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Hanns-Werner Heister

Music and Fuzzy Logic

The Dialectics of Idea and Realizations
in the Artwork Process

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To Inge Rubbert

Preface: Subject, Themes and Aims

With this book I pursue a twofold objective. On the one hand, it is about appropriating fuzzy logic even more intensively for the science of music and to make it as broadly as differentiatedly usable there: for the analysis of musical works and facts, for the expansion and specification of thinking about music and thinking in music. On the other hand, it is a concern to prepare the broad field of music, at least to a certain extent, in such a way that music becomes accessible for research from the side of fuzzy logic up to its practical application in an easier, more intensive, more detailed and more differentiated way. The book goes back to studies about fuzzy logic and music, which I started in 2009 mainly due to suggestions by Rudolf Seising (See Heister 2012).

Double Approach, Hybrid Perspective

In this book I deal with numerous further aspects, which go beyond of what I have already researched and published in this context. This includes as well such aspects, that have so far not received enough attention, by research, which takes Fuzzy Logic as a starting point. For here we extend the scope of research beyond the elementary, like acoustics (in the context of space and on perception), or systems of pitch or rhythm, of elementary problems of musical tuning systems, but also beyond, what in the realm of Fuzzy Logic so far has likewise been dealt with, like the complex matters of timbre simulation and styles of interpretation, of procedures for storage and automatic finding, and many more.

Complexity and Priority of Qualitative Questioning

Due to my disciplinary competence I generate primarily *qualitative* reflections. Starting from music and different arts, they are elaborated in this perspective. From now on, it has to be taken into account to analyze such qualitative facts, as far as

possible, or as useful, with Fuzzy Logic' *quantitative*-mathematics, as it has already and in varied ways been undertaken. Thus we may achieve further and more far-reaching specifications, for instance, about problems of motivic-thematic affinities as special cases of similarities. By so to say hand-made music analysis, such similarities may be hardly, rarely and in some points even in principle never be reached.

In such cases reflected formalizing, mathematical logic, and modeling, on the basis of computerizing, just in the realm of "Soft Computing", offer plenty, new, and surely at the moment not fully foreseeable potentials of research (and practically applicable too). In the meantime, the series *Studies in Fuzziness and Soft Computing* has already published an array of relevant themes. Their main topics, such as storage and recall at databases, and similar, connected or related task areas. Automated recognition of patterns is probably one of its core areas.

Mutual Benefit for Science of Music and Fuzzy Logic: Tunnel Digging from Two Different Sides

On the other hand, experts of Fuzzy Logic may be provided by this book, depending on how far as they embark on it, with a deeper comprehension about what music means. While I have rather too little to tell, or hardly anything new and of actual relevance, about *direct practical* application of Fuzzy Logic and about practicing Soft Computing, I can tell surely a lot about music and its connections with Fuzzy Logic. I am concerned with the ontological, gnoseological, psychological, and (music-) aesthetical status and the relative importance of different phenomena of relationship between music and Fuzzy Logic.

This seems to be a journey full of risks: For specialists of music, this book contains too much of what is well-known in their department, while on the other side, specialists of Fuzzy Logic are commonly familiar with its content. Nevertheless, from a double access, a cross-wise, for not to say "hybrid" perspective, the combination of music analysis and fuzzy logical modes of thinking, might reveal plenty of new aspects in both directions. I took the risk of loosing the ground and falling into the abyss, but followed the path with my eyes wide-opened. But to travel on trodden routes only is unproductive. Without the risk of going astray, there will be no scientific progress. By the way, to make it clear, once and for all. What is presented in this book, remains always under the proviso "Under the actual state of affairs ..."—This refers to research in general, and I concede, that naturally my knowledge about it remains rudimentarily, but also refers to my own researches, even if they only mark attempts, but nevertheless, they are new. Therefore, the theory, based on empirical knowledge, as it is hereafter unfolded, contains hypothetical components. It can be enlarged, reduced, and partially rejected.

