.* rises and falls to and from a definite pitch (D-D octave) the open strings (D and A) sound simultaneously in *pizz.*

Ex. Section 6, 'bars' 3-5, Cello

²⁹⁶ Brown, String Quartet, 1970, Notes - Strings - Abbreviations and Unusual Indications.

Example 156. Contoured Glissando
Rapid Pizzicato

Composer String Quartet Date Symbol
Brown St. Qt. 1970 ↗ ↘

Explanation

The short contoured lines ending in an arrow of indefinite pitch require the pizz. *glissandi* to be rapid in the directions indicated

Ex.. Last Section, last line, Cello

Example 157. Contoured Glissando
Transient

Composer String Quartet Date Symbol
Brown St. Qt. 1970 

Explanation

In the penultimate section the composer requires these *glissandi* to be: 'small, transient, inarticulate sounds.'²⁹⁷ The graphic contours include the addition of specific bowing and dynamic requirements

Ex. Violins 1 & 2 and an extra stipulation : 'Micro gliss.' : Cello

small, transient, inarticulate sounds

²⁹⁷ Brown, String Quartet, 1970. Notes. Margin at left of staff

Example 158. Contoured Glissando

Passing Through Specific Notes

Composer **String Quartet** Date **Symbol**
 Brown **St. Qt.** 1970 *gliss*

Explanation

This note-to-note *gliss.* is not altogether contoured in a free flowing manner as at one point it is required to pass through a specific note (B₄) on it's way up from

B₄toF_#

Ex. Top line - Violin 1

Note: Brown makes extensive use of and varies the *glissandi* described in the above section.

Example 159. Contoured Glissando

Ending Arrow of Indefinite pitch

Composer **String Quartet** Date **Symbol**
 Rihm **Drittes Stqt** 1976 *Flag. gliss.*

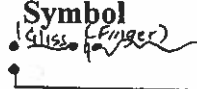
Explanation

The contoured *gliss.* ends in an arrow of indefinite pitch

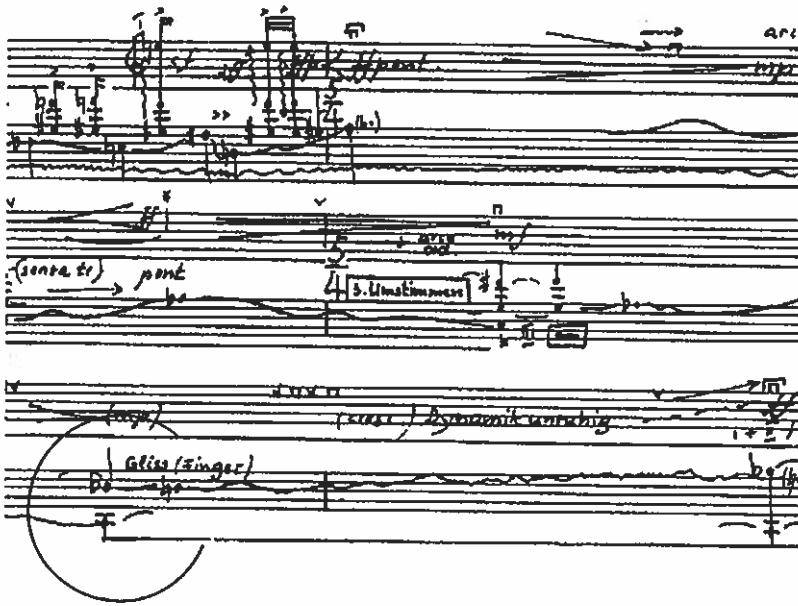
Ex. p. 39, Section 6.

Violin 2, Viola & Cello

Example 160. Contoured Glissando
Against Sustained Note

Composer	String Quartet	Date	Symbol	Explanation
Holliger	Statt	1973		

The upper contoured '(gliss.) Finger' to and from pitched notes is shaped against a sustained beamed open string (C)
Ex. p. 32, E. 17, Cello



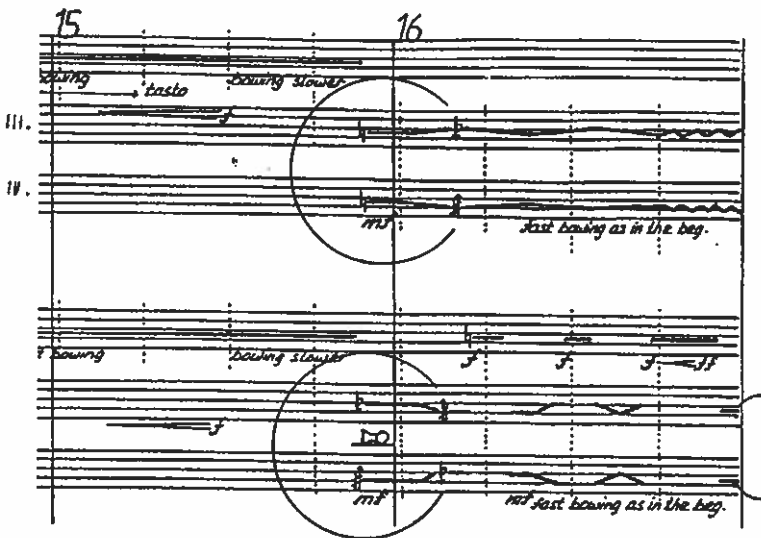
Example 161. Contoured Glissando
In Contrary Motion

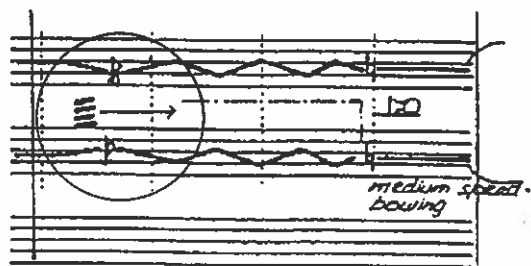
Composer	String Quartet	Date	Symbol	Explanation
Heyn	Sirènes	1983		

The contoured *gliss.* are placed on two different staves, each representing a different string for a single instrument - in this case Violin 2.

The upper staff represents String III (D) : and the bottom staff String IV (G). The beamed contours move in a series of quarter-tones creating *gliss.* in contrary motion. The extra symbol represents the simultaneous playing of the wooden part of the bow and bow-hair.

Ex. bar 15 -16, Violin 2





In the second example the *gliss.* also move in contrary motion on string 1 & 2 (A & D) Cello. However, the contoured quarter-tone *gliss.* are in *tremolo*

Ex. Bar 16, Cello

Note: Heyn makes widespread use of this effect throughout the first half of the quartet : bars 1-86

Example 162. Contoured Glissando Ending Slow Vibrato

Composer	String Quartet	Date	Symbol
Heyn	<i>Sirènes</i>	1983	

Explanation

The contoured quarter-tone *gliss.* are arranged on two staves as described in the example above and end in a series of wavy lines, where : the finger would slide back and forth rapidly, rather like a very slow-moving vibrato,²⁹⁸ which could as easily be heard as a fast, small *gliss.*

Ex. bar 57, Violin 1

Example 163. Contoured Glissando In Harmonics

Composer	String Quartet	Date	Symbol
Coeck	<i>Graphismes</i>	1983	

Explanation

The contoured *glissandi* occur as harmonics in the three lower instruments


Ex. *Graphismes* III, line 2

Violin 2, Viola & Cello

Articulated/Chromatic *Glissando*

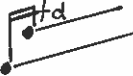
Where the notes in between are discernible

**Example 164. Articulated/Chromatic *Glissando*
Explained but Non-Existent**

Composer	String Quartet	Date	Symbol	Explanation
Bartolozzi	<i>Qtto per Archi</i>	1960		<i>glissando articolato</i>

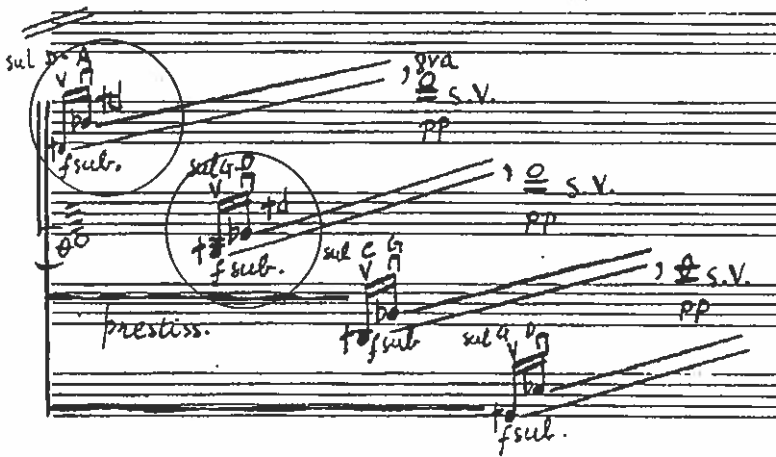
Note: Despite illustrating and explaining the symbol for the *glissando articolato* in the *Spiegazione Dei Simboli* at the beginning of the score, Bartolozzi makes no use of the articulated (or chromatic) *glissando* in this quartet.

**Example 165. Articulated/Chromatic *Glissando*
In 1/4 Tones**

Composer	String Quartet	Date	Symbol	Explanation
Coeck	<i>Graphismes</i>	1983		

The notational symbol accompanying the double *glissandi* on the two upper strings, requires the ascending slides to be done in quarter-tones: 'quasi-chromatiek per 1/4 toon, stygend.' (quasi-chromatic in 1/4 tones).²⁹⁹ ending on approximate pitches.

Ex. *Graphimes I*, line 1, All Instruments



The image shows a handwritten musical score for four staves. The notation is dense and includes various markings such as 'sul', 'f sub.', 'pp', and 'prestiss.'. There are several instances of the articulated glissando symbol (a horizontal line with vertical bars underneath) used for ascending slides. The score is written in a cursive, handwritten style.

²⁹⁹ Coeck, *Graphismes, Symboles*.

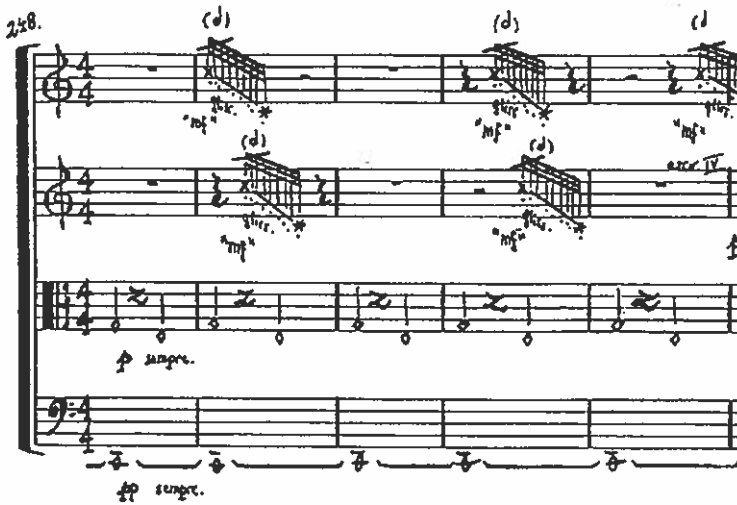
Example 166. Articulated/Chromatic Glissando
Quasi Chromatic

Composer	String Quartet	Date	Symbol
Brewaeys	St. Qt.	1989	

Explanation

For the descending series of *col legno battuto glissandi* the composer requires that : ‘... the pitches should be coming out as close as possible to the text.’³⁰⁰ The slash (/) at the start of each note grouping represents : as fast as possible

Ex. bars 249-253, Violins 1 & 2



Glissando Col legno

Glissando Col legno - tratto

With the wood of the bow across the strings in place of the hair.

