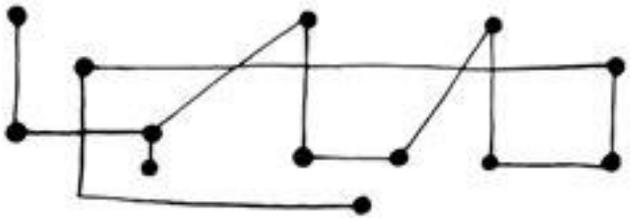
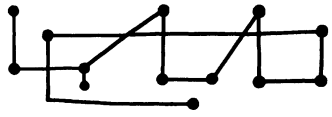


STOCKHAUSEN'S PARADIGM: A SURVEY OF HIS THEORIES



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INTRODUCTION

USUALLY, WHEN Stockhausen's theories are discussed, they are considered as part of his composing. They have never been the subject of systematic research, independently from their historical context. They have been the subject of historical research (Sabbe 1981), or part of discussions of Stockhausen's work (such as Harvey 1975). When the first two collections of his *Texte* were published, the theoretical contributions were considered to be a major contribution to a new composition theory without being analyzed as such (Schnebel 1964, Brinkmann 1972, Karkoschka 1965). The third collection, published in 1971, caused problems to some writers who expected a consistent theory (Schnebel 1971,

Brinkmann 1972 and 1974). Morgan, however, saw "a consistent line running through the volumes" (Morgan 1975, 16), but he sees this line more in the importance of Stockhausen's thinking for contemporary music than for music theory. More recently Stockhausen's importance for music theory has been recognized without being extensively discussed (e.g., Maconie 1989, 179). Hopkins in his *New Grove* entry on Stockhausen spends one of the three paragraphs on the issue of "theory." But he starts by remarking that "no scholar or critic has yet gained the perspective from which a comprehensive exegesis would be feasible, and consequently, discussion of his ideas and his system of reference necessarily remains somewhat piecemeal" (Hopkins 1980, 155).

The problem with Stockhausen's articles is that most of them are not presented and not meant as theory, but as explanations of his musical work: "My texts are always comments to the music," he writes in volume 4.[1] The consequence is that they do not contain explicit theories, which may be the main reason why nobody has been inclined to consider them as such. There is some consistency in his thinking, however, reflected in all articles, interviews, and scores. Therefore his "theories" should not be approached as music theory, but from a broader perspective in which philosophy, theory, and compositions have a place. Stockhausen's thinking has to be considered as a musical paradigm.

After the publication of *Texte* volumes 5 and 6 in 1989, and more interview material (Maconie 1989, Tannenbaum 1987) it seems possible to come closer to an exegesis (as Hopkins says). The purpose of this article is to provide a perspective from which such an exegesis might ultimately be accomplished.

This article consists of two sections. In the first section I briefly explain the concept of a paradigm and the "paradigm model" based on this notion. Section 2 contains the analysis, structured according to the paradigm model in three divisions: fundamental assumptions (aesthetics), images (models) and working methods (techniques). After section 2 some conclusions will be drawn.

1. The Paradigm Model

The paradigm model is derived from the paradigm theory of Thomas Kuhn. Because Kuhn's theory deals with science and not with music it cannot be applied wholesale. But some useful parts can be taken out of it in order to form a consistent model for analyzing thoughts and ideas about music and composition.

1.1. KUHN'S PARADIGM

The Structure of Scientific Revolutions (Kuhn 1970) analyzes the history of science as a sequence of paradigms and paradigm shifts ("scientific revolutions"). During a period of "normal science," a scientific community tries to solve problems in accordance with a specific view, which is its "truth." But at certain points in history one can see that an unsolvable problem (an "anomaly") comes up, which can only be solved by assuming another view, another truth, another paradigm. The way in which this paradigm shift takes place cannot be rational, according to Kuhn. Therefore he calls them revolutions, a kind of psychological battle between scientific communities, where the decision depends on psychological and sociological forces. The *beliefs* of scientists are changed during scientific revolutions.

The importance of Kuhn's analysis mainly lies in his observation that decisive moments in scientific development are not rational, and that scientific truth is relative.

1.2. PARADIGM ASPECTS

What is of interest for our model is not the scientific-philosophical dimension, nor the historical, even not the sociological aspect. What is interesting for us is the concept of a paradigm and its concrete meaning within a "normal science" situation. Although Kuhn's paradigm theory has become known for its concept of revolutions, the "normal science" situation is equally important and is emphasized here because of its usability for describing a whole set of beliefs and theories in music.[2]

A paradigm is a set of rules and habits that a scientific community employs for solving its problems. Many rules, however, are never discussed because they seem self-evident to the members of the scientific community.

In order to analyze a paradigm, one has to make explicit what is "hidden" implicitly in the mind of the paradigm users. To do this, four aspects of the paradigm seem to be of importance; they match the four aspects that Kuhn himself once summarized as the four global aspects of paradigms or "disciplinary matrices" (Kuhn 1970, 181–87):

* values
* models
* generalizations
* exemplars

I will discuss these four aspects now, to get a more detailed view of the paradigm concept. Each aspect will be discussed twice. First I summarize the Kuhnian notion, then I give its possible meaning in music.

1.2.1. VALUES

Values are the basic beliefs of a scientific community; they concern philosophical assumptions and questions. "[No] scientific group could practice its trade without some set of received beliefs. . . . Effective research scarcely begins before a scientific community thinks it has acquired firm answers to questions like the following: What are the fundamental entities of which the universe is composed? How do these interact with each other and with the senses?" (Kuhn 1970, 4–5). In musical paradigms these values will concern assumptions about what music is or should be, what the fundamental entities of music are, how music should be performed or listened to, what music means in everyday life.