As it is unavoidable, I am dealing with matters, that concern various scientific disciplines. As far as possible, I challenge questions of a truly interdisciplinary dialogue, which surpasses declarations and lyrical applications for research grants. It

should not be a conversation among deaf persons. And instead of being competitive, it has to be handled in a productive and cooperative way. As I had to acquire, as much as possible, concepts, presentations, questions, and results of Fuzzy Logic, conversely one should expect, that those, who are scientifically as well as practically engaged in various areas of Fuzzy Logic and its application on music, get involved with questions of music - at least, as far as they are dealing with music from the perspective of Fuzzy Logic. Facing the vast expertise of Fuzzy Logic's researchers in information science and mathematics, as well as in related scientific disciplines, I hold full respect, with all due modesty. But if someone takes 'science' only as something in combination with the utmost in mathematical formulas and logical formalizations, then such a person will be disappointed. Anyway, he or she must not continue to read. On the other hand, I cannot totally do without musical examples. Even if someone is unable to read the lines, they bear as an approach of understanding an aesthetical and sensual quality of charming, totally in the sense of Fuzzy Logic. Taken as a picture without any understanding of what is written, it somehow exposes the intended sound and purpose.

A work partly from the science of music, like this one, and partly from Fuzzy Logic, respectively, from soft computing, may be taken in such a way: We dig a tunnel from various directions. Whether we meet exactly in the middle, is however not quite sure. In case, that this may not be completely achieved, and if there were blurs, nevertheless yet undetected states of affairs will be laid bare, which were until now hidden in the darkness of ignorance. Thereby, for both sides the interests and tasks might get clearer, and it could further the studies with or about music and Fuzzy Logic.

About the Structure of This Book

The introduction gives an explanation for a number of important categories and terminologies in relation to Fuzzy Logic, focusing on their relevance to matters of music. Thereupon, correlatively and complementarily, basic categories of the musical process are outlined in the light of Fuzzy Logic. This encompasses its absorption in the individual's memory, or in external storage and forms of reflection like texts or pictures from the concept and first ideas to the different forms of storing. During this kind of process, a musical work of art is the centering focus for at least thirteen different forms of existence, with which I analyze in detail the manifold occurrences of fuzziness in the music process and thus reveal further questions for the field of fuzzy logic.

The Notion of ‘(Art)work’: A structural, Genre-Comprehensive Concept, Not a Concept of Assessment

‘Work’ is not considered as a concept of assessment, but as a structural one. The characteristics of a ‘work’ are not confined to ‘classical’ music, contrary to common prejudices held by enthusiasts of either ‘Pop’ or ‘Classics’. Here, it is meant in the sense of being free of any value judgement, just a specific aesthetic representation, taken in its concreteness and objecthood: a ‘piece’ of music with more or less complex qualities of character, being limited in space in its temporal and in concrete realization. In principle, such an objecthood is likewise valuable for popular music, or even for improvised, relatively completed productions, being ‘pieces’, or works.

On the other hand, there is no reason to dismiss the concept of work altogether, as it became a trend in modernity and post-modernity. If firmly outlined characters are missing during processes of art or actions, like in the case of a ‘Happening’, then the action, as a whole, stands for the ‘Work’. No matter how much it is emphasized by the ideology of the ‘Open Form’ or similar concepts: Actually, even such actions may be reproduced, for example, by filming. Since the 1980s, this is done by ‘Performance’, which indeed is nothing but performance, only that most of the time there is nothing to be performed. Although in a regularly screened video-reproduction it becomes a work. As will be further explained below (see 2.), the work as a whole appears in and through its different forms of existence as a ‘processing identity’; as a whole, that, in the end, may never be absolutely completed.

The main part of this book treats the four principles and five manifestations or phenotypes of Fuzzy Logic in musical process. The pivot rests basically in the dialectic, which is multi-dimensional, multi-layered, involved (encapsulated) and folded in its fuzziness and sharpening along with blurring, for intentionally compositional-artistic utilization of fuzziness in its different facets of art.

Towards a ‘Philosophy of Fuzzy Logic’

A brief and final part recapitulates and outlines some further perspectives of future research, above all, interdisciplinary, especially for the realm of theories of art. Apart from that, I am generally tempted to draw some consequences from Fuzzy Logic’s way of thinking for the world view in general, and specifically in a musically-artistic context. Seen from this angle, some reflections about analogies and isomorphies are even for those productive, who are hardly interested in music. May be, this book has in a direct way only little to contribute to the methods of Fuzzy Logic, but probably

for its meta-theory. Anyway, the book offers a small contribution in this direction. Bluntly, it might even be labeled as being a piece of ‘Philosophy of Fuzzy Logic’.