Glissando Col legno - battuto

With the wood, tapping the string with the stick of bow.

Note: When the percussive sound is required, the term *battuto* is used, often notated in conjunction with a wedge over the note. (▼)

The *col legno* bowing technique was used as a technical resource in Carlo Farina’s early publication (*Ander Theil* 1627)³⁰¹ which included a collection of violin pieces - Dances, French Airs and Quodlibets - of which the most favoured was the *Capriccio Stravagante* (1627). Yet, Leopold Mozart in *A Treatise On The Fundamental Principles Of Violin Playing*³⁰² does not include the *col legno* technique in the chapter : “Of the Many Varieties of Bowing.” Interestingly, in the 1921 publication, : *Violin Playing As I Teach It*,³⁰³ by the Hungarian born violinists Leopold Auer (1845-1930), no mention is made of the *col legno* technique in the extensive discussion in Chapter V, “Hints on Bowing,” the reason being, perhaps, that in that period it required only a straightforward turning of the bow for the necessary sound. Apel maintains that *col legno* is used as ‘ a purely orchestral effect,’³⁰⁴ and while this is true of such compositions as Saint-Saëns’ (1835-1921)

³⁰⁰ Brewaeys, *String Quartet*, Remarks For Performance

³⁰¹ Donnington, *Early Music*, p. 341.

³⁰² Mozart, Leopold, *Treatise On Violin Playing*, Ch. VII, p. 114.

³⁰³ Auer, Leopold, *Violin Playing As I Teach It*, London: Duckworth & Co., 1921.

³⁰⁴ Apel, *Harvard Dictionary*, p. 104.

symphonic poem *Danse Macabre* (1871), violin literature has proved that even before this century it functioned as a special effect in other *genre*. It was used, for example, by 19th century composers such as Ludwig (or Louis) Spohr (1784-1859), in the *Finale all' Espagnola* of the sixth of his fifteen violin concertos.

The *battuto* effect, when used by Hector Berlioz (1803-1869) in the *Symphonie Fantastique* (1820) was both revolutionary and rare but, in the 20th century, is commonly used. In previous centuries, when these special effects were required, it was sufficient to accompany the notes with the instruction: *col legno*, however, in the 20th century other symbols have been added to demonstrate it's widespread appeal as a percussive effect in compositions for string quartet.

Example 167. *Glissando Col legno*

Open-ended : *Accelerando* : In Contrary Motion

Composer	String Quartet	Date	Symbol
Druckman	No. 2	1966	

Explanation

The angle of the *col legno* notes in contrary motion seem to represent two techniques :

1. a *glissando*
2. an *accel.* towards the end of the open-ended notation

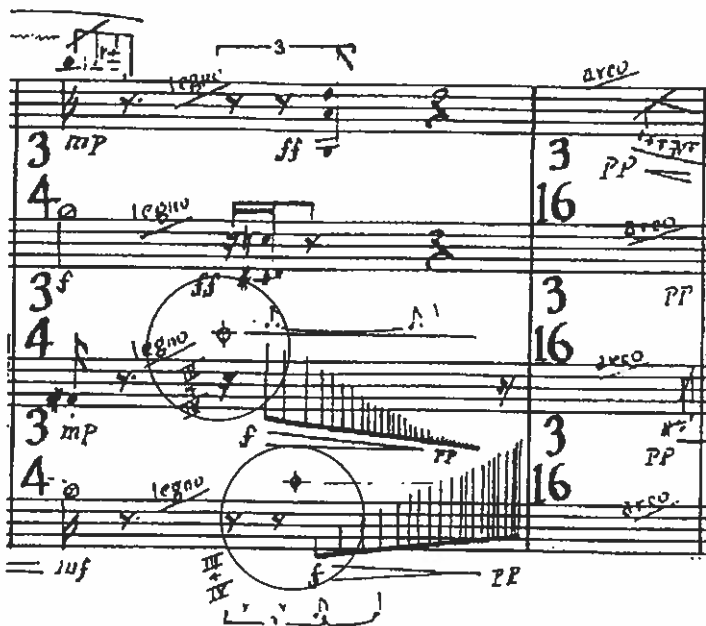
They are asynchronous, however there are further requirements

The symbol (⊕) represents: 'stop reverberation of string either with next highest left-hand finger or by releasing left-hand pressure and touching string lightly as in harmonics.'³⁰⁵

The others are self explanatory

Ex. between Nos.11 & 12

Viola and Cello



The image shows a musical score for a string quartet, specifically for the first and second violins and the viola and cello. The score is written in 3/4 time and consists of four staves. The first two staves are for the first and second violins, and the last two are for the viola and cello. The score includes various performance instructions such as 'legno', 'arco', 'mp', 'ff', 'pp', and 'f'. There are also dynamic markings like '3' and '4' for the first and second violins, and '3' and '16' for the viola and cello. The score is annotated with a circled '⊕' symbol and a circled 'f' symbol, which correspond to the techniques mentioned in the explanation. The score is annotated with a circled '⊕' symbol and a circled 'f' symbol, which correspond to the techniques mentioned in the explanation.

Example 168. *Glissando Col legno Battuto and Tremolo*

Composer	String Quartet	Date	Symbol	Explanation
Crumb	Black Angels	1970	▼	<i>Glissando in tremolo</i> accompanied by words and wedge signs

The musical score for Example 168 features a complex arrangement of string parts. The top staff is annotated with 'camere. col legno trafo (sul G)' and 'mp'. The middle and bottom staves show 'col legno battuto' techniques, with 'mp' and 'pizz' markings. A circled section includes 'tongue click' and 'pizz' annotations. The score uses various rhythmic and dynamic markings to achieve the desired glissando and tremolo effects.

Ex. 2. Sounds of Bones and Flutes p. 6, Violin 11 & Cello

Example 169. *Glissando Col legno Battuto and Tremolo : Double Stops*

Composer	String Quartet	Date	Symbol	Explanation
Crumb	Black Angels	1970		<i>Glissando in tremolo</i> notated in double stops as above, on (sul A - E):

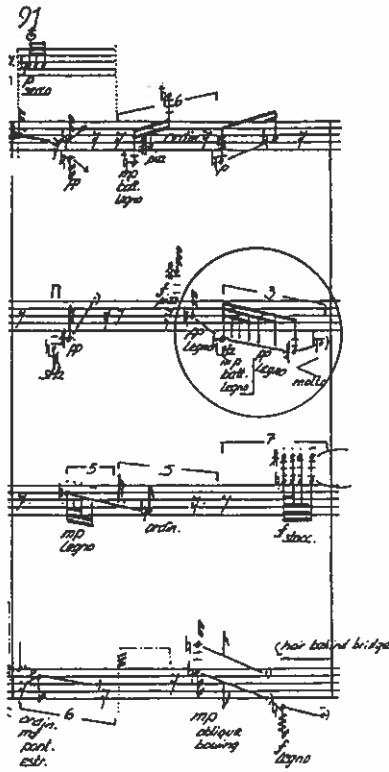
The musical score for Example 169 illustrates double stops and glissando techniques. The top staff is annotated with '(sul A-E)'. The middle staff shows 'col legno' and 'whisper (stacc)' markings. The bottom staff includes 'pizz.' and 'p' markings. A circled section highlights the double stop technique. The score uses various rhythmic and dynamic markings to achieve the desired glissando and tremolo effects.

Ex. 2. Sounds of Bones and Flutes p. 6, Violin 11

**Example 170. *Glissando Col legno*
Changing to *Battuto***

Composer **String Quartet** **Date** **Symbol**
 Heyn *Sirènes* 1983 

Explanation
 The descending *gliss.* changes midway from being executed at the start as a : *batt. legno* bouncing bow to finish as a *legno*, played smoothly on the wood.
Ex. bar 91, Violin 2



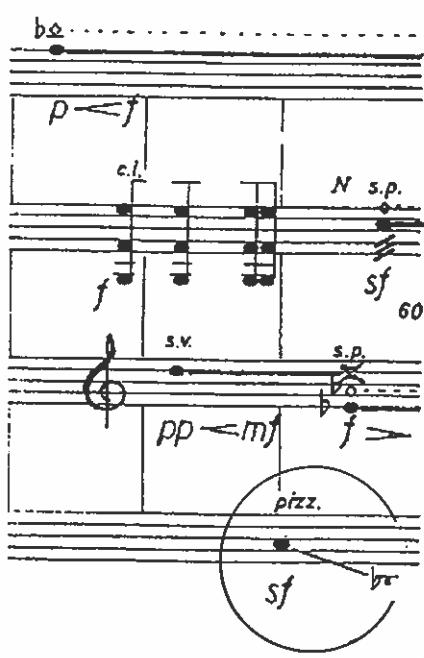
Note: The *glissando col legno/battuto* is used extensively in many contemporary quartets

Pizzicato Glissando

**Example 171. *Pizzicato Glissando*
Within Time Unit**

Composer **String Quartet** **Date** **Symbol**
 Cervetti *Zinctum* 1967 

Explanation
 Descending *pizz. gliss.* to and from definite pitches within time unit of |--1"--| per bar
Ex. bar 60, Cello



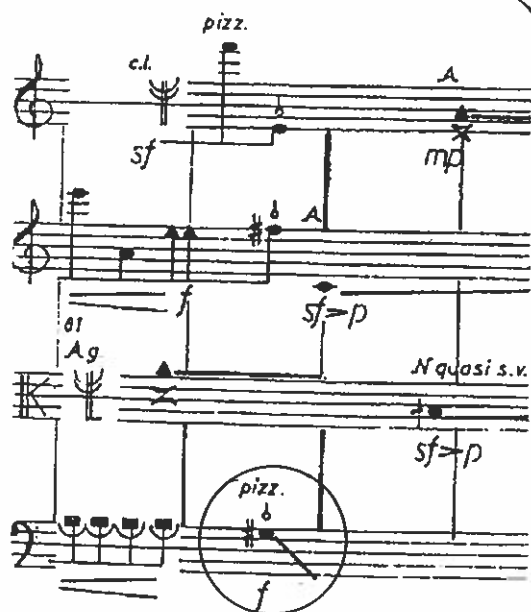
Example 172. Pizzicato Glissando

Bartok Snap : Note-to-Note : Definite to Approximate Pitch : within Time Unit

Composer	String Quartet	Date	Symbol
Cervetti	Zinctum	1967	

Explanation*Glissando pizz.* explained as :*pizzicato* alla Bartok...let string snap back on to the fingerboard

from a definite pitch (G#) to a descending undefined pitch within time unit |--1"--| per bar

Ex. Cello : bar 82

Example 173. Pizzicato Glissando

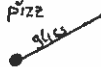
Bartok Snap : Note-to-Note :

Composer	String Quartet	Date	Symbol
Huber	Doubles	1987	

ExplanationAs in the previous example, the *gliss.* are made as snap or Bartok *pizz.* but here they occur in a seriesEx. Bar 183, Cello


Note: This symbol (δ) was invented and first used by Bartók in his String Quartets, an example of which can be found in the String Quartet No. 4, 1928, Mov. IV, Bar 37, Viola.

