PART II.

AN ANNOTATED ENGLISH TRANSLATION OF

NEUE HARMONIELEHRE
TRANSLATOR'S PREFACE

Due to its broad scope as well as its special subject matter, Alois Hába's *Neue Harmonielehre des diatonischen, chromatischen, Viertel-, Drittel-, Sechstel- und Zwölftel-Tonsystems*, written in 1927, represents an important contribution to music theory. It remains, even today, the only treatise that has attempted to deal in depth with the equal-tempered quarter-tone and sixth-tone systems. Other composers and theorists have written detailed studies concerning microtonal systems without an equal-tempered basis, for example, Julián Carrillo's *Sonido Trece* (1948) and other theoretical works, Adriaan Fokker's *Neue Musik mit 31 Tönen* (1966), Harry Partch's *Genesis of a Music* (1949), and Joseph Yasser's *Theory of Evolving Tonality* (1932), but Hába's work remains the sole example of a composer-theorist who has tried to codify the principles of the twenty-four-tone and the thirty-six-tone systems.

Whether or not Hába succeeded in formulating valid, convincing theories concerning the quarter-tone and the sixth-tone systems is perhaps not the most important issue. The fact remains that in the 1920s, he chose a path of investigation that, at that time, appeared to him to be extremely fruitful and pointed to the music of the future. As historian William Austin states, "It was surely plausible to imagine that the true fulfillment of the famous tendencies towards increasing chromaticism and dissonance would be neither twelve-tone technique nor organized sound, but rather a breakthrough to some new
scale of pitches with more than twelve degrees in an octave."¹

Although the hope of many microtonal musicians such as Hába—that their work would be acknowledged and their music widely played—was never realized, the importance of their vision cannot be denied. But, as Mosco Carner comments, "That his path has proved a cul-de-sac is perhaps the tragedy of Alois Hába."²

The text of Neue Harmonielehre poses a challenge to the translator for a number of reasons. Hába writes in a colorful, flowery style; however, his sentence structure does not always follow standard grammatical rules, and there are incorrect verb tenses and punctuation marks. Also, Hába uses an excessive amount of foreign words and phrases and invents words. In addition, many names cited in the treatise are misspelled, titles are cited inaccurately, and the numbering of the musical examples is frequently inconsistent.³

It is necessary to point out some of the terminology frequently used in the translation. The terms "dyad," "triad," "tetrad," "pentad," "sextad," and "septad" are utilized to indicate two-note to seven-note (pitch class) sonorities, regardless of the intervals utilized in them. The terms "secundal," "tertian," "quartal," "quintal," "sextal," and "septal," are used to indicate the type of interval that comprises a particular sonority. (A sextal sextad, for example, is a six-note


³ The problem of Hába's periodic lack of historical accuracy and his misinterpretation of factual data has been discussed in the second chapter of Part I of this dissertation on pages 43-44.
sonority built of sixths.) Chords with more than seven notes are labeled "-note chord;" Arabic numerals are used in this expression in order to avoid the double hyphenation of names of some chords that occur in the microtonal systems. The expression "-step" also uses Arabic numerals. Some microtonal intervals are written as fractions for the sake of readability; therefore, a "twenty-seven-sixth tone," for example, is given as a "27/6 tone." Finally, the terms "whole tone" and "half tone" have been utilized in the translation instead of the more common expressions "whole step" and "half step;" this has been done in order to conform to the other expressions utilized in regard to the division of the whole tone into smaller parts, for example, quarter tone and third tone.

The punctuation markings used in the translation follow the original treatise as closely as possible. Italics are used in the translation for the sections of text in which Hába uses larger type, for the names of musical pitches (e.g., c - e - g) and for foreign expressions; both italics and underlining are used in the translation for sections of the text that Hába himself italicizes. Parentheses that appear in the original text have been omitted if they impair the readability of the text and if the information contained in them is important to the sentence; however, they are retained if they set off parenthetical thoughts. Brackets have been used by the translator for added words, but not to show added articles, conjunctions, punctuation, and other types of alteration of the original German text essential for the idiomatic translation of sentences into English.