Rosengarten, Germany
September 2020

Hanns-Werner Heister

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Contents

1	Introduction: Fuzzy Logic’s Four Art-Related Principles and Five Phenotypes in the Musical Process	1
1.1	Realization, ‘Appropriation’. Craftsmanship and Engineering as a Bridge Between Fuzzy Logic and Music	2
1.2	Logic of Difference and Identity. The Internal and External Interdisciplinary Subjects of Fuzzy Logic	3
1.2.1	Sources and Elements of Fuzzy Logic as Interdisciplinary Synthesis	4
1.2.2	Heuristics. Exploring the Uncertain	9
1.2.3	Realistic Limits of Absolute Precision	10
1.2.4	“Precise Fuzziness”	11
1.2.5	Ideology, Illusions, Realities. Vulgar Mathematics and Fuzzy Logic	12
1.2.6	Abstract Scientific and Concrete Artistic Anticipation	13
1.3	Modal Logic, Polyvalent Logics and Musical Logic	14
1.3.1	Possibilities and Reality, Coincidence and Necessity	14
1.3.2	Infinite Possibilities and Finite Reality. Intermediate Values	16
1.3.3	Musical Logic	16
1.4	The Four Principles with Its Five Phenotypes: Similarity, Sharpening (Filtering and Crystallization), Blurring, Variation	17
	References	20
2	The Structure of the Music Process and the Work’s Thirteen ‘Forms of Existence’. Identity in and as a Process, Against and Through Differences	23
2.1	The Music Process as Overarching Entirety—The Artwork as Integral and Concentrate. Productive, Reproductive and Receptive Realization of the Idea	23

2.1.1	Music as Process—and as Result of the Process	24
2.1.2	Vertical Segmentation: Simultaneity. The Five Anthropological Layers of the Music Process	25
2.1.3	The Layers Between Physics and Philosophy	25
2.1.4	Horizontal Segmentation I: Succession. The Arrow of Time	26
2.1.5	Horizontal Segmentation II: Fanning Out in Various Sensorial Areas	27
2.1.6	The Three Main Phases: Production/Composition, Reproduction/Interpretation, Reception	27
2.1.7	Partial Advancement from the More Vague to the More Precise—Tendencies and Countertendencies	28
2.2	Dialectic—Becoming and Being, Contradictions and Unity, Change and Constancy	29
2.2.1	Sublation as “Processing Identity”—A New Category for the Entire Process and Result	29
2.2.2	Difference and Identity: Heraclite’s River Bank, River and Transformations of Object and Subject	30
2.3	Horizontal Segmentation III. The Sequence of the ‘Forms of Existence’—Progressive Elimination of Fuzziness up to the Score Form	31
2.3.1	The Concept ‘Forms of Existence’	31
2.3.2	List of the ‘Forms of Existence’	32
2.3.3	‘Segmented Continuum’: Overarching Holistic Process with Cesuras	33
2.3.4	Processes of Composition and Decomposition, Sharpenings Versus Blurrings	34
2.3.5	Complete and Incomplete Cycle of ‘Forms of Existence’. Word Form, Picture Form and Quotation Form as Exceptional Cases	37
2.4	Core and Contours. The Variable and the Relatively Invariable	38
2.4.1	Dialectic of Variance and “Constancy of Shape” Within and Between the ‘Forms of Existence’	38
2.4.2	System and Surrounding, Motivations and Functions	39
	References	40
3	Fundamental Fuzziness: The Imperfect Perfection	43
3.1	Idea vs. Sound. Fuzziness in Composition and Interpretation	44
3.1.1	Productive and Receptive Realization	45
3.1.2	Avoidable “Vagueness” and Indelible Fuzziness	46
3.1.3	Information Theory and Improvisation	51
3.2	Artwork as Idea in Fixed Written Form. Sharpening of Blurs Through the Notation	54