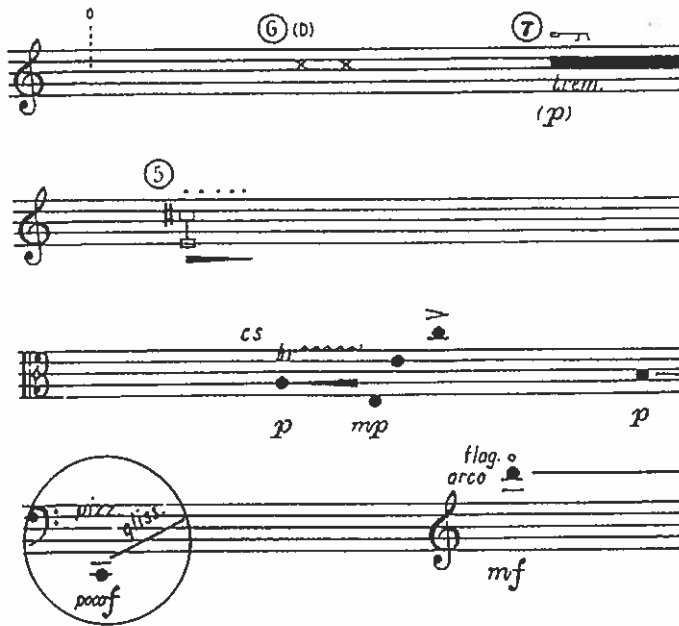
Example 174. Pizzicato Glissando
 From Definite to Approximate Pitch : Spatial Notation

Composer **String Quartet** Date **Symbol**
 Kopolent *Otto* 1960 


Explanation

Within spatial notation
gliss. & pizz. and rising straight
 line from defined note (C) to an
 approximate pitch:

Ex. p. 16, Cello



Example 175. Pizzicato Glissando
 Note-to-Appoggiatura : Definite Pitch

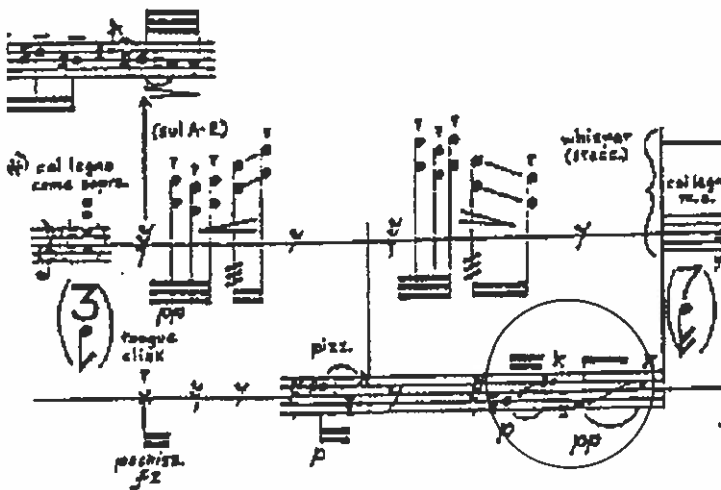
Composer **String Quartet** Date **Symbol**
 Crumb *Black Angels* 1970 

Explanation

Pizzicato Glissando ending in
 pitched *appog.*


The grace note shows that the
gliss. continues past the value
 of the beams and stops just
 short of the following beat

Ex. 2. Sounds of Bones and
 Flutes, p. 6, Cello



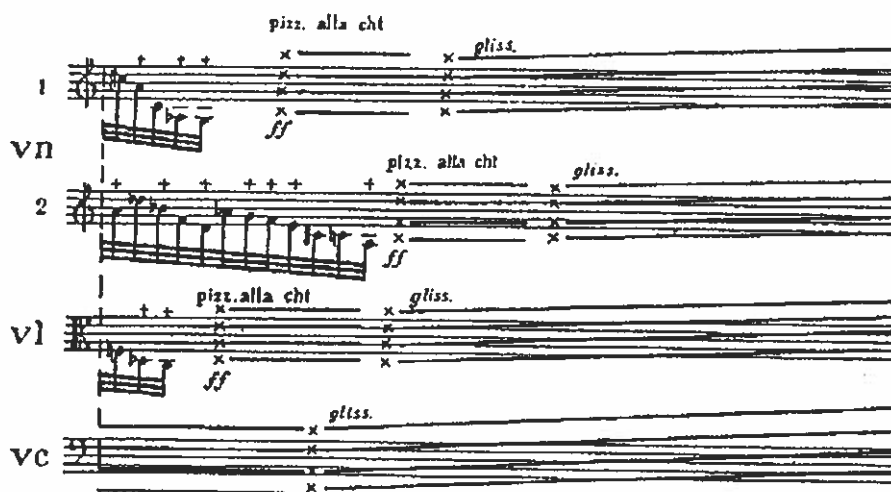
Note : The *glissando pizzicato* is used in one or other technique in most contemporary quartets

**Example 176. Pizzicato Glissando
alla chitarra :**

Composer	String Quartet	Date	Symbol
Penderecki	<i>Qtto per Archi</i>	1968	

Explanation

The *pizz. gliss.* in all the instruments is done over four strings. This is as stipulated : '*pizz alla cht*'³⁰⁶ : in the strumming manner as if playing across the strings of a guitar. There are two accompanying contemporary symbols:



1. The *gliss.* in the two lower instruments stops at the end of the bar at no specified point
2. Those of the two upper instruments continue across the barline to the next line.

This last point is indicated by the arrowheads found at the end of the line


Ex. p. 14, Lines 1 & 2

Note : The abbreviation '*cht.*' refers to the *chitarra* which is the Italian for guitar

³⁰⁶ Penderecki, in Score, *Quartetto per Archi*, p. 14.

Double Stops *Glissando* : Notes or Harmonics

Example 177. Double Stops *Glissandi*
Arrows Indicate Continuation to Next Line

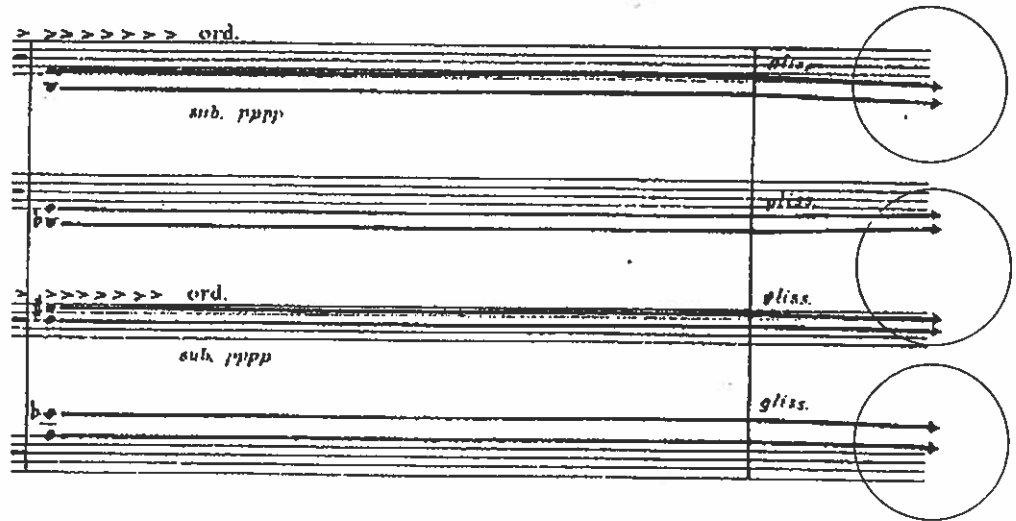
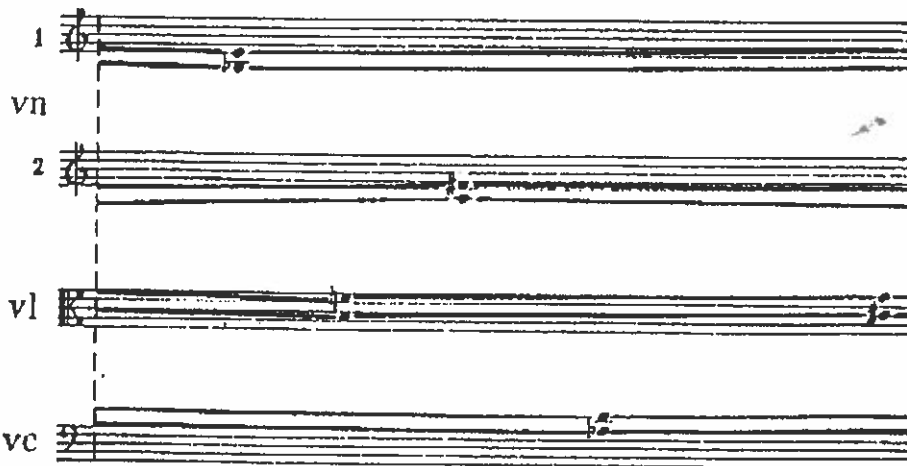
Composer	String Quartet	Date	Symbol
Penderecki	<i>Qtto per Archi</i>	1968	

Explanation

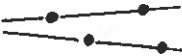
The arrows at the end of the beamed double-stopped *gliss.* indicate a continuation of the slide from one line to the next. The changes to definite pitches between the instruments is asynchronous

Ex. p. 7, Lines 2 & 3

all four instruments

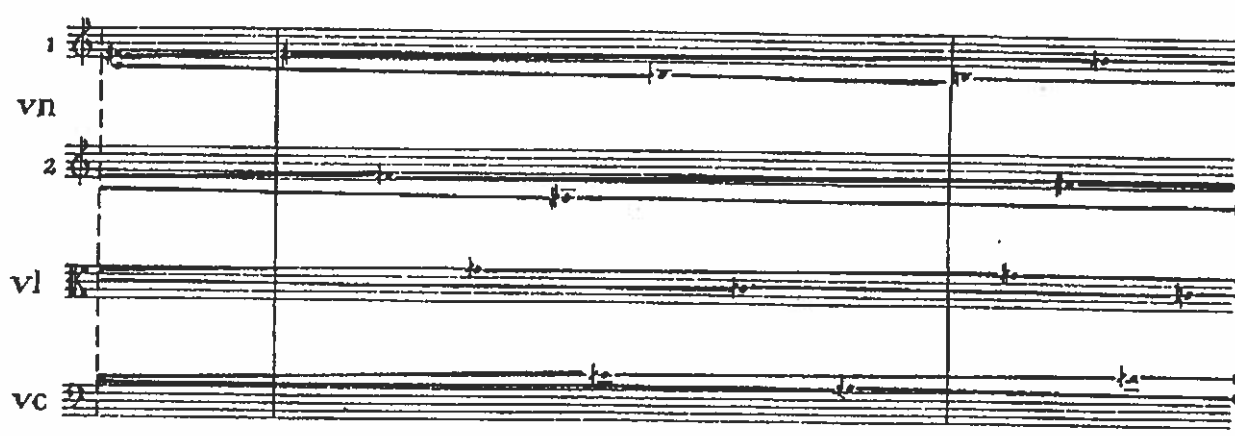



Example 178. Double Stops Glissando
Asynchronous Intervallic Microtonal Changes

Composer	String Quartet	Date	Symbol	Explanation
Penderecki	<i>Qtto per Archi</i>	1968		The pitch of the double-stops used independently, to and from definite micro-tones, creates a series of asynchronous vertical <i>glissandi</i> simultaneities

Ex. p. 8, Line 1

all four instruments



The musical score consists of four staves, labeled 1, vn, 2, vl, and vc from top to bottom. Each staff shows a double stop (two notes) that is glissandoed (indicated by a horizontal line with an arrow) across three measures. The glissando is asynchronous, meaning it occurs at different times for different instruments. The notation uses stems with dots and arrows to indicate the glissando movement.