1.2.2. MODELS

Models are metaphors or images. An example in the natural sciences is: "the molecules of a gas behave like tiny elastic billiard balls in random motion" (Kuhn 1970, 184). Models reflect basic beliefs of the scientific community in a concrete way. They can help in specifying scientific problems and finding approaches for solving them. Models in music theory can mostly be found in the form of analogies with other arts. In the nineteenth century for example music was considered "dramatic," referring to theatrical and literary forms. Another model, used in baroque music, is the rhetorical one: music as spoken discourse. Through the analysis of the models one can understand the composer's compositional problems and his technical solutions.

1.2.3. GENERALIZATIONS

Generalizations are the explicit ideas that are shared by a scientific community, and which reflect its world view in logical and reduced form. Formulas like $f = ma$ and "action is reaction" are examples of these (Kuhn 1970, 182–83). In musical paradigms one can find generalizations in composition techniques, like "a dissonance must be resolved" for the

tonal paradigm, or "all twelve notes have to occur with equal weight" for the twelve-tone paradigm. This is usually called "music theory."

1.2.4. EXEMPLARS

Exemplars are the concrete solutions of problems that function as clear examples of how to solve certain problems and of how the world is. Mostly these exemplars are used for educational purposes. "All physicists, for example, begin by learning the same exemplars: problems such as the inclined plane, the conical pendulum, and Keplerian orbits" (Kuhn 1970, 187). In the field of music one can think of compositions that are viewed as paradigmatic. The examples and exercises in Fux's *Gradus ad Parnassum*, for example, could be considered as such. All "classics" (Bach's *Wohltemperiertes Clavier*, Beethoven's Symphonies, Wagner's *Ring*) can be seen as exemplars; every music student learns them and keeps them in mind as examples.

1.3. COMPOSITIONAL THEORY AS PARADIGM

A music theory, as far as it concerns the composition of music (what I will call "compositional theory"), can be described in terms of the four paradigm aspects: exemplars, generalizations, models, and values. In order to complete this into a useful framework, the relationships between these four aspects have to be made precise. At this point I will leave Thomas Kuhn and add my own considerations that serve our purpose.

A compositional paradigm has to be defined as a "way of looking at musical composition," defined by fundamental assumptions about music (Kuhn's values), rules for a working method (Kuhn's generalizations), images used for explaining the music (Kuhn's models), and exemplary compositions (Kuhn's exemplars). Analyzing a compositional paradigm means describing these four aspects and their interrelationships. It also means answering four essential questions (see Example 1): why the composer composes, what his examples are, how he imagines his music, and how he tries to achieve his goal.

A compositional paradigm can apply to an individual composer or to any combination of composers, styles or even to a part of a composer's work. Kuhn's "community" must be translated in a flexible way, and can be defined as a "compositional unity", which may vary from a single work to a stylistic movement. I will assume without detailed discussion that Stockhausen's work may be dealt with as an individual paradigm.

science	*composition*	*analysis question*
values	assumptions	why (aesthetics)
models	images/models	how (imagining)
generalizations	working methods	how (working)
exemplars	compositions	what (examples)

EXAMPLE 1

2. Stockhausen's Paradigm

Stockhausen's thinking is reflected in theoretical work, program notes, interviews, and scores. The theoretical work that will be considered here mainly consists of his six volumes of *Texte zur Musik* (Stockhausen 1963, 1964, 1971, 1978, 1989a, and 1989b), which include most of his articles, program notes, interviews, and paraphernalia from 1951 till 1987. Some other published interviews can be added, mainly the ones by Cott (1974), Tannenbaum (1987), and Maconie (1989). It has to be emphasized that the following survey of Stockhausen's thinking does not aim at completeness. It only reviews some main issues. Stockhausen's thinking will be described in terms of four paradigm aspects: exemplars, assumptions, models, and generalizations. The discussion of exemplars is put first because of its special nature.

2.1. Stockhausen's Exemplars

Exemplars usually should be "classic" compositions or other works of art to which a composer refers in order to demonstrate his paradigm or aspects of it. Only in some of his early articles does Stockhausen analyze other composer's work, the main articles being the ones on Bartók's Sonata for Two Pianos and Percussion (Stockhausen 1964, 136–39 [1951]),[3] Webern's Concerto, op. 24 (Stockhausen 1963, 24–31 [1953]), Webern's String Quartet, op. 28 (Stockhausen 1963, 86–98 [1955]), Debussy's *Jeux* (Stockhausen 1963, 75–85 [1954]), Boulez's *Le Marteau sans maître* (Stockhausen 1964, 149–56 [1957]), Nono's *Il canto sospeso* (Stockhausen 1964, 157–66 [1957]), and Mozart (Stockhausen 1964, 170–205 [1961]). The article in which Mary Bauermeister's visual art is discussed ("Mary Bauermeister," in Stockhausen 1964,

167–69 [1962]) could be added to this list. What all these articles have in common, however, is that the work in question is not a straight example of a certain technique, but is taken as a starting point for his own theorizing. Therefore, all these references to other artists' work cannot be considered as real exemplars; they never serve as pedagogical examples of "how to do it." His own works do: they are the examples that illustrate in detail his theoretical thoughts. In Stockhausen's paradigm the results are the exemplars as well. For this reason, the exemplars will not be discussed separately here, but are integrated in the explanations of assumptions, models, and generalizations.

2.2. STOCKHAUSEN'S FUNDAMENTAL ASSUMPTIONS

What seems to be Stockhausen's most important and basic assumption is that everything can always be seen in a new perspective. I will call this Stockhausen's progressive relativity.