3.2.1	Enlarged and Restricted Frames of Determinations in the Notation	54
3.2.2	Starting with Mere Indications of Pitches and Durations to Excessively Precise Notation of Technical and Expressive Execution	55
3.2.3	‘Transcription’ of Sounding Music as Re-Translation	56
3.2.4	Notation and Finalization of Uncompleted Works	57
3.3	„Tolerances” in the Real Music. Work as Acoustically Realized Idea: Sound Form	58
3.3.1	“Miserable Violin” (Beethoven). the Composable and the Composed, the Feasible—and then the Audible	61
3.3.2	Compositional Guiding Principles Complexity Versus Comprehensibility	64
3.3.3	Fuzzy Edges. Framework Institution, Tradition, Historical Changes of Interpretation	66
3.3.4	<i>Desafinado</i> . Tuning Systems and Standard Concert Pitch and Historical Change	67
3.3.5	The Work as Unspecific Stimulus. Postmodern “Constructivist” and “Deconstructive” Nihilism	68
3.4	‘Uncertainty’. Work as Sensually Received and Mentally Reflected Idea: Perception Form	70
3.4.1	Unconscious Amending of Hearing, Playing, and Singing	71
3.4.2	Perception in the Trinity of Text, Sound, and Context ...	73
3.4.3	Reception as Processual Sensory-Mental Perception Between Anticipation and Recollection	75
3.4.4	Conditions, Situations, Distractions	75
3.4.5	Preconditions Activated and Updated: Expectation	76
3.4.6	Pre-preconditions. ‘Halo’ and ‘Devil’ Effect and Other Blurs—Prejudices as Pre-formations and Deformations of Perception	78
3.4.7	Soft Computational Modeling. Computerized Entanglement of Perception and Production	79
3.4.8	New and Negentropy—The Unexpected	81
3.5	Remembering and Forgetting. Work as Sensual Idea Preserved in Memory: Recollection Form	84
3.5.1	Ultra-Short-Term Memory, Short-Term Memory and Long-Term Memory. Cognitive Frames	84
3.5.2	<i>The Lady Vanishes</i> . Fading, Sharpening, Forgetting	86
3.5.3	„O, Du Lieber Augustin, Alles Ist Hin“ (O My Dear Augustin, All Is Gone) by Arnold Schönberg. Fading Away, Composed	91
3.5.4	Refreshing and Reinforcing	96

3.5.5	Reconstructing from Memory as Special Case of Reinforcement and Sharpening	96
3.5.6	Recalled Memories—Quotation, Leitmotif. Composed Memory as Reinforcement	97
3.5.7	Uncalled Memories as Hallucination Form	98
3.6	Blurring in the Technical Reproduction of Music. Work as Technically Recorded Sound: Phonography Form (I)	99
3.6.1	Media Mediated Power and Deception of Memory—‘False Memory’	99
3.6.2	A New Type of Sound Form from Technical (Re-)Production. Blurs and Permutations in the Transformation to Another Medium	100
3.6.3	“Noise” vs. „High Fidelity“. Technical-Medial Limits of Accuracy	104
3.6.4	The Audiovisual Form as a Variant of the Phonographic Form	105
3.6.5	Phonographic Form as Primary Form of Existence	106
3.6.6	Guiding Principle Immersive Reception as Overwhelming—Focus on Effect Instead of Work	109
3.7	Work and Effects. the Multiplication of Fuzziness Possibilities	110
3.7.1	Difference Between End and Aim of the Music Process	110
3.7.2	Considerations and Suggestions for Fuzzy Logic Experiments for Objectify Subjective Experiences	110
	References	115
4	The Principle of Similarity: The Resultant of Identity and Difference	119
4.1	Such as and Different from: Approximations, Convergencies—Difference Instead of Identity	119
4.1.1	Different from and Such as: Expression Versus Imprint, Misleading Identification of Signifier and Signified	120
4.1.2	Comparing—Production and Determination of Similarities: Concrete and Abstract Analogy, Typology, and Classification	124
4.1.3	From Known to Unknown—Heuristic, Mirror-Neurons, and Empathy	129
4.2	Art-Specific Iconicity and Materiality of Reflection, Mimesis, Poiesis, Aisthesis, and Catharsis—Representation, Production, Perception, and Achievement	131
4.2.1	Art ≠ Science. The Artistic Reflection: Mimesis	131

4.2.2	Four Dimensions of Similarity in Music Process: Relations with Reality, Relations Between Components of a Work, Between Its Forms of Existence, and to Components of Other Works	134
4.2.3	Analogies, Synaesthesias, Subjects, Sources and Material of Musical Mimesis in Nature and Society	136
4.3	Nature and Arts, Mimesis and Poiesis. Real Tones as Readymade and Handmade, Musical Onomatopoeia and Painting	137
4.3.1	Things as Signs	138
4.3.2	Real Tones as Readymade and Thing Signs	139
4.3.3	Real Tones as Handmade—Mimesis by Means of Poiesis	143
4.3.4	Real Tones and Existing Pieces of Music as Readymade Material of a Work	145
4.3.5	Real Tone Transformed into Onomatopoeia	147
4.3.6	Painting as Mimesis and Poiesis. Hypernaturalism, Trompe D'Oeil/"Optical Illusion", „Organized Sound" (Edgard Varèse)	149
4.3.7	Mimesis of Matter	150
4.3.8	Music as Painting	153
4.4	Art with Numbers. Musical Mimesis with Proportions as Paradoxical Abstract Iconic	158
4.4.1	Mimesis with Visual Abstractions and Geometric Proportions—Alvin Lucier and Alban Berg	159
4.4.2	Lengths of Structural Parts and Numerical Proportions as an Expression of Gender-Relations in Case of Artur Schnabel and Johannes Brahms	162
4.5	Art and Art—Intertextuality: Reflections and Interactions of Music with Texts, Pictures and Other Arts	166
4.5.1	Medium Change and Total Art Work ("Gesamtkunstwerk")	167
4.5.2	Word Art and Musical Art, Setting to Music and Textualization (Tropatura)	168
4.5.3	Palimpsest, „Transtextuality", „Hypertextuality"	170
4.5.4	'Music Form' of Texts: Program-Music I	170
4.5.5	'Music Form' of Pictures: Program-Music II	172
4.5.6	Real and Imagined Pictures as Objects—Respighi's <i>Verrate di Chiesa</i> (1926)	173
4.6	Similarities, Affiliations, Structural and Processional Relations: Fuzzy Logic and Music-Analysis	174
4.6.1	The Range of Possibility Between Identity, Equality and Blurred Sophistication	175