Example 179. Double Stops *Glissando*

From Definite Pitches to Highest Indefinite Pitch: Beamed Notation :

Composer	String Quartet	Date	Symbol	Explanation
Penderecki	<i>Qtto per Archi</i>	1968		All the double-stops move from notes on the two lower strings of each instrument respectively, sliding up and ceasing asynchronously to the highest pitches as indicated by the double blackened arrowheads, at which point they continue in: ' <i>molto vibrato</i> .' ³⁰⁷

Ex. p. 16, Lines 3 & 4

All Instruments


This musical score shows four staves for string instruments. Each staff begins with a 'sul' marking: Violin I (sul G), Violin II (sul G), Viola (sul C), and Cello (sul D). The notation consists of beamed notes that slide upwards. At the end of each glissando, there is a circled double-headed arrowhead pointing to the right, indicating the final pitch of the glissando.

This musical score shows four staves for string instruments: Violin I (vI), Violin II (vII), Viola (vl), and Cello (vc). The notation shows beamed notes sliding upwards. The Cello staff has a 'glissa' marking. At the end of each glissando, there is a circled double-headed arrowhead pointing to the right, indicating the final pitch of the glissando.

³⁰⁷ Penderecki, in Score, *Quartetto per Archi*, p. 16.

Example 182. Double Stops *Glissando*

From Stopped Definite to Open-Ended *Glissando* : in Time Units

Composer	String Quartet	Date	Symbol	Explanation
Gielen	Stqt	1983		Each double <i>glissandi</i> starts on what appears to be definite pitches and ends indefinitely.

3 nicht synchron.

30" bis Einsatz II 4)

3) con sord
2"

2"

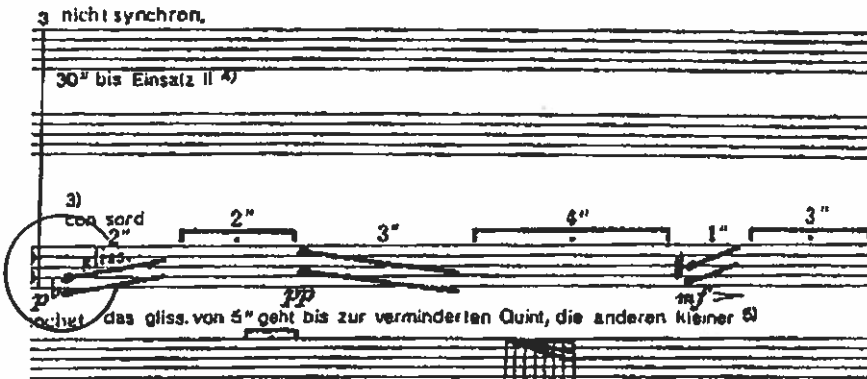
3"

4"

1"

3"

2) Acht das gliss. von 5" geht bis zur verminderten Quint, die anderen kleiner 6)



Attached to the separate slides are specific time units in seconds which alternate in longer and shorter pauses which, in turn, are also accompanied by specific time units.

Ex. bar 3, Viola

after which the *gliss.* move without being confined to bar structures.

Note: In the first of this five movement quartet, the *glissandi* described above last for the entire movement and are confined specifically to the two lower instruments which, according to the composer, are to:

'.... distribute their material freely and regularly for the duration of the entire movement (3 ½ '). The notation is approximate. The two players form a backdrop for the dialogue of the violins.' ³⁰⁸

Example 183. Double Stops Glissando

From Definite Pitch : Ending Open-Ended Rest : within Time Unit

Composer **String Quartet** Date **Symbol**
 Gielen *Stqtt* 1983



Explanation

The double *glissandi* in all four instruments start on definite pitches ending with rests signifying open approximate pitch-endings. They appear within a bar unit of one second (1") executed as : *arco ricochet ff*

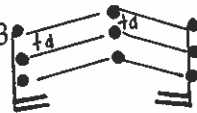
The *gliss.* entries are asynchronous
Ex. bars 401-402

Triple Stops Glissando

Example 184. Triple Stops Glissando

Quasi-Chromatic Quarter-Tones

Composer **String Quartet** Date **Symbol**
 Coeck *Graphismes* 1983



Explanation

The notation for the triple- stopped *glissandi* states : 'quasi-chromatiek per 1/4 toon.' executed : *presto*

Ex. Graphismes I, line 1, Cello

Note : Double-stopped *glissandi*, in one form or another, are regularly found in contemporary quartets.

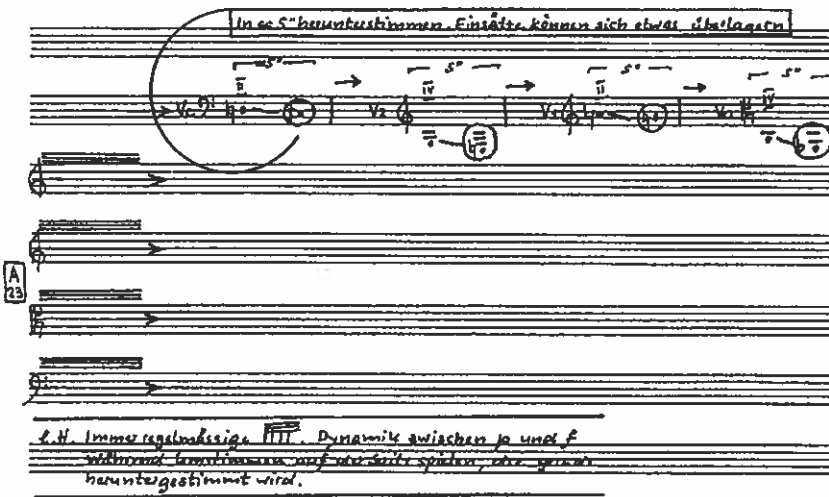
Glissando by Turning the Pegs

Example 185. *Glissando by Turning the Pegs*

Composer	String Quartet	Date	Symbol	Explanation
Holliger	<i>Stqutt</i>	1973		

Each instrumentalist is required to re-tune a selected string from the standard pitch down to a specific encircled note 'while the finger action continues without interruption'³⁰⁹, thus creating a *glissando* effect through the turning of the pegs in conjunction with a continuous finger action

Ex. p. 17, A 23



In *es* *herunterstimmen*. *Einzelne können sich etwas abheben*



*L.H. Immer regelmäßige III. Dynamik zwischen *p* und *f* während kontinuierlich auf der Seite spielen, aber genau heruntergestimmt wird.*

Note: Holliger uses this *glissando* effect more than once in this quartet.

Example 186. *Quasi Glissando or Scordatura Effect*
Turning the pegs against a 'Pedal Note'

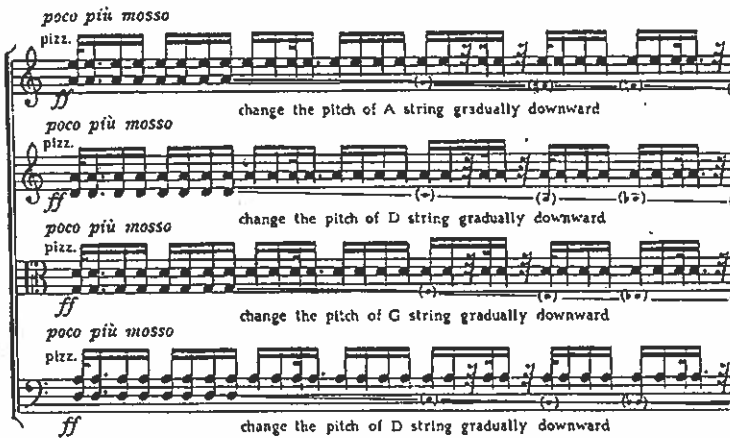
Composer	String Quartet	Date	Symbol
Mayuzumi	Prelude	1964	

Explanation

Each instrument retains an open stringed note, double-stopped against a lower string of gradually changing pitches within rhythmic groupings of successive semi-quavers () *pizz.* in all four instruments. This effect is achieved by constantly turning down the pegs - of a single specified string - in a series of *quasi glissandi* descending to approximately bracketed () semitones at the start of each rhythmic grouping. As the example on the left shows, a *glissandi* effect, accompanying the turning pegs, is suggested by the presence of straight lines joining the descending lower notes. Audibly, they present as a series of continuous sounds, but are technically not true *glissandi* due to the absence of finger slides. However, the continuous loosening of the strings creates discernible *glissandi* by virtue of the pitch sliding continuously from one note to another.

Ex. p. 10, line 1.


Note : The composer extends the intervals from the open string in each instrument by a 5th and returns them to their original pitches in the bars following, with the instruction : and upward in the same way. The question as to whether the technique described above constitutes a *quasi glissando* or a 'scordatura in action' lies in the dominant auditory effect that it creates. It emerges principally, perhaps, as the former, by virtue of the pitch sliding consistently from one note to another.