It is not a relativity *pur sang*, neither is it a relativism; it is the idea that everything is developing progressively, relating itself to previous stages in the development; every stage in the development is relative to the next stage. This principle is reflected in Stockhausen's ideas about the universe, human life, perception, and music. The whole universe is seen as an ever-changing constellation of relationships. The only universal element may be "vibration," so that relationships can be expressed as proportions of vibrations. This vibration metaphor makes it possible to translate the universe into music. Stockhausen: "Every object in the world, down to the smallest atom, produces waves which can be transformed into acoustic waves" (in Cott 1974, 75).

The principle of progressive relativity in *human life* means that the life we live is not the only one. Human life in Stockhausen's view is only a phase in a longer development, which goes from a purely material towards a purely spiritual existence. Reincarnation is a necessary part of this development: death is just the closing point of one phase and the opening to the next (Stockhausen 1989b, 234ff [1984]). The crucial concept and the purpose of life is "enlarging one's consciousness"; by becoming more conscious, one reaches a higher level of spirituality. "Let us not fall into one aspect, but always mediate and enlarge consciousness rather than just replace one thing with another and thereby remain on the same level of consciousness" (Stockhausen in Cott 1974, 71). This idea is based on the philosophy of Sri Aurobindo, whose work Stockhausen got acquainted with in 1968 during a personal crisis (Kurtz 1988,

214). Stockhausen has worked out this philosophy, in combination with other religions and mythologies, into his own mythical world, reflected in the music-theatrical work *Licht* with the three basic human archetypes Michael, Eve, and Lucifer (for more information on this see Stockhausen 1989b, 152ff).

Not only the world is changing, but also our *perception*. Stockhausen believes in the ability to change perception.[4] The purpose of new music is to change perception, to help people enlarge their consciousness. This is also based on the assumption that music influences people, not only psychologically but also physically: "When a human experiences something acoustical, he will be changed, because he is modulated by the vibrations, all his atoms are modulated" (Stockhausen 1978, 395 [1972]).[5]

Composition of music should reflect the universe (Stockhausen 1978, 405 [1973]). The purpose of composing music is to capture the universe in music and to create the opportunity for people to enlarge their consciousness. Therefore composition should be based on the principle of progressive relativity, which can be found in Stockhausen's main composition technique: serialism (see the section on Stockhausen's working methods, below).

2.3. STOCKHAUSEN'S IMAGES

In Stockhausen's thinking one can find many images, metaphors, and models. The most important ones are the vibrating world, the continuum, the spiral, and the galaxy.

2.3.1. THE VIBRATING WORLD

The image of the vibrating world, already mentioned as a fundamental assumption in the previous section, can be traced in many of Stockhausen's pronouncements. A vibration should be seen as a more or less periodic motion of energy. Vibrations, like sound waves, can be expressed in terms of frequency and amplitude, or—in the case of aperiodic and complex motion—in terms of probability. One can find these notions in Stockhausen's concepts of "points" and "groups," as will be discussed in the next section on compositional techniques.

These notions can also be found in more philosophical statements by Stockhausen: "There is a fundamental periodicity of the whole cosmos when it explodes and contracts—it breathes, God breathes all the time,

naturally, periodically, as far as we can think. This is the fundamental of the universe, and all other things are partials of this fundamental—the galactic years and the years of the sun systems, etc. And going down to the atoms and even the particles of the atoms, there is always periodicity" (Cott 1974, 27). The vibration model is important because it implies the concept of proportions: phenomena can be related to each other in terms of proportions. Not only sound but all kinds of musical aspects, even perceptual and cognitive categories, like *recognizability*, can be expressed as proportions, and this makes it possible to use the same proportions for different parameters. The vibrating-world model is also important to clarify Stockhausen's view on intuition, as will be explained in the next section about his working principles. If people are open-minded enough, they are able to perceive many vibrations they never sensed before; this sensation is crucial for the "step forward" in the concept of enlarging one's consciousness.

2.3.2. CONTINUUM

The assumption of progressive relativity is reflected in the image of the "continuum": the line between two extremes. Every aspect in the world can be seen as a point on some continuum, which means: as a gradation of at least two extremes. A human being can be seen as a certain point or band on a continuum between purely material beings on one side and pure spirit on the other. Every tone, every sound in Stockhausen's music is meant to be a crossing point of several continua.

2.3.3. SPIRAL

The spiral image reflects the dialectical development towards spirituality. The spiral consists of two seemingly contradictory features: the circle and the arrow. The circle (sometimes it is referred to as "star," e.g. Sabbe 1981, 62) reflects the act of construction, of integrating all elements into one continuum. The arrow, or rising direction of the spiral, reflects the innovating force, the act of listening, enlarging one's consciousness, going a step further, getting inspired. The combination of circle and arrow is the spiral, an integration of construction and adventure. Stockhausen sees his own development as a spiral movement (Frisius 1982, 159). The spiral image has been used as the title for one work (*Spiral*, 1968), and it is the basis for several other works as well (see Purce 1973 and Fritsch 1979), and is the basis for Stockhausen's main compositional technique, serialism (see the next section).

2.3.4. GALAXY

Another metaphor often used in Stockhausen's writings is the *galaxy*. It reflects the idea that all things are related to each other, like the planets and stars are, but that at the same time there is some grouping, that some planets belong a little bit more to each other and that some stars with their planets form galaxies. One can find this explicitly in Stockhausen's musical concept of the formula, which will be explained in the next section about working methods. For example: "*Mantra* is a miniature of the way a galaxy is composed" (Cott 1974, 223). In 1976 he explained the formula technique as "a new system, in which little partial systems are put together, with each its own center—like solar systems with their planets and moons; the big system is like a galaxy, that contains several solar systems" (Stockhausen 1978, 465 [1976]).[6] But in earlier works too he used the concept of a main note with auxiliary notes surrounding it: "In *Klavierstück V* you will hear the way in which a central pitch will sometimes be attacked with a very rapid group of little satellites around it, sustained with the pedal as a coloration of this central pitch, like moons around planets and planets around a sun" (Stockhausen 1993, 140).