4.6.2	One-, Two-, Three-Tone-Motifs and Four-Tone-Motif B-A-C-H – Modifications, Transformations, Permutations	183
4.6.3	BA, BAC, BACH—Variations and “Constancy of Shape” („Gestaltkonstanz“)	185
4.6.4	BACH: Counterpoint as Procedure of Variation and Transformation	187
4.6.5	Cross Motif and Chromatics—Wagner’s <i>Ring</i> , Strauss’ <i>Arabella</i>	190
4.7	Neuronal Iconic and Fuzzy Logic	192
	References	194
5	The Principle of Sharpening (I): Filtering. Cosmos Out of Chaos—Aspects and Elements of the Musical Materials	199
5.1	The Development of Musical Materials Under the Aspect of Sharpening. Segmentation: Discrete Parts Instead of Continuum	200
5.1.1	Sharpening. Filtering of Components, Crystallization of Shapes	200
5.1.2	Selection. Filtering in Arts and Nature	201
5.1.3	Filtering of Elements: Musical Tone, Pitches- and Rhythm Systems, Tuning Systems	202
5.1.4	Tones from Noises and Sounds: Organizing and Structuring of Rhythmical-Temporal Acoustic and Non-Acoustic Processes—Culture Versus Nature. Historical and Logical-Systematic Dimensions	203
5.1.5	Development of Chords as Structured Vertical from Heterophonic Lines	204
5.1.6	Tuning Systems—Sharpening, Blurring and Fuzziness	206
5.1.7	Filtering: Technical Production of Tones and Sounds from Noises in Electro-Acoustic Music	208
5.1.8	Solmization as Soggetto Cavato (Carved Out Theme): Filtered Syllables as Pitch Names. System Building Within an Already Established Historical System of the Musical Material	209
5.2	Filtering as a Search for Similarities Using Fuzzy Logic	211
5.2.1	Detection, Storage and Retrieval of Patterns or Shapes	211
5.2.2	Melodic and Other Similarities—Computer-Based Analysis	212
5.2.3	<i>Call Wolfgang</i> via <i>Voice Over IP</i> (Johannes Kreidler). Automatic Phone-Tapping, Internet Censorship and Fabrication of “Terrorists”	219

5.2.4	BACH-Searching as a Test on the Internet. Sequence, Cross, Fate: Expected and Unexpected Results—Flexibility and Productivity of Fuzzy Logic	221
5.3	Sharpening Without Proper Filtering and Transitions Towards Crystallization	225
5.3.1	Precisioning of the Recollection Form Through Objectivation, Exteriorization and Repeatability—Phonography Form (II)	225
5.3.2	Audio- and Data-Compression as Ambivalent Filtering	227
5.3.3	Compositional Use of the Filtered Nature for Crystallization: Shapes and Motifs from the Partial-Tone-Spectrum—Wagner’s Prelude to <i>Rheingold</i> , „Spectralism“ Since the 1970s	227
	References	231
6	The Principle of Sharpening (II): Crystallization. Development and Advancement of Musical Shapes	241
6.1	From Filtering to Crystallization: Extraction, Concentration, Core, Contour	242
6.1.1	‘Soggetto Cavato’	243
6.1.2	Pre- and Para-Compositional Form of Hallucination: Arnold Schönberg’s <i>War-Clouds Diary</i> —Anthropomorphic Projections of Socially Significant Shapes into Natural Phenomena	250
6.2	„Motif“ as Nucleus for Formation of Structures in Improvisation and Composition	253
6.2.1	Crystallization in the Historical Process. BACH as an Emblem Before, In, and After J. S. Bach—The Cross as Generating Deep Structure Since Guillaume Dufay	256
6.2.2	Crystallization Within the Work. Motif, Theme, Movement, Work	261
6.3	Work as Inspiration and Idea. Conceptual Form	265
6.3.1	Questions of Documentation and Translation. Verbal, Notational, and Pictorial Partial Concretization of the Idea	266
6.3.2	Emulation of Processes of Creation and Crystallization in the Work Itself	269
6.3.3	Conceptual Art as Discontinued Conceptual Form	272
6.4	Work as an Outlined Written Conception. Sketch Form	273
6.4.1	Exteriorizations of the Conceptual Form	274
6.4.2	Sketches and Music Process	278