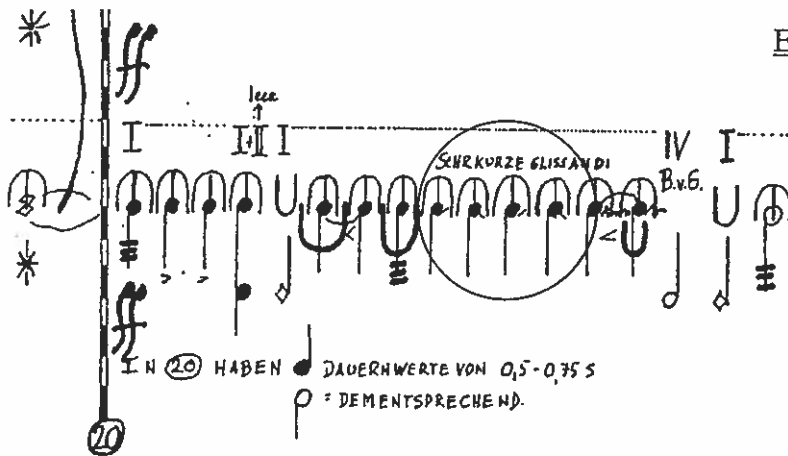


Use of Individual Symbols for *Glissandi* and/or Special Effects

Composers writing after The Second World War have paid much attention to *timbral* effects. *Glissandi*, incorporated extensions of the old sounds and symbols and developments of new, experimental effects and signs. These innovations are discussed in the following examples:

Example 187. Use of Individual Symbols for *Glissandi* Speed and Duration

Composer	String Quartet	Date	Symbol	Explanation
von Biel	<i>Qtt für Str.</i>	1965		(composer's explanation) The black note <i>Glissandi</i> played at the larger duration very close and fast ³¹⁰ <u>Ex. at 20, Violin I</u>




I N 20 HABEN DAUERWERTE VON 0,5 - 0,75 S
p = DEMENTSPRECHEND.

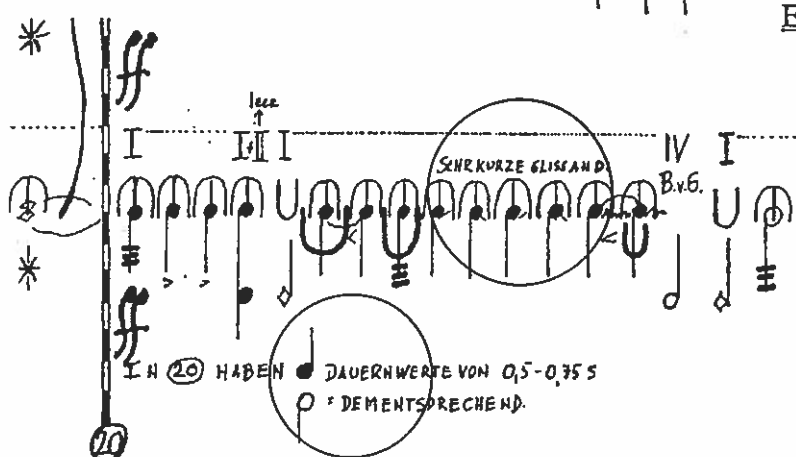
Note: von Biel makes a distinction between the durations of the various notes he uses throughout the composition by allotting each a duration between a given number of seconds. The single 'black' note (J), at this point in the composition, which includes the *glissando*, is required to be sustained for between 0,5 - 0,75s

³¹⁰ von Biel, in Score, *Qtt für Streicher*, 1965, Violin at 20.

Example 188. Use of Individual Symbols for *Glissandi*
Speed and Specific Duration

Composer	String Quartet	Date	Symbol	Explanation
von Biel	<i>Qtt für Str.</i>	1965		


Ex. p. 6, Violin 1



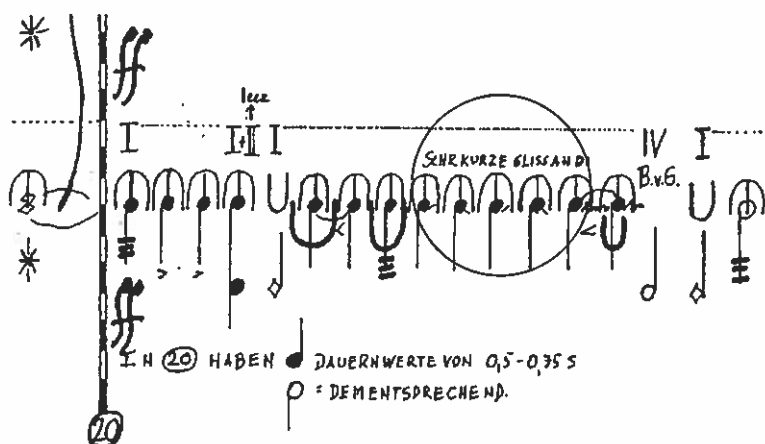
I H (20) HABEN DAUERWERTE VON 0,5-0,75 S
P = DEMENTSPRECHEND.

Note: von Biel 's general instruction for the duration of single black notes (♮) stipulates that they must be played for between 1.0 ± 0.25 s. duration. At this point in the composition, (at 20) there is a change, as these notes are required to be sustained for between 0,5 - 0,75s. This includes the *glissando*, which is notated as a 'black note'

Example 189. Use of Individual Symbols for *Glissandi*
Glissando Coupled with Time-Duration and Playing indications

Composer	String Quartet	Date	Symbol	Explanation
von Biel	<i>Qtt für Str.</i>	1965		

von Biel marks a series of very short *glissandi*(*sehrkurzeglissandi*)



I H (20) HABEN DAUERWERTE VON 0,5-0,75 S
P = DEMENTSPRECHEND.

The 'arches' have a particular description, indicating that the notes be played higher than the wide end of the fingerboard.³¹¹

Ex. p. 6, Violin 1

³¹¹ von Biel, *Qt. für Streicher*, 1965, *Erläuterungen*

Example 190. Use of Individual Symbols for *Glissandi***New Notation for Bow Position**

Composer String Quartet **Date** Symbol
 Cervetti *Zinctum* 1967 ☂

Explanation

This new sign ☂ is explained as - 'on the bridge'³¹² : it then follows that the addition of the upward extending line, after the sign, represents the following : a *glissando* which, presumably, starts on the 'A' string, due to its position on the staff and moves up to an indefinite pitch at a pre-specified bowing position - on the bridge - within a general time unit of

1" per bar |--1"--|

Ex. bars 62-63, Viola

The image shows a musical score for a string quartet, specifically focusing on the Viola part. The score consists of four staves: Violin I, Violin II, Viola, and Cello/Double Bass. The Viola staff features a circled glissando symbol (☂) with an upward-pointing stem, indicating a glissando starting on the 'A' string. Dynamics include *p*, *f*, *mf*, and *sf*. Bowing instructions like *c.l.b.* and *N* are present. The score is marked with bar numbers 61 and 62.


Note: The assumption that the *glissando* starts on the pitch of the open 'A' string is made for the reason that Cervetti uses exactly the same symbol (without the upward straight line) on the 'Abbreviations and Symbols' sheet, placing it in the top space of the treble clef with the instruction alongside :

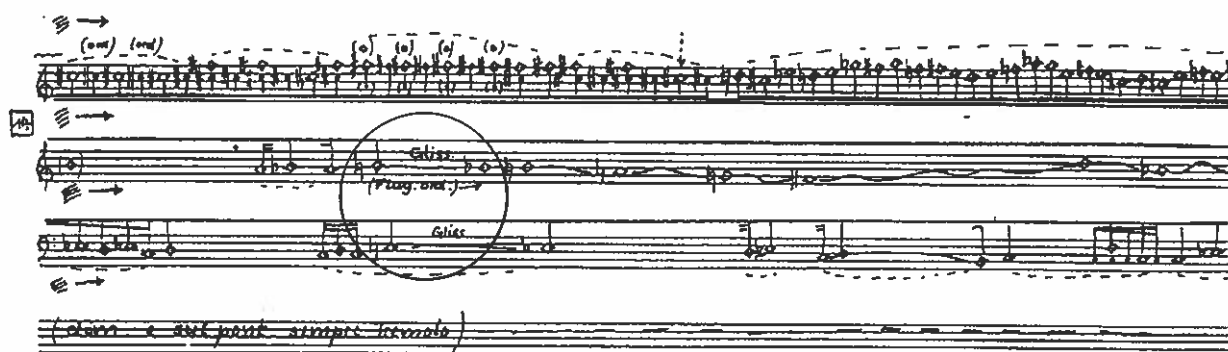
The image shows a single treble clef staff with a glissando symbol (☂) in the top space. Below the staff is the instruction: - dto. E-Saite - do. e-string

The quartet is spaced throughout with a time unit per bar of one second : |--1"----| and the notation is both spatial and beamed which frequently creates non-rhythmic, asymmetrical *glissandi*.

³¹² Cervetti, *Zinctum*, Abbreviations and Symbols

Example 191. Use of Individual Symbols for *Glissandi* Semi-harmonics

Composer	String Quartet	Date	Symbol	Explanation
Holliger	<i>Stqtt</i>	1973		At the outset, the composer makes a distinction between the amount of finger pressure applied to differently shaped and shaded notes. The not easily discernable half shaded diamond-shaped notes in this example, are : “semi-harmonic” and within the <i>glissandi/tremolo</i> are to be played with ‘finger pressure slightly less than normal.’ ³¹³ <u>Ex. p.10 at 14, Viola & Cello</u>



*sind alle beim Schlusstremolo angelangt
gibt V₁ das Zeichen [X]

³¹³ Holliger, *Sireichquartette*, 1973, Notes.

Example 192. Use of Individual Symbols for *Glissandi*
 Double stops *glissando* : Against Open Strings

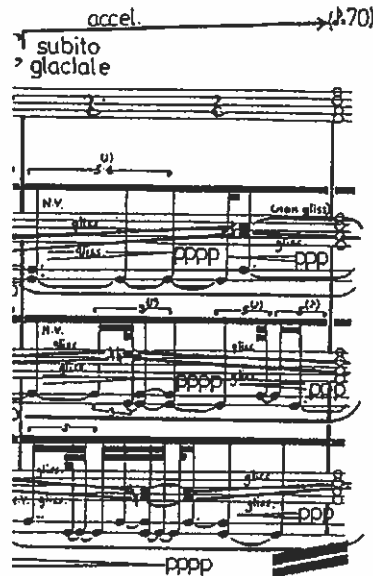
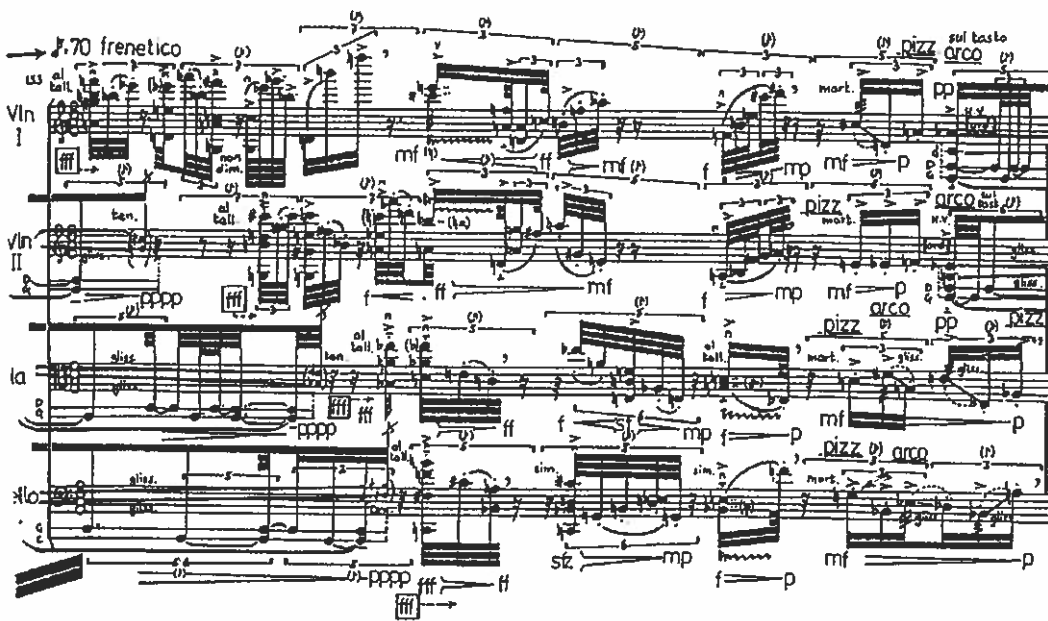
Composer	String Quartet	Date	Symbol
Ferneyhough	No. 2	1980	