2.4. STOCKHAUSEN'S WORKING METHODS AND GENERALIZATIONS

Working methods in musical composition can generally be analyzed into three categories:

1. working principles (how to gather material)
2. working materials (what basic material is used)
3. construction principles (how the material is applied).

Common classical working principles are modality and tonality; working materials are tones, scales, cadences, and melodies; construction principles are counterpoint, the sonata form, and the fugue, for example.

Stockhausen's working principles are serialism and intuition, his working material ranges from point to formula, and his construction principles are serialization and formula projection.

2.4.1. WORKING PRINCIPLES: SERIALISM AND INTUITION

In the most general sense Stockhausen's assumptions lead to serialism, although this serialism should be understood in a different sense than the

usual one. Stockhausen's serialism is not the simple technique of putting sets of pitches, durations, and dynamics into a series, but a more general method for creating parameters. In Stockhausen's words, "Serialism is only a way of balancing different forces. In general it means simply that you have any number of degrees between two extremes that are defined at the beginning of a work, and you establish a scale to mediate between these extremes" (Stockhausen in Heyworth 1970, 34). Serialism can be generalized as a method of thinking (Sabbe 1977), which can be formalized into an algorithm (Coenen 1987:199):

1. Take or create a dualism as starting point (innovation)
2. Create a scale between the two extremes of the dualism (integration)
3. Consider the created scale as a starting point for a new dualism (recursion, "goto 1").

Take, for example, the dualism "slow-fast" in relation to the tempo of a musical structure. Defining this dualism in terms of metronome numbers (e.g. MM 7.5 = the slowest, MM 960 = the fastest), one can create a scale between these extremes (e.g. a logarithmic scale of eighty-four steps with a grid-factor of $1:\sqrt[12]{2}$) and thus integrate the concepts of fast and slow: MM 75.6 is slower than MM 960 but faster than MM 7.5. So far the method is not shocking. The next step, however, makes the serial method interesting. After having defined the scale, and having used it in some compositional context, one can consider the scale to be characterized by a rather rigid measurement, and one could feel the need to incorporate some margins (e.g. considering that a musician can not always be sure if a tempo of 113.3 is performed exactly as 113.3). This leads to a new dualism, i.e. between an exact tempo-performance and an extreme freedom; a new parameter is found (the parameter of "freedom") which can be defined, scaled, and used in a composition (see for example Stockhausen's time-measurements used in *Zeitmaße*, Stockhausen 1964, 46–47). The definition of a new parameter is always such that the old one is preserved and becomes part of the new one; the exact tempo-scale is not abandoned but incorporated in the new tempo-freedom scale. The serial method guarantees constant stylistic renewal without abandoning the old. It is based on the progressive relativity assumption and the spiral and galaxy image: "The stars are organized in a serial way" (Stockhausen, in Cott 1974, 97).

Another important working principle is the use of *intuition*, based on the vibrating-world image. For Stockhausen, using intuition means opening one's mind in order to receive more vibrations from the universe than

one normally does (Stockhausen 1978, 569 [1975]). The use of intuition is extensively explained and explored by Stockhausen in many interviews from the early seventies; some of his pieces are dedicated to this technique, principally *Aus den Sieben Tagen* (1968) and *Für kommende Zeiten* (1978–70). It is, of course, impossible to trace back exactly what material in any given composition has been the result of intuition, but Stockhausen assures us that he uses what he has discovered in his experiments with intuition: "Now I can write such music [i.e., music resulting from intuition]! Formerly I couldn't do, because I didn't know it" (Stockhausen 1989b, 325 [1978]; also Frisius 1978, 148).[7]

2.4.2. WORKING MATERIAL

The serial method has led to an ever-growing collection of parameters in Stockhausen's works. At the same time these parameters have led to certain elements in which the parameters are crystallized, such as *points*, *groups*, and *moments*. Parameters and elements can be considered as Stockhausen's working material. I will discuss some main parameters and elements first, in a chronological order which turns out to be a logical one as well, and then present a summary overview which will give an interesting formal perspective on Stockhausen's working material.

The smallest element that can be found in Stockhausen's work is the physical *sound parameter*. Stockhausen customarily works with the five "classical" parameters pitch, duration, dynamics, color, and place (Stockhausen 1963, 160 [1958]). Stockhausen developed several special scales for most of these parameters, e.g. an orchestral dynamic scale (for *Inori*; Stockhausen 1978, 215, 226–29, 232–33, and 586 [1975]), a pitch-tempo scale (for the first time in Stockhausen 1963, 99–139 [1956]), and a tone-to-noise scale (for many compositions). The pitch-tempo scale, presented in Stockhausen's famous article ". . . wie die Zeit vergeht . . ." of 1956 is interesting because it is the first presentation of a synthesis of parameters, here relating pitch and duration. The unifying basis of both parameters is time-length: pitch being a periodic recurrence of a wave-length, duration being a simple time-length. From that point of view, both pitch and (metric) duration are degrees on the same time-length continuum: wave-lengths between 0.00005 and 0.05 seconds (corresponding to 20,000 and 20 Hz) are perceived as pitch, lengths between 0.05 and 8 seconds are perceived as metrical time divisions. On the basis of that, Stockhausen constructed a tempo-scale which corresponds to the Western twelve-tone equal-tempered pitch system, using the same concepts of intervals (octave, fifth, and so on) for both metrics

and pitch. The octave is divided into twelve equal ratios ($1:\sqrt[12]{2}$), resulting in the central "metric octave" scale shown in Example 2 (expressed in terms of pulses per minute (MM), Hz, and seconds).