The main source of the dates, names, titles, and other factual information used in the translation is Baker's Biographical
Dictionary of Musicians, sixth edition (1978). The sources used for problematic information not found in Baker's Biographical Dictionary were Die Musik in Geschichte und Gegenwart: Allgemeine Enzyklopädie der Musik; Riemann Lexikon: Personenteil, twelfth edition (1959) and its Supplement (1972); The American Heritage Dictionary of the English Language, 1975 edition; and Jiří Vysloužil's Alois Hába: život a dílo [Alois Hába: Life and Work]. Incorrect factual information has been corrected within the text of the translation and the original, inaccurate information given in a footnote. Full names of individuals referred to by Hába are included only the first time the individual is mentioned; later citations give only the last name of the individual, unless the full name is again stated by Hába.

In the translation, footnotes appear in two places on the page. First, Hába's footnotes, which appeared in the original text at the bottom of the page (each indicated by the designation "1") are included with an asterisk, and are set up as block quotations. Second, footnotes by the translator are placed at the bottom of the page and arranged consecutively beginning with each chapter, using Arabic numerals. These footnotes by the translator serve several purposes: they point out incongruities with known facts or practices and clarify certain terminology that Hába utilizes in the work; they also give additional factual information regarding Hába's work and the work of other composers and theories mentioned in the treatise and point out cross-references that occur in the book.

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Two indexes compiled by the translator have been added at the end of the translation. The first one, a General Index, includes the names of individuals and their works mentioned by Hába, as well as general subjects that arise during the course of the treatise. The second index, an Index of Terms, lists most of the important and often unusual terminology that is utilized in the work.

In *Neue Harmonielehre*, Hába makes use of the standard octave designations shown below:

The musical examples (numbered consecutively by Hába beginning with each chapter) and the figures (unnumbered) are reproduced in this translation from the original text by permission of the publisher Fr. Kistner & C. F. W. Siegel & Co. of Cologne, West Germany. Short vertical lines have been added by the translator to some of the musical examples to help set off the captions of the individual sections.

The following abbreviations have been used on occasion in the musical examples because of the scarcity of space to insert the entire English equivalent of the German captions:

A, aug: augmented

asymmetr: asymmetrical
ch: chord
chrom: chromatic
constr: construction
contin: continuation
d, dim: diminished
deg: degree
div: division
dom: dominant
func: function
inv(s): inversion(s)
invt: inverted
M, maj: major
m, min: minor
mid: middle
neut: neutral
oct(s): octave(s)
pos: position
pt(s): parts
sc: scale
st: step
sus: suspension
symmetr: symmetrical
t: tone
tetr: tetrachord
transp: transposed
transpos: transposition
The standard abbreviations "e.g.,” "etc.,” "ex.,” Hz,” "i.e.,” and "No." as well as the so-called "pop" symbols (a capital letter standing for a major triad and a capital letter plus a lower case "m" standing for a minor triad) have also been utilized in the musical examples. The abbreviations "1st," "1.,” and "I." are used in various places by Hába to designate the ordinal number "first;“ this holds true for abbreviations of larger numbers. In order to save space, periods have not been used at the ends of these abbreviations.

Hába's *Neue Harmonielehre* proves itself to be interesting and thought-provoking reading not only for the theorist but for the composer and musicologist as well.
NEW THEORY OF HARMONY

of the Diatonic, the Chromatic,

the Quarter-tone, the Third-tone,

the Sixth-tone, and the Twelfth-tone Systems

by

Alois Hába

Translated from Czech [into German]

by the author.

Revised by Dr. Erich Steinhard

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FOREWORD

Usually, an overture is written only after the opera has been completed.

It is also more suitable to think of a preface to a theoretical work as a conclusion rather than as a beginning. The author can still discuss different