Explanation

At first glance, the technique required to produce the *gliss.* as specified on : *sul D + G* in conjunction with the sounding of the open-string notes seems highly impossible. However, the composer's explanation clarifies the implementation when he states:

' - execute a continuous "*glissando*" between the pitches given in left hand whilst alternating in right hand between the strings as specified on the separate lines appended below the staff. The string(s) involved in each case are indicated by the appropriate letter.'³¹⁴


Ex. bars 152-4, Violins 1&2

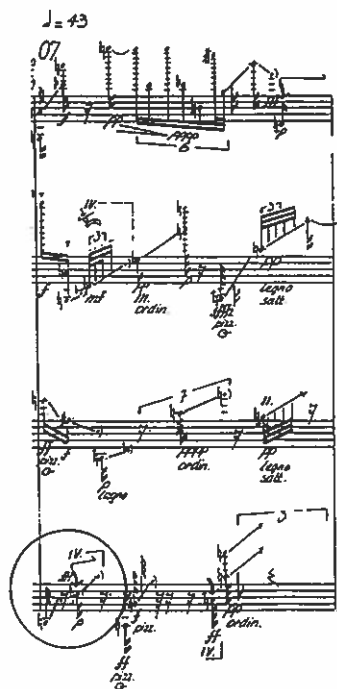



Note: Ferneyhough makes frequent use of the *gliss.* described above where, in the last bars of the quartet : 156-163 (of total 164), he uses it constantly in either one or all of the lower instruments. He, too, makes recurrent use of single *gliss.* against repeated open strings.

³¹⁴ Ferneyhough, String Quartet No. 2 1980, *Performance Notes*

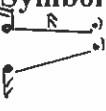
Example 193. Use of Individual Symbols for *Glissandi* Articulation Requirements

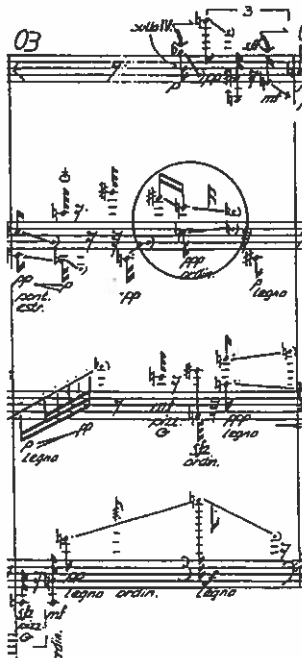
Composer	String Quartet	Date	Symbol	Explanation
Heyn	<i>Sirènes</i>	1983		This <i>gliss.</i> starts with a specific symbol which requires that the : 'left-hand fingertips (or two fingers combined) strike down vertically on string in a percussive manner.' ³¹⁵



Ex. bar 107, Cello

Example 194. Use of Individual Symbols for *Glissandi* Tone Colouration

Composer	String Quartet	Date	Symbol	Explanation
Heyn	<i>Sirènes</i>	1983		Although the <i>gliss.</i> appear to be simple note-to-(small)-note slides, they, nevertheless, serve a special purpose in the context of the score as their : ' motions are played much softer (p-ppppp) than the rest of the musical text. They mostly serve the compositional purpose of tone colouration, in a way that they add to the musical diction in a veil-like, lucent layer of tone quality.' ³¹⁶



Ex. p.27, bar 103, All Instruments

Note: Heyn illustrates three different examples on the Notation page and makes extensive use of three types of *gliss.* in the second half of the quartet: bars 86 -179.

³¹⁵ Heyn *Sirènes*, Notation


³¹⁶ *Ibid.*, Notation

Example 195. Use of Individual Symbols for *Glissandi*
Glissando Half Col legno - Half Bow Hair

Composer **String Quartet** **Date** **Symbol**
 Heyn *Sirènes* 1983



Explanation

The new symbol () is used as a technique for the contoured *gliss.* played : ‘ simultaneously with wooden part (*legno*) and bow-hair (ord.),³¹⁷ moving through pitched quarter-tones


Ex. bars 9-10, Violins 1 & 2

Example 196. Use of Individual Symbols for *Glissandi*
Glissando Col legno Hair Behind Bridge

Composer **String Quartet** **Date** **Symbol**
 Heyn *Sirènes* 1983



Explanation



The new symbol () is used for the *gliss.* to be played with (hair behind bridge), *legno*.

Ex. bar 91, Cello

³¹⁷ Ibid., Notation

Example 197. Use of Individual Symbols for *Glissandi*

Glissando : Tremolo



Composer	String Quartet	Date	Symbol	Explanation
Brewaeyes	St. Qt.	1989		This symbol () followed by the word <i>gliss.</i> and a dotted line represents an ascending <i>tremolo gliss.</i> to and from definite pitches

Ex. bar 14, Viola



Example 198. Use of Individual Symbol for *Glissandi*

Glissando : Specific Bowing Technique

Composer	String Quartet	Date	Symbol	Explanation
Brewaeyes	St. Qt.	1989		The thick wavy line incorporating the <i>gliss.</i> depicts the following : 

Pressed drawing of the bow so that a dry rattling of the string is heard (never a scratchy sound!). The bow is drawn [drawn] across the end of the fingerboard, thus away from the bridge.³¹⁸

Ex. bars 4-5, Viola



Note: Brewaeyes makes frequent use of this particular *glissando*

³¹⁸ Brewaeyes *String Quartet*, Remarks For Performance

Example 199. Use of Individual Instruction for *Glissandi**Pizzicato Glissando* : New Technique

Composer	String Quartet	Date	Symbol	Explanation
Brewaeys	St. Qt.	1989	words	The descending <i>gliss.</i> passes through an approximate pitch within a rhythmic grouping of two notes, to be executed as follows : ' scratch with nail on string '

Ex. Mov. II, bar. 113, Cello**Composite *Glissandi***

Many of the *glissandi* used in contemporary quartets are composite by definition, containing extensive additional requirements with no one stipulation taking precedence over the other. The combinations are, in fact, limitless and 20th century quartets display a remarkable array of mixed instructions. For this reason many do not effectively fit into any particular subdivision and are best placed under separate headings, each with their own particular requirements.

In George Crumb's Black Angels, for Electric for String Quartet (1970), to achieve the desired composite effect, for example, the *glissandi* are formed from a series of separate requirements and, in each case, form the principal part of the execution, as in the following example taken from the first of : Thirteen Images From the Dark Land : 1. Departure : Threnody 1 : Night of the Electric Insects:

Composite Glissandi

Example 200. Composite Glissandi

Composer	String Quartet	Date	Symbol	Explanation
Crumb	Black Angels	1970		<i>sempre sul pont. e glissando</i> <u>Ex. p. 3, line 1.</u>

Vibrant, intense! $\text{♩} = 60$
sempre sul pont. e glissando

Electric Violin I
Electric Violin II
Electric Viola
Electric Cello

7 3

Example 201. Composite Glissandi

Artificial Harmonic Glissandi : non-Rhythmic Tremolos
Series Definite Pitches : Dynamics : Time Unit : Spatial Notation

Composer	String Quartet	Date	Symbol	Explanation
Cervetti	Zinctum	1967		Artificial harmonics to and from a series of definite pitches accompanied by non-rhythmic tremolos with specific bowing instructions :

N. sp.

mp *f*

f > p *p* *f*

95 *N*

sf > p *f*

pp *f*

Artificial harmonics to and from a series of definite pitches accompanied by non-rhythmic tremolos with specific bowing instructions :

N. sp. = *natural sul ponticello*
Z = non-rhythmic tremolos
and dynamics *mp cresc. f*
time unit of $\lfloor _1 \rfloor$ per bar
spatial notation :

Ex. bars 96-99, Violin 1

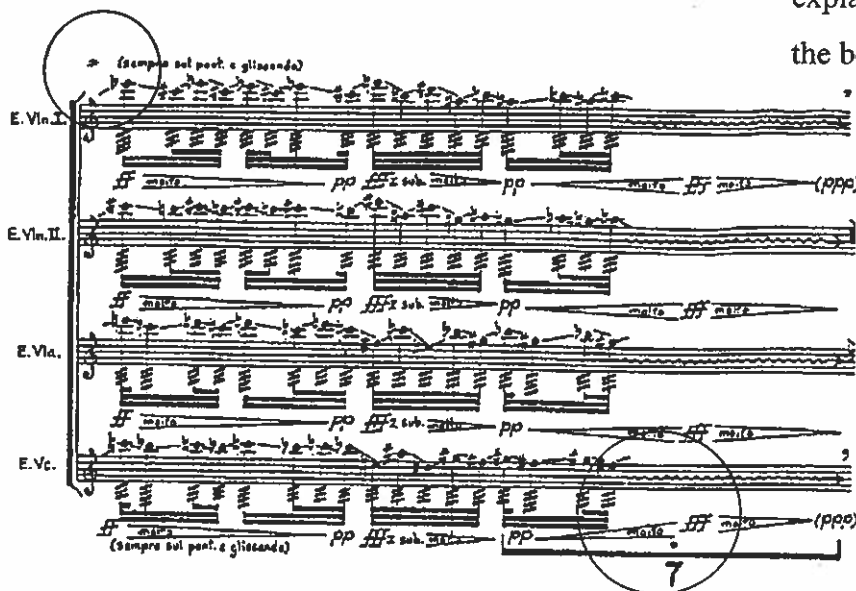
Example 202. Composite Glissandi

Controlled Tremolos : Repeated : Time Unit : Dynamics : New Symbol

Composer String Quartet Date Symbol Explanation

Crumb Black Angels 1970 

The multiple instructions are self explanatory. Specific requirements at the bottom of page state :



*) Make a continuous *glissando*, without dwelling on given pitches. The *tremolo* should be extremely rapid.

and

**) The numbers under the brackets indicate duration in seconds.³¹⁹

Ex. 1. Threnody, p.4, line 1:

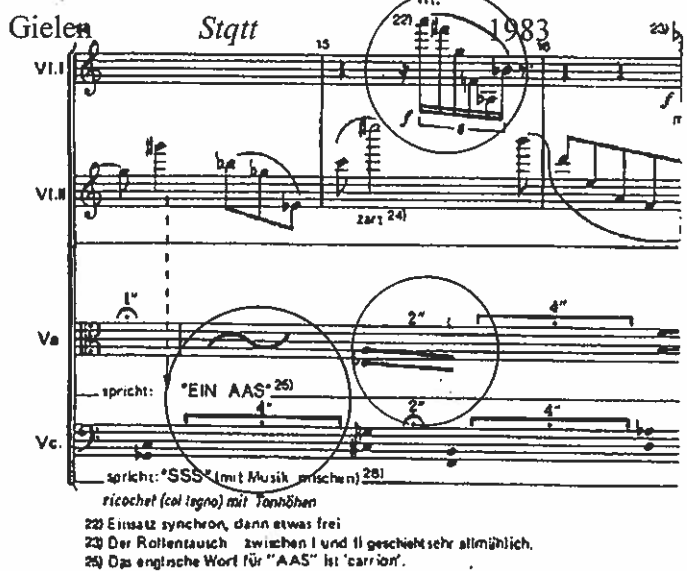
all instruments

Note: New notation is in the form of wavy lines ending in arrows, coupled with a bracketed time unit of 7 seconds placed under the staff to indicate the duration of repeated notes, within a *tempo* marking ($\text{♩} = 60$). Contrary to the specific pitches of the *glissandi*, Crumb's special requirement, without dwelling on given pitches, negates this implication resulting in a series of indefinite pitch relationships.