MM	*Hz*	*sec*
60.0	1.00	1.000
63.6	1.06	0.944
67.3	1.12	0.891
71.4	1.19	0.841
75.6	1.26	0.794
80.1	1.33	0.749
84.9	1.41	0.707
89.9	1.50	0.667
95.2	1.59	0.630
100.9	1.68	0.595
106.9	1.78	0.561
113.3	1.89	0.530
120.0	2.00	0.500

EXAMPLE 2

The sound parameters are crystallized into *points*. A point (*Punkt* in German) is a single value of all five parameters together, normally called a "tone" (Stockhausen 1963, 76 [1954]). The piece *Punkte* (1952–62) was originally composed on this principle. Points can be combined into a *group* (*Gruppe*), in which the points are connected with each other by an overall and combined quality (Stockhausen 1963, 63 [1955]). Group characteristics are expressed in statistical terms of direction, range, and density. These parameters can be applied to each sound parameter of the points: direction of pitch, direction of duration, direction of dynamics, direction of color, range of pitch, and so on.

When points and groups are organized together, a new dimension is involved: that of form. The main concept in this context is the *moment*.

Moments are form units, characterized by a specific "personality" (Stockhausen 1963, 200 [1960]); they can be collections of groups, of points, or quotations from existing music (*objets trouvés*). Stockhausen has determined two main parameters which characterize a moment. One ranges from *Gestalt* ("individual" form, in which every element is unique) to *Struktur* ("dividual" form, in which elements are repeated).[8] Stockhausen doesn't give a name to this parameter (Stockhausen 1963, 201 [1960]), but one might call this the parameter of "organization." The other parameter in relation to the moment can be called "temporal tendency," and ranges from *Prozess* (dynamic structure) to *Zustand* (static structure). Stockhausen has explained these parameters rather extensively in his article "Momentform" from 1960 (Stockhausen 1963, 189–210), illustrated with examples from the electronic work *Kontakte*, which is one of the "exemplars" of this technique, together with *Momente* and *Mixtur*.

In the late sixties, Stockhausen composed several pieces that are known as "process-plan" pieces, like *Plus-Minus*, *Solo*, *Spiral*, *Prozession*, and *Kurzwellen*. Stockhausen by this time was not writing so extensively about the theoretical considerations for these compositions, but from the scores one is able to infer some new parameters and elements. The main element is the *process*, being a musical structure in which elements are transformed (Stockhausen 1978, 107 [1975]). The main parameter involved is change (*Veränderung*), which is expressed in terms of increase or decrease, concerning any parameter in relation to some other event. In these scores this is mostly found notated in terms of plus, minus, and equal signs, which have the following meaning (quoted from the score instructions of *Prozession*):

\+ higher OR louder OR longer OR more segments

\- lower OR softer OR shorter OR fewer segments

= same (similar) register AND dynamics AND duration AND timbre AND number of segments

The scores are meant to be worked out by the musicians themselves, interpreting these signs in relation to some chosen source. *Plus-Minus* and *Spiral* are the most abstract examples of this meta-music idea; every version of these pieces is a new piece in itself; the process of composition has become part of the performance. But in other pieces like *Hymnen* and *Telemusik*, the same elements and transformations are applied by Stockhausen himself during the composition process.

From the seventies on Stockhausen developed the so-called *formula* technique. In one respect the formula is not comparable with points, groups, moments, and processes, because a formula doesn't have parameters. But the principle of creating new parameters is transcended into creating new elements (in which all the former parameters and elements are incorporated); instead of crystallizing parameters into elements, elements are crystallized into formulas.

The formula is a structure in which all possible musical aspects are personalized into a mini-composition. It reflects the image of a galaxy: the inner organization of the formula is based on a distinction between *nuclear tones* and *accessories* (the stars and their surrounding planets). The notion of an "accessory" stems from the process-period (*Plus-Minus* is the first score in which accessories are mentioned), but is more fully developed in the formula technique. Stockhausen defined the accessory (*Akzidens* in German) as a "klangliche Hinzufügung" (score of *Plus-Minus*, p.5 [1963, *Neuformulierung* 1974]). The nucleus forms the serially organized structure, the accessories give it a character. The following accessories can be found in Stockhausen's texts in relation to some formulas (see, e.g., Stockhausen 1982 about the Michael-formula for *Licht*):

echo (repetition of nuclear notes)

pre-echo

colored pause (soft noise-like sounds instead of a silent pause)

variation

scale (fast scale as introduction to a nuclear note or bridge between two nuclear notes)

modulation (tremolo)

It is interesting to notice that most accessories seem to have their origin from the practice of electronic music. Echo and pre-echo are known as unwanted side-effects of tape recordings; colored pause is originally the hiss of the tape; the scale could refer to the glissando-effect if a tape is started, and modulation is a well-known electronic technique. These mostly unwanted "accidents" in the praxis of electronic tape music are incorporated musically in the formula technique: another example of a way of working in which everything that passes the composer's way is incorporated into the system. The formula technique has been used by Stockhausen since *Mantra* (1970) in almost all his works, and was

expanded to the triple formula used for his gigantic opera work *Licht* (Example 3).

Formulas are not only used as working material, but have given rise to a completely different construction principle, which will be explained in the next subsection. Formula technique is not only metamusical (as was process technique), but is transcended into metacomposition: not only the *process* of composition, but also the *result* of composition is the material for a new composition.