6.4.3	“Writing” as Mere Dictation of Thought and Spontaneous Transcription	284
6.4.4	Accelerations on the Way to the Score. Partimento and Particell	287
6.5	Work as an Idea Completed in the Composers’ Mind. Thought Form	291
6.5.1	„Always Having an Eye for the Whole“ (Beethoven). „Gradual Generation“ of Thought and Anticipatory Completion of the Work	292
6.5.2	Disappointment. The Reduction of the Infinite Possibilities to the Only One Realized Possibility	294
6.6	Preliminary and Final Stage of the Work as a Notationally Completely Realized Idea. Anticipation Form and Score Form	296
6.6.1	The ‘Abstract Composition’	297
6.6.2	Stage I. The Naked, but Integral Body. From Thread to Fabric—Evolving the Polyphonic Composition	301
6.6.3	Stage II: The Clothed Body. Compositional Anticipation and Intentional Determination of Performance and Execution	315
6.6.4	Changing Cubicle. Sharpening with Turnaround—Transcription as Transformation of the Sound Form into a Notation Form	333
6.6.5	Changing Clothes. The ‘Postproduction’ of ‘Versions’	334
6.7	The Work as a Notationally Completely Realized Idea. Score Form	337
6.7.1	New Sounds, New Signs. M. Kagel’s <i>Pas de cinq</i>	340
6.7.2	Sharpening in a Round-About Way. ‘Graphical Notation’	341
6.7.3	New Freedom from Order to Chaos. Sylvano Bussotti’s <i>Siciliano</i>	343
6.7.4	Graphic Notation on the Way to Fuzziness	347
6.7.5	Sharpening Notation of Non-notes: Ervin Schulhoff’s <i>in Futurum</i> (1919)	349
6.8	Bypassing Blurs: Direct Composition of the Sound Form Without Notation and Human Interpreters	351
6.8.1	Automatophones. Barrel Organ and Player Piano, ‘Abstract Composition’ and Secondary Subjectivity of the ‘Pianolist’	353
6.8.2	Electrification. Reproducing Piano as Production Instrument: Conlon Nancarrow	354
6.8.3	Film as Sound Carrier—The Optical Sound Track	363
6.8.4	Composition as Realization. „Musique Concrète“ and „Electronic Music”	366

6.8.5	Without Notes, Text and Graphic. Controlling the Sound Form via Brain Waves	378
6.8.6	Soundless. <i>Music for Reading</i>	379
6.9	Sharpening of Perception. Anticipative Preparation in the Production and Supporting Activities in the Reception	380
6.9.1	„From the Heart—May It Go to the Heart” (Beethoven). Rhetorics and Intensity	380
6.9.2	„Hookline“. Catchiness, Repetition, Obtrusiveness	381
6.9.3	„Earworm“. Undesirable Remembrance	385
6.9.4	Sharpening Through Motion and Reproductive Participation: Dancing and Singing Along	389
6.10	Sharpening Through Blurring. Fuzzy Logic as a Partial Logic of Compositional History	393
6.10.1	The Development of European Melodic Polyphony. Counter Movements Instead of Parallel Movement of the Parts	394
6.10.2	Poly-Textuality. Sharpening of Sound Perception, Blurring of Sense Perception in Motet and Quodlibet	402
	References	403
7	The Principle of Blurring. Conscious, Artistically Produced Blurings	413
7.1	“Dying” and Concealment	414
7.1.1	The “Morendo” Ending in the Prelude of Alban Berg’s <i>Three Pieces for Orchestra</i>	414
7.1.2	The Tarnhelm Motif in Wagner’s <i>Ring</i>	416
7.1.3	The Hidden Theme in Elgar’s <i>Enigma Variations</i>	418
7.2	Point of Departure. Idea and Conceptual Form. Blurred and Blurings in the Service of Crystallization—Noises as New Material	419
7.2.1	„Cluster“. Clumped Chords—Pitches in Transition to Noise	420
7.2.2	“Intonarumori”. Sirens, Airplane Propellers. Pre-electric Noise Production	422
7.2.3	Technical Re/Produced Noise as Musical Material	428
7.2.4	“Noise” as Blurry Real Residue and as Ideology	430
7.3	Point of Departure: Score Form. ‘Musical Graphics’	434
7.3.1	The Pictorial Instead of Notes and Writing as a Blurred or Vague Concept for the Realization	435
7.3.2	„Soundpainting“. Realtime Composing Alias Improvisation	440
7.3.3	“Visible Music”, Air Guitar and Air Drums	441
7.3.4	Text Form Instead of a Notation Form: Concept Art as Mere Verbalization of Ideas Without Realization	444