Example 203. Composite Glissandi

With Spoken Words : Selection of Requirements

Composer String Quartet Date Symbol Explanation



spricht: "EIN AAS" 25)

spricht: "SSS" (mit Musik mischen) 23)

ricochet (col legno) mit Tonböhen

22) Einsatz synchron, dann etwas frei

23) Der Rollentausch zwischen I und II geschieht sehr allmählich.

24) Das englische Wort für "AAS" ist 'carrion'.

Explanation

The *glissandi* are accompanied by a series of instructions. Apart from the obvious time units attached to them and the pauses, the numbers 22 : 25 : (23 is not related to the *gliss.*) - transcribed from the German - represent the instructions as follows :

22) enter synchronised, then somewhat *ad lib*
25) spoken "EIN AAS". The English word for "AAS" is carrion.

³¹⁹ Crumb, score, Black Angels, p. 4.

The other sound in "sss" (*mit musik mischen*), and a further bowing requirement : *ricochet (col legno)*

Ex. p. 2, line 1, Viola & Cello

Final Comment

The *glissandi* of the 20th century are generally not used in isolation nor described as a simple movement as in previous periods. Contemporary usage carries with it aspects which involve variation of speed, specific and non-specific pitches, contoured and measured movements, various bowing strokes, *pizzicato*, the inclusion of dynamic and *tempo* variations as well as many newly defined techniques. *Glissandi* are used either individually or in a variety of combinations, with adaptations of, and extensions to, the traditional symbols or the addition of new signs to illustrate the contemporary approach for this centuries old technique.

Listed below are the various changes found in the string quartets under discussion, all of which contain either an aspect of notation that is new in the 20th century, or a novel use of symbols, often accompanied by instructions to effect the *glissandi*. The foregoing examples fit broadly into the following groupings :

- to and from definite pitch
- from a definite to an indefinite pitch
- from a definite to an indefinite pitch (in parenthesis)
- to and from indefinite or implied pitches
- in graphic line - curved or angular
- in or associated with *pizzicato*
- in conjunction with variable dynamics
- in conjunction with detailed rhythmic instructions
- in conjunction with detailed bowing instructions
- regulated by *tempo*
- placed within a general time unit of the composition as a whole
- placed within a specific time unit per bar
- placed within a specific time unit per duration of *glissando*
- combined either with measured or non-rhythmic *tremolos*
- combined with trills

- with composite instructions
- varying peg tension
- using new and specific notation

New *glissandi* effects and notation were used in the early quartets of the century where, for example, Bartók, in his String Quartet No. 3 (1927), Mov. 2, (between) Numbers 10-11 first used and notated double-stopped *glissandi* which, while descending from note-to-note, pass through a series of approximate, headless, pitches with rhythmic indications. Another Bartók innovation are *glissandi* beamed across barlines which are found in Quartet No. 4 (1928), but the technique, as such, does not play a dominant part in any of the six quartets. Many composers subsequently used the 'Bartók' headless *glissando* which is found particularly, and extensively in the three late quartets of (1989) - one each by the continentals Helmut Lachenmann, II *Streichquartett*, and Luc Brewaeys String Quartet and the third by the American Roger Reynolds, Coconino - A Shattered Landscape. Schoenberg also makes very brief use of *glissandi* which, in fact appear only twice in his four quartets, on both occasions in the String Quartet No. 4 (1939) - first as an ascending trill : Bar 261 : Violin1, and second : descending at Bar 409: in the three lower instruments. Webern's compositional interest, like Schoenberg's, lay within the development of the 12-tone series, which resulted in an absence of the use of *glissandi* as a *timbral* effect in his quartets. Hindemith, in his neo-Baroque quartets encompassing expanded tonality, fiercely energetic rhythms and dissonant harmonic language, found scant use for this device.

Decades later the Cervetti string quartet *Zinctum* (1967), Penderecki 's *Quartetto per Archi* (1972), George Crumb's *Black Angels* (1970), Ferneyhough's later second quartet of 1980 , as well as Volker Heyn's *Sirènes für Streichquartett* (1983) all demonstrate that after 1966 the 20th century approach to *glissandi* finally emerged with an explosion of new and extended techniques in almost unlimited combinations that encapsulate the contemporary approach to texture, *timbre* and notation. In these quartets in particular, but also in other quartets, *glissandi* effects are found that expand the technique far beyond the limited use of previous centuries. The contemporary use of *glissandi* is practised within traditional, spatial and beamed notation and also within established conventions such as 'pedal points', sustained notes and intervallic extension. The latter grouping, particularly, reflects an approach that extends tradition rather than demonstrating novelty. The unlimited variety of new symbols and individually assembled combinations demonstrate the composers' search for innovative sonority and individuality of style which has developed the simple *glissando* into a significant technique in the 20th century.

The expressive *portamenti*, although used in early 20th century chamber works, have become less prominent in the quartets of the second half of the century and do not play a significant role within the context of innovative sounds or notation.

Scordatura

Definition and Application

The term *scordatura* comes from the Italian '*scordare*', to 'mis-tune', and was used in contrast to '*accordatura*' - 'tuning'. The concept of mis-tuning was first used early in the 16th century and applied more specifically to lute music of the late Renaissance and early Baroque, where the strings were tuned to various pitches to suit the key of the music, resulting in virtually no 'normal' tuning. Consequently, in this period, it is difficult to consider any tuning for this instrument to be a *scordatura*.³²⁰ The same was true of the *Viola d'Amore* which, in Leopold Mozart's time, 'unfortunately suffer[ed] frequently from mis-tuning'³²¹ - his way of saying it had many different tunings. *Scordatura* in stringed instruments was in vogue between 1600 and 1750 and used principally, for the violin, by Heinrich von Biber (1644-1704) where, in his most notable music for the instrument, the 16 Mystery Sonatas (c.1676), many different unconventional tunings were established. The Baroque composer, Antonio Vivaldi (1678-1741), used various tuning changes in five of his *violin* concerti which number amongst some 500 of his various compositions. J. S. Bach's 'mis-tuning' for the Fifth Suite for Solo Cello

(c. 1720) is shown at the outset and indicates that the top string be tuned to 'g' and not the standard 'a'. No alteration to note reading, nor adjustment to fingering is made as the notes are written at the sounding pitch of 'standard' tuning. Mozart continued this practise where, in the *Sinfonia Concertante* K. 364 (1779) for Violin and Viola, the viola strings were originally tuned a semi-tone higher to increase the soloist's brilliance in relation to the orchestral accompaniment, as well as to compete and compliment the sound of the violin.

Another advantage emanating from the use of abnormal tuning was the facilitating of difficult passages where, for example, in the Mozart *Concertante* the D Major finger patterns were easier to play than those of E \flat Major. Other advantages included extending the range, changing the tone colour by creating a brighter quality through higher tuning, the increased use of open strings and also the appearance of unusual chords and mixed sonorities. The Italian violinist Niccolò Paganini (1782-1840) took full advantage of this technique and in many compositions the various mis-tunings

³²⁰ Apel, *Harvard Dictionary*, p. 758.

³²¹ Mozart, L., *Violin Playing*, p. 12.

provided him with both the advantages of making certain passages easier to play or even at times, possible to play, as well as effectively adding brilliance. One of many examples occurs in the Variation on the G String from the Moses Fantasy for Violin and Orchestra Op. 24 (1818-1819), based on a theme from Rossini's biblical opera, *Mosè in Egitto* of the same year (1818), where the G string of the solo instrument is raised a 3rd higher resulting in the violin part being written in c Minor and the orchestral accompaniment in E \flat Major - with startlingly brilliant effects.

Interestingly, as early as 1752 Johann Joachim Quantz (1697-1773), German flautist, composer and theorist, considered *scordatura* to be obsolete, but there is ample evidence that it continued - although not necessarily in Germany. In Italy composers such as Pietro Castrucci (1689-1769)³²² - these dates are variable - Antonio Vivaldi (1678-1741), Giuseppe Tartini (1692-1770) and Pietro Nardini (1772-1793)³²³ amongst others, found ample use of tunings outside those of the standard pitches. In France, Michel Corrette (1709-1759) was the first to use it in his French violin pieces '*Pieces à cordes ravallées in L'école d'Orphée, 1738*'.³²⁴

In the 19th century *scordatura*, unlike the intense experimentation of the early 17th century, was mostly confined to a limited group of mis-tunings with either a transposition with all the strings tuned a semi-tone higher, or in an adjustment to the lowest string. Robert Schumann (1810-1856) in the *Andante Cantabile* movement of the Piano Quintet Op. 47, (1842), lowered the C string (cello) down to B \flat . Later Richard Wagner (1813-1883) used *scordatura* in extending the range of the double bass C string down to an E in two of his music dramas: *Das Rheingold* (1853-54), the first of a cycle of four dramas with the collective title *Der Ring des Nibelungen*, and later in *Tristan und Isolde* (1857-59). Johannes Brahms' (1833-1898) German Requiem (1868), for soprano and baritone solos, chorus and orchestra (with the Biblical passages of meditation and solace in German and not from the text of the Latin Requiem Mass) used the same pitch adjustment.

In the early decades of the 20th century Igor Stravinsky (1882-1971) had the highest string of the first violin tuned down a tone to (d) in the Firebird Suite (1909), enabling the *arpeggios* to be played in natural harmonics - all on the open string, in the key of D major.³²⁵ In a Bartók work, Contrasts for Violin, Clarinet and Piano (1938) a different example of *scordatura* is encountered, where in Movement III, (Sebes), *Allegro Vivace* (♩ = 140), the violinist initially uses two separate violins. The player commences the movement with an instrument tuned in tritones (between the two lower

³²² Rieman, Dictionary

³²³ Grove, 5th edition, *Scordatura*, p. 59.