In order to get some comprehensible overview, all this working material from points to formulas can be summarized and simplified into five categories:

category	*elements*	*parameters*
sound	points	pitch, duration, dynamics, color
statistics	groups	direction, range, density
form	moments (forms)	organization, tendency
transformation	processes	change
composition	formula	elements (nucleus, accessories)

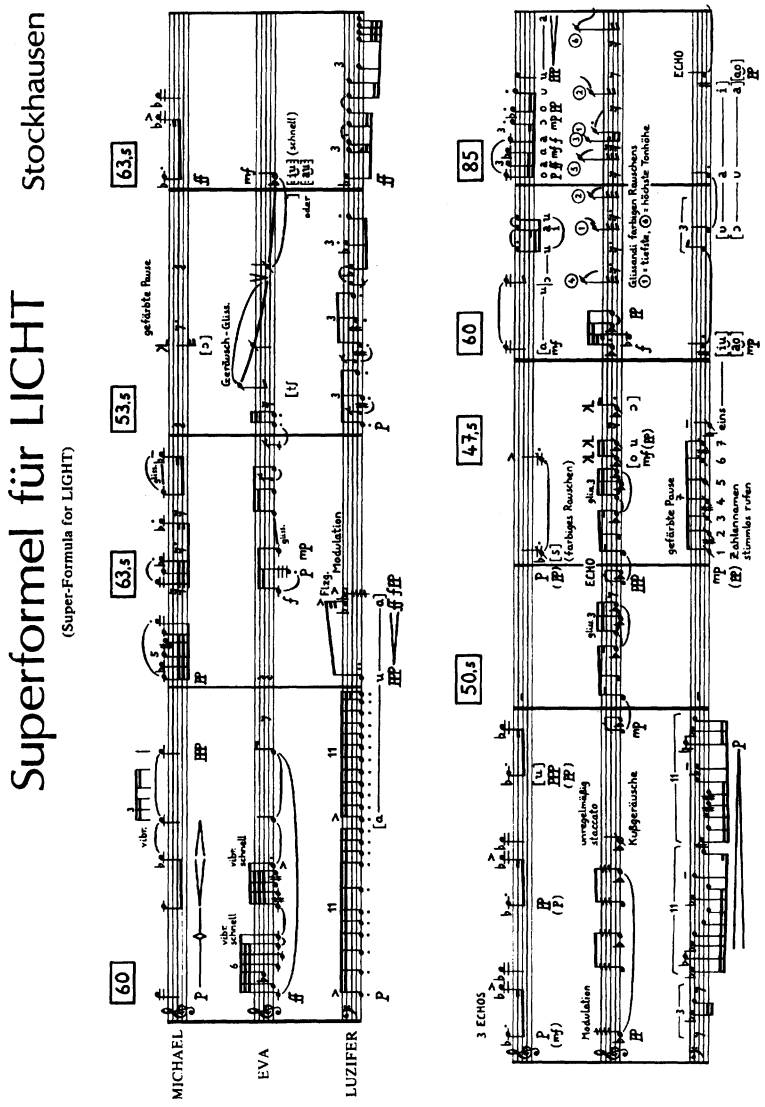
This summary is made in such a way that some syntax-like relationships can be formulated:

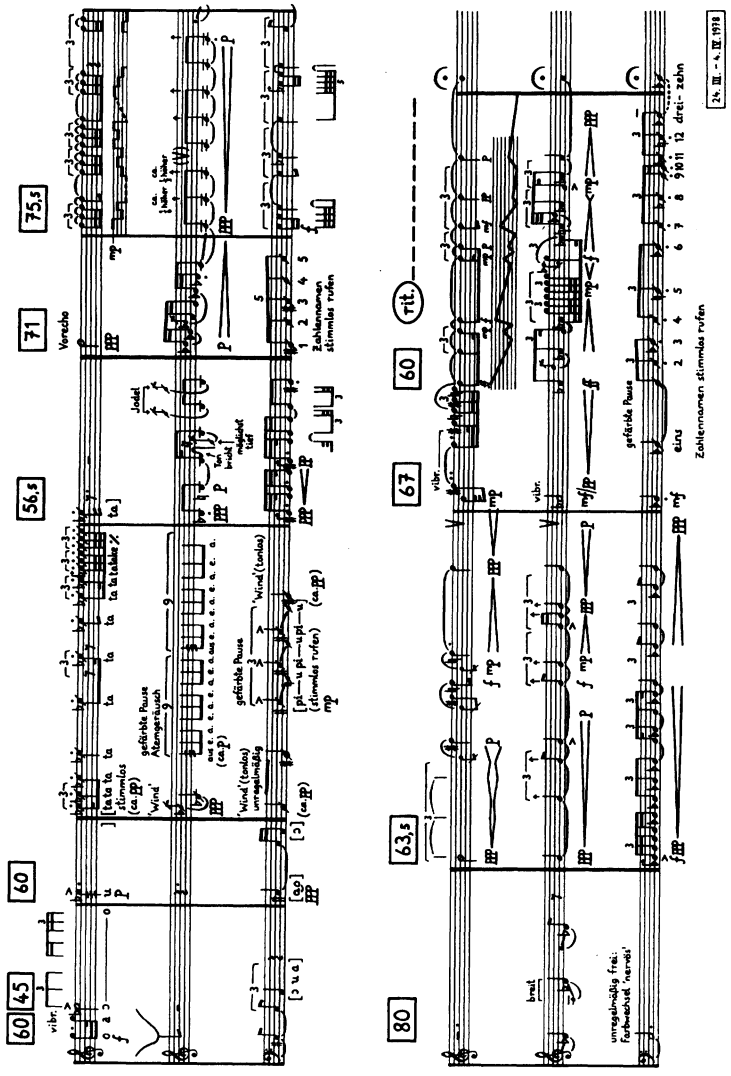
- from the perspective of a category, you can compose its elements;
- an element is expressed in terms of its parameters;
- every parameter is expressed in terms of the elements of all the previous categories.