7.4	Point of Departure: Anticipation Form. Instrumentation, Ornamentation, Indeterminations	446
7.4.1	Notation as Blurring: The Main Theme of the IVth Movement in Tchaikovsky's 5th Symphony	447
7.4.2	Pitch. Embellishment as Blurring	448
7.4.3	Tone Color. Instrumentation as Blurring—Color Instead of Drawing, Brush Stroke Instead of Line	456
7.4.4	Musical Chiaroscuro, Sfumato, Clocks and Clouds. from the Transparent Polyphonic Structure to the Opaque "Texture"	472
7.4.5	Resulting Patterns as Pre-calculated Blurs—Between Bach/Gounod's <i>Ave Maria</i> and Central/East African Xylophone Music	475
7.4.6	Musical 'hatching'—Blurring as Structural Condensation. Iteration of Patterns in Minimal Music and Steve Reich's <i>Drumming</i>	481
7.4.7	Indeterminacy Instead of "Fully Completed Unity"	485
7.4.8	Reworking and Arrangement as Blurring	496
7.5	Point of Departure: Sound Form. Subjective Vivifications of Tone and Tempo	500
7.5.1	Vibrato. Blurring in the Dimension of Pitches as Vivification	501
7.5.2	Modifications of Tempo, Tempi and Beat	504
7.5.3	Rubato. Blurings in Relative Tempi as Vivification	517
7.5.4	Off-Beat. Generalized Rubato	521
7.6	Point of Departure: Phonography Form. Electroacoustic Simulation of Liveliness	523
7.6.1	"Humanizers". Simulated Vibrato and Other Expression and Animation Effects	523
7.6.2	Composition, Indeterminacy and Improvisation: 'Live Electronics'	528
7.6.3	People as Interface. Towards the Elimination of Professional Composers	530
7.7	Point of Departure: Perception Form. Mishearing and Misunderstanding Between Fuzziness and Blurring	533
7.7.1	Unintentional Parodies: "Lady Mondegreen" = "Laid Him on the Green"	533
7.7.2	Intentional Parodies, Deliberate Misunderstanding, Rewrites. Walther's and Beckmesser's "Preislied" in <i>Die Meistersinger von Nürnberg</i>	537
	References	542
8	The Principle of Variation: Similarities, Differences, Development	549
8.1	Width and Diversity of the Principle of Variation	550

8.1.1	Permutation (I)—Change Ringing ^c	551
8.1.2	Permutation (II)—Twelve Tone Technique	555
8.1.3	Difference and Identity: Repetition, Contrast, Alteration	557
8.1.4	Variance Without Constancy	559
8.1.5	Musical Variation Cycles	560
8.1.6	Universal Design Principles of Varying Music Making?	563
8.2	Variation Through Reconfiguration: Quotation Form	564
8.2.1	Metamorphoses	564
8.2.2	Large Quotation—The Work as a Completely Resurrected Whole	569
8.2.3	Embedding: Smaller Work as Complete Quotation Within a Larger Work	586
8.2.4	Palimpsest—Parts of the Work as a Changed, but Maintained Combination of Sound and Idea	593
8.2.5	Collage—Fragments of Works as Semantic and Syntactic Building Blocks	597
8.3	Variations Through Media Transformations (I): Word Form	610
8.3.1	Recrystallization and Reconfiguration in a Detour Through Fuzziness and Transformation into a Different Art	610
8.3.2	Word Form—Afterwards and Afore: Music Criticism, Music Analysis, Introduction to Works	611
8.3.3	Ekphrasis: Word Form Versus Program Music as ‘Music Form’ of Texts and ‘Music Form’ of Pictures	612
8.3.4	Program as Ekphrasis: Charles Ives’ Remarks on His Orchestral Pieces <i>Three Places in New England</i>	613
8.3.5	Facilitating the Imagination Through Verbal References to Pictures and Known Works	616
8.3.6	Fictional Musical Works in Word Form: Descriptions of Fictional Works with Reference to Real Ones in Thomas Mann’s Novel <i>Doktor Faustus</i> and Elsewhere	617
8.4	Variation Through Media Transformation (II): Picture Form	620
8.4.1	Demarcations: Pictures with Music, Pictures Based on and About Music, Picture Form of Works, Music Form of Pictures	621
8.4.2	Individual Works in Picture Form	623
8.4.3	Title Pages of Sheet Music Editions, Sound Carrier Covers and Advertisements as Picture Form of Works	635
8.4.4	Moving Picture Form of Works I: Dance/Ballet	639