³²⁴ *Ibid.*, p. 58.

³²⁵ *Ibid.*, p. 57.

and two upper strings : g# - d' - a' - eb"), and then plays the other instrument - tuned normally - for the bulk of the movement . This work was commissioned by the American clarinetist Benny Goodman (1909-1986), and first performed with only the outer movements by violinist Joseph Szigeti, Benny Goodman and pianist Endre Petri in New York (1939).

As previously mentioned, one problem of *scordatura* is correctly interpreting the notation if, for example, the composer writes the actual pitch leaving the players, generally unaccustomed to associating different notes with normal fingering, to work out the new fingering. This difficulty is compounded by different pitches and irregular sounding intervallic relationships resulting from the *scordatura*. Bartók's contemporary, the Hungarian Zoltan Kodály (1882-1967) composed his early Sonata, Op. 8 for unaccompanied cello (1915), where the C and G strings, respectively, are tuned down a semitone, resulting in a constant interval of a 5th being maintained between the lower strings, but with a change in the quality of sound by reason of the extended the range. In 1940, the score of an 18th century string 'quartet' consisting of 3 violins and cello by an American statesman, scientist and writer Benjamin Franklin (1706-1790) was discovered in the Library of the Paris Conservatoire. The quartet, for 3 violins and cello, consisted only of open strings tuned in *scordatura*.

The advantages of *scordatura* are offset by certain disadvantages : lessening the compass if the range is decreased ; the possibility of new finger positions for each set of adjusted tunings ; reduction in the distinctive quality of the instrument ; string thickness often not conducive to re-adjusted tensions and finally, stress areas could develop in an instrument through higher tuning .

Scordatura in String Quartets of 20th Century

The following examples demonstrate the different use of *Scordatura*. Only the composer's instructions are given - generally without an extract from the score - as the technique is applied throughout the composition.

The first example of *scordatura* in the quartets under discussion is found in John Cage's String Quartet in Four Parts (1949-50). The retuning is indicated at the beginning of the score with the instruction :

Example 204. Scordatura

Cello Strings D and G down a Semi-Tone for Duration of Score

Composer	String Quartet	Date	Explanation
Cage	St. Qt.	1949-50	<p>Composer's notes:</p> <p>(FOR THE 'CELLO (STRINGS II + III TRANSPOSING))</p> <p>SCORE NOT TRANSPOSED.</p> <p>(EDITED BY CLAUSE ADAM)³²⁶</p> <p>and with the editing of the score the note reading requires no adjustment</p> <p>Ex. from score : each of the two inner strings are tuned a semi-tone down :</p> <p>from D and G</p> <p style="text-align: center;">↓ ↓</p> <p style="text-align: center;">D\flat G\flat</p>

Score example unnecessary

³²⁶ Cage, Preface to Score

Example 205. Scordatura

Second Violin and Cello down a Semi-Tone for One Minute

Composer	String Quartet	Date	Explanation
Brown	St. Qt.	1970	In the preface under Specific Notations, the composers states : 'The very first sound is a very quiet cluster (2nd vln. and cello must tune their strings down a half tone) After a total time of approximately 1 minute, the cluster chord ceases, the lowered strings are re- tuned to normal pitch during the rest of the first line of the score' ³²⁷ Sections 1 and 2 last approximately 20" and 40" respectively in <i>scordatura</i> where after, as shown in the score, both the Violin 2 and Cello at Section 3 :

'slowly retune to D [and] C'³²⁸Ex. Sections 1,2 & part 3

The musical score is divided into three sections:

- Section 1 (20"): NAT. A string ppp → mp**
- Section 2 (40"): NAT. string ppp → mp**
- Section 3: NAT. string ppp → mp**

Performance instructions in Section 3 include:

- PLAY PHRASE TWICE. B.B. PIZZ.
- PLAY PHRASE TWICE. B.B. PIZZ.
- PLAY PHRASE TWICE. B.B. PIZZ.
- PLAY PHRASE TWICE. V. LIGHT INARTICULATE POINT.

Dynamic markings and performance notes include: pp, mp, (slowly retune to D), (slowly retune to C), and various 'ends here' markers.

³²⁷ Brown, *Notes of score*³²⁸ *Ibid.*,

Example 206. Scordatura

Assortment of Tunings for all Instruments for Duration of Score

Composer	String Quartet	Date	Explanation
Lachenmann	<i>Gran Torso</i>	1971-78	<p>The instruments are tuned as follows resulting in an assortment of intervals for each instrument, from the lowest to the highest respectively:</p> <p>Violin I : g - d - g - e_b perfect 5th & 4th : minor 6th</p> <p>Violin II : a - d - a - e_b perfect 4th & 5th : minor 5th</p> <p>Viola & Cello : a_b - g - d_b - a major 7th : dim. 5th : aug. 5th</p> <p>The composer makes it clear that</p> <p>'The pitches in the score do not indicate the audible result but the tones to be stopped on the indicated string; this does not apply to the pitch indications added in parentheses at natural harmonic stops, which indicate the actual resulting sound.'³²⁹</p>

Score example unnecessary

Example 207. Scordatura

Assortment of Tunings for all Instruments for Duration of Score

Composer	String Quartet	Date	Explanation
Lachenmann	<i>II Stqtt</i>	1989	<p>Lachenmann in his II. <i>Streighquartett</i> ('Reigen seliger Geister') 1989 uses two different types of <i>scordatura</i> :</p> <ol style="list-style-type: none"> 1. Traditional re-tuning 2. 'Wild <i>Scordatura</i>' <p>The first shows the tuning intervals of each instrument under the heading : 'Scordatura at the Beginning of the piece,'³³⁰ and requires the adjustments to the strings from lowest to highest as example :</p>

³²⁹ Lachenmann, *Gran Torso*, *Notation and Performing Techniques*³³⁰ Lachenmann, *II Streighquartett*, *Hints on Notation and Performance*, p. 1.

Score example unnecessary

Violin I : $g\flat - d\flat - a\flat - e\flat$

Violin II : $f - c - g - d$

Viola : $c - g - d - a$

Cello : $b - g\flat - d\flat - a\flat$

Note: The Violin I and Cello strings are tuned down a semi-tone which alters the colour but not the relative pitch between the two instruments. The second violin is lowered by a whole tone in each respective string while the viola strings retain standard pitch. The important aspect is that :

The noted music is transposed. The resultant sounding pitch is found in the part underlying the score.³³¹

Example 208. *Scordatura*

'Wild *Scordatura*' by Temporary Tuning of Pegs

Composer	String Quartet	Date	Explanation
Lachenmann	<i>II Stqtt</i>	1989	The second is named "wild <i>scordatura</i> " where in the following three bar rests the strings of each instrument must be tuned down as follows :
			Bar 317 : all four strings Violins I : II
			Bar 320 : all four strings Viola
			Bar 323 : I-III Cello

Bar 323 : I-III Cello

'This is done by turning all four pegs (use/turn the wrist only once - at own discretion). The resultant tuning of strings is therefore no longer controlled.'³³²

Ex. bar 321, Viola

Note: The tuning and resultant intervallic differentiation between each neighbouring string is not controlled through the deliberate variation of the peg movements containing '....as far as possible no intervals of a 5th.'³³³ Further and importantly Lachenmann issues the following warning:

³³¹ Lachenmann, *II Streichquartett*, *Hints on Notation and Performance*, p. 1.

³³² *Ibid.*, p. 2.

³³³ *Ibid.*, p. 2.

'The clefs in angular brackets indicate that the positioning of fingers is indeed fixed, but the sounding result of the pitches is not predetermined. Each written position of fingering must be carefully observed, because the composer controls/checks the interrelation of the positions of fingers to each other and to the basic vibrations of each noted string.'³³⁴

COMMENT

Generally *Scordatura* is used sparingly in the quartets under discussion and is only found in the following scores: -

Cage	String Quartet in Four Parts	1949
Brown	String Quartet	1970
Lachenmann	<i>Gran Torso Musik für Streichquartett</i>	1971-6-8
Lachenmann	<i>II Streichquartett</i>	1989

The changes and durations are as follows :

Composer	Instrument/s	String/s Changes	How Much	Duration
Cage	Cello	D + G D _b + G _b	1/2 tone down	Throughout
Brown	Violin 2/Cello	All strings	1/2 tone down	One minute
Lachenmann <i>Gran Torso</i>	Violin I	g - d - a - e g - d - g - e _b	one tone 1/2 tone down respectively	Throughout
	Violin II	g - d - a - e a - d - a - e _b	one tone 1/2 tone down respectively	Throughout
	Viola & Cello	c - g - d - a a _b - g - d _b - a	interval 3rd 1/2 tone down respectively	Throughout

³³⁴ *Ibid.*, p. 2.

Lachenmann II <i>Stqtt</i>	Violin I :	g - d - a - e ↓ ↓ ↓ ↓ g \flat - d \flat - a \flat - e \flat	1/2 tone down	Bars 1-317
	Violin II	g - d - a - e ↓ ↓ ↓ ↓ f - c - g - d	one tone down	Bars 1-317
	Viola	c - g - d - a	no alteration	Bars 1-320
	Cello	c - g - d - a ↓ ↓ ↓ ↓ b - g \flat - d \flat - a \flat ↓ b \flat at bar 204	1/2 tone down changing to 1/2 tone down	Bars 1-323 Bars 1-323 Bar 204

After bar 323 *scordatura* of indeterminate pitch - 'wild *scordatura*' - occurs in all four instruments until the end of the quartet at bar 418.

Conclusions may be drawn as follows:-

- no consistent pattern occurs in the alteration of either instruments or strings
- *scordatura* varies in each composition as does the duration for which the *scordatura* is sustained
- the common factor is that the string adjustments are down, in most cases by a semi-tone, with the occasional tone and with a single larger interval of a (3rd)
- the *scordatura* are listed in the performing notes prior to the start of all the scores and any further instructions are notated when required within each movement
- generally, the retunings are controlled except in the second of Lachenmann's quartets where the strings are slackened to an indeterminate arrangement of pitches
- transposition occurs in the Cage and Brown quartets, while in the Lachenmann I the pitches and notes do not correlate ; Lachenmann II , is part transposed with the resultant pitches on the stave below
- indeterminate pitches are due to 'wild *scordatura*' - Lachenmann II , second half

In the second half of the 20th century the advantages and effects gained from the use of *scordatura* are vastly dissimilar to those in previous periods of music. Many of the former objectives founded in the discipline of tonality are irrelevant to post-war compositions. In contemporary use, the emerging emphasis is on an array of individual sonorities and *timbral* effects, accomplished by a variety of new and contrasting techniques that have no boundaries in either pitch or style, resulting in the old concept of *scordatura* losing one of its distinctive aims, that of facilitating technique.