This means that, e.g., from the perspective of form, you can compose moments; a moment is expressed in terms of organization and tendency; these two parameters are expressed in terms of points and groups (it is about the organization of points, of groups, and of points and groups together, and so on).

2.4.3. CONSTRUCTION PRINCIPLES

Material has to be shaped in order to create a composition. One can find three important construction principles in Stockhausen's writings:





EXAMPLE 3: *LICHT* FORMULA

1. serialization
2. form genesis
3. formula-projection

By *serialization* I mean the strict sense of "serialism" as a composition method: putting the values (or ratios) of a parameter into a a particular order, as Schönberg did with the twelve chromatic tones. In Stockhausen's case the number of parameters has increased enormously, as has been shown in the previous subsection. With the "series" the composer can give a work its particular characteristics. Serialization is based on the continuum image and the assumption of progressive relativity. Important are the proportions and the necessity that all possible values are represented equally.

Form-genesis is Stockhausen's principle that every work asks for its own, individual scheme. He worked this out in his 1961 article "Erfindung und Entdeckung" (Stockhausen 1963, 222–58 [1961]), in which the ways to generate form are reduced to nine types of form-genesis, which have become known as the *Neunerschema* (Kirchmeyer 1963)[9] (Stockhausen 1963, 250–51 [1961]). Stockhausen presented this scheme as shown in Example 4 (translated and explained by myself) and suggested that every one of these three groups can be combined with another (e.g. point-variable-moment, or collective-determined-development form).

1. point forms	formed with points
2. group forms	formed with groups
3. collective forms	formed with collectives (e.g. clusters)
I. determined forms	formed with determined structures
II. variable forms	formed with indeterminacy of performance
III. polyvalent forms	formed with many possible "paths"
A. development forms ("dramatic")	formed according to a dramatic structure
B. concatenation forms ("suite")	structures in succession
C. moment forms	formed with moments

EXAMPLE 4: THE *NEUNERSCHEMA*

The *Neunerschema* is not without problems. The basic difficulty is that form has been considered as material already (see section 2.4.2, in particular the paragraph on "moment"), and systematizing form would

suggest a parametrization of form. Kirchmeyer tried to submit the *Neunerschema* to a superimposed parameter "periodicity" as shown in Example 5 (Kirchmeyer 1963, 153). The problem with this interpretation is that it is not clear why, e.g., a dramatic form ("development") is more periodic than a suite form.

elements	collective	group	point
connection	determined	variable	polyvalent
form	development	concatenation	moment
(general:)	*periodicity* ⟵		⟶ *aperiodicity*

EXAMPLE 5

The solution is to view the Neunerschema as a temporary summary of what Stockhausen had achieved in 1961 by applying his basic genesis idea. This idea, that each composition has its own scheme, "which is typical and unexchangeable and asks for completely individual methods of composition" (Stockhausen 1963, 250)[10] is clearly a construction principle which can be traced throughout his whole *oeuvre* until today and which is based on the relativity assumption.

As stated before, the *formula* is material as well as a construction principle. The formula is projected on a larger scale in order to determine the total form of a work. Examples are *Mantra*, *Inori*, and *Licht* (hybrid examples are *Sirius* and *Harlekin*; see Conen 1991, 40 and 57).

At this point, however, Stockhausen's theoretical writings actually stop. Stockhausen has never explained in detail the concept of projecting a formula on a large scale, has never explained the composition process of deriving the total form from one formula. He only mentions the idea, and one is left with the sketches and compositions to deduce the technique behind. Research has already been done toward clarifying this construction principle, mainly by Hermann Conen (1991) and Jerome Kohl (1990). But, considering the purpose of this article, taking Stockhausen's writings as the main source, we can only consider the idea of formula projection in general and place it in the perspective of Stockhausen's assumptions and images. Formula projection as a construction principle, then, seems to be based on the progressive relativity assumption and stresses the exchangeability between micro and macro level structures in an even more penetrating way than ever before. Stockhausen summarizes many aspects of his paradigm in relation to this technique: "[the formula] mirrors exactly my view on man and my mind's view on beings, on

stones, on trees, on everything I experience. . . . Also a single man is not isolated, but he is the manifestation of very large processes in the cosmos; and within a galaxy, within a solar system milliards of people are only the expression of a certain movement and of a spiritual orientation within this movement and of the internal patterns of the processual development. Myriads of so-called human lives or other lives are nothing but atoms within a covering whole" (Stockhausen 1989b, 426 [1982]).[11]

3. Conclusions

Two things have been demonstrated here, one related to Stockhausen, the other related to the paradigm approach.

What seems to be demonstrated in the first place is that Stockhausen's thinking has its own merits, containing a certain consistency. It has become clear that some assumptions and basic images are maintained throughout his writings (see Example 6 for a summary).

In his earlier years Stockhausen emphasized technical details, explained his working material and construction principles explicitly. Later he concentrates more on the fundamental assumptions and working principles, which are not different from the ones he had before, but are only stressed more. It is clear that the "big shift" in the early seventies in Stockhausen's writings is nothing more than a shift of attention in his paradigm from the technical side to the more philosophical side; but it still is the same paradigm.