8.4.5	Moving Picture Form of Works II: Translation of Musical Works in Sign Language	640
8.4.6	Moving Picture Form of Works III: Film	641
8.5	Variations Through Receptive Realization: Imagination Form	645
8.5.1	Mental Reconstruction of the Realized Work from Fragmentary and Vague Information—Optimum Fuzziness	646
8.5.2	Mental Construction of a Non-real Work—Imaginations of “Conceptual Art”	646
8.5.3	Imagination Form as the Translation of Conceptual Art Concepts into Subjective Realizations	651
	References	651
9	Perspectives and Prospects	659
9.1	Productivity I. Historical Development and Progress of Music Through Fuzziness/Blurring and Sharpening—Fuzzy Logic as Logic in the History of Music	660
9.1.1	Pendulum Swings in Musical History Between Blurring and Renewed Sharpening: Expression Becomes Material—Material Becomes Expression	660
9.1.2	Analogies Between Music and Life with Movements in Space: Purposefully With or Without Parallels—Sharpening and Blurring	663
9.1.3	Quadrature of the Circle and Rules of the Game—Keeping Them, Consciously Breaking and Changing Them	665
9.2	„Musical Turn“ in Natural Sciences, Liberal Arts, and Social Sciences. Generalizations and „Philosophy of Fuzzy Logic“	667
9.2.1	Pragmatics and Practice: Acoustical and Musical as Technical and Psychosocial Instrument	667
9.2.2	Musical “Biofeedback”, “Mindball” and “Experimental Music”. Music as Science?	669
9.2.3	Chimera. Musical Parallels to Scientific-Technical Procedures	671
9.2.4	<i>The Creation</i> , Becoming Instead of Being <i>in</i> and <i>as</i> Music, and the Arrow of Time—A Mimesis of Nature. Music as an Active Component of World View	672
9.2.5	Seismograph. Music as a Historical-Social Document	676
9.2.6	“West-Eastern Divan Orchestra” and “Mozart Effect”—Chaos and Anomy, Cosmos and Harmony. Music as a Model for Dialectics	677

9.3	Productivity II. Interdisciplinary Cooperation Transgressing Disciplinary Boundaries and ‘Inner Interdisciplinarity’.	
	Fuzzy Logic, Music and Musicology	680
9.3.1	Interdisciplinarity as sum and synthesis. Musical contribution to “The Philosophy of Fuzzy Logic”	680
9.3.2	‘Fuzzy Logical Turn’?	681
9.3.3	‘Inner Interdisciplinarity’. Answered, Processed, Open and New Questions	682
	References	685
	Bibliography	687

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Books

The Concert. Theory of a Cultural Form, 2 vols. (1983) *Jazz* (1983)

Of the Universal New. Analyses of Engaged Music: Dessau, Eisler, Ginastera, Hartmann (2006)

In/Finity. Encountering Görgy Ligeti (2008)

Background Sound Art (2009)

Heinz Gellrich—Times, Paths, Signs (2014)

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Over/Tones. Music and Other Arts, series since 1995

Music/Society/History, series since 2005

History of Music in the 20th Century, Vol. III: 1945–1975 (2005)

Charles Ives, 1874-1954. American Pioneer of New Music (Atlantische Texte, vol. 23) (2004)

Layers, History, System. Geological Metaphors and Forms of Thought in Art Studies (*Over/Tones, New series* vol. 6), 2016

(with W.-W. Sparrer) *Contemporary Composers* (loose leaf lexicon, since 1992, till April 2020 66 deliveries, ca. 12.700 pages)

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