The paradigm approach has not only made it possible to detect this consistency, but also points to a basically new approach in musicology, especially in cognitive musicology. Instead of analyzing a composer's work in terms of style, in which the pieces themselves are the indisputable sources, the paradigm approach takes the values, principles, and images as main sources. This gives rise to creating "possible" or "virtual" music, based on such a paradigm, independent of the existing works of the analyzed composer. It not only aims at understanding or explaining a composer's work, but goes beyond that by opening up new paths in music.

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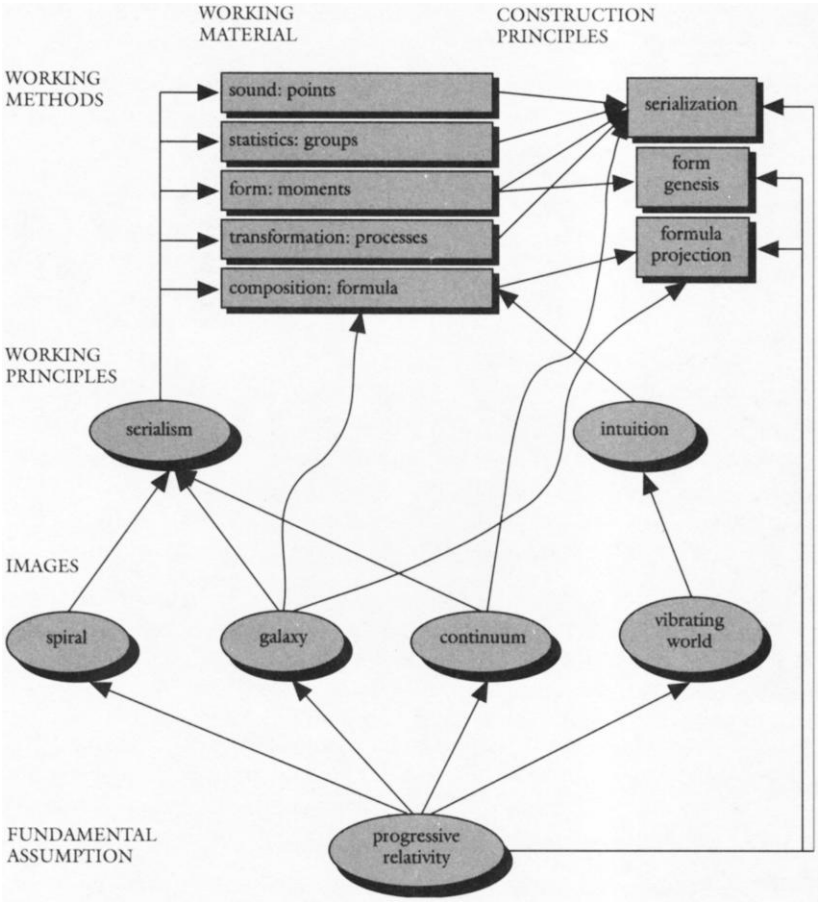

EXAMPLE 6: STOCKHAUSEN'S PARADIGM

Notes

1. "Meine Texte sind immer Kommentare zur Musik."
2. The applicability of Kuhn's concept of revolution to the history of music is another subject, which I hope to clarify in the near future in a separate article.
3. In the references to Stockhausen's *Texte,* the year in which the article was actually written or first published is added, enclosed in square brackets, after the page reference.
4. Commonly it is assumed that human perception has some absolute limits, like the "just noticeable difference" in pitch intervals. Stockhausen assumes that there are no absolute limits, and that one is always able to change one's perceptional limits by exercise. Stockhausen is very conscious of his disagreement with perception research: "I use intervals which are even smaller than the Pythagorean comma, let's say the interval from 800 to 810 cycles per second, which is normally not considered to be perceivable. That's not true at all, you can certainly perceive it" (in Cott 1974, 89). It does not make sense to argue that Stockhausen's theoretical constructs would not be perceivable, as some critics of his early articles did (for example Karkoshka 1965, 13), because the assumptions are different.
5. "Wenn ein Mensch etwas Akustisches erlebt, wird er verändert, weil er durch die Schwingungen moduliert wird, seine ganze Atome werden moduliert."
6. "ein neues System, in dem kleine Teilsysteme mit je einem Mittelpunkt dargestellt werden—wie Sonnensysteme mit ihren Planeten und Monden—, und wobei das große System wie eine Galaxie ist, die viele Sonnensysteme hat."
7. "Ich kann heute solche Musik richtig aufschreiben! Das habe ich vorher nicht gekonnt: ich kannte sie ja gar nicht."
8. The terminology "individual-dividual" is originally Paul Klee's (Klee 1924, 13–15), whose theoretical work Stockhausen was acquainted with.
9. The term *Neunerschema* was first used by Helmut Kirchmeyer in his article on *Kontakte* from 1963 for the record of this work on the Wergo label. The article was republished in *Neuland* 3 1982/83. It seems that the term *Neunerschema* was never used by Stockhausen.

10. "Das typisch und unverwechselbar ist und ganz individuelle Kompositionsmethoden verlangt."

11. "[Der Formel] spiegelt genau mein Menschenbild und mein Geistesbild von Wesen, von Steinen, von Bäumen, von Menschen und von allem, was ich überhaupt erlebe. . . . Auch der einzelne Mensch ist überhaupt nichts Isoliertes, sondern er ist die Manifestation ganz großer Prozesse im Kosmos; und innerhalb einer Galaxie, eines Sonnensystems sind Milliarden von Menschen nur Ausdruck einer gewissen Strömung und der geistigen Orientierung innerhalb dieser Strömung und der inneren Gesetzmäßigkeiten der prozessualen Entwicklung. Ganze Myriaden von sogenannten Menschenleben oder Lebewesen sind dann nichts anderes als Atome einer übergeordneten Gestalt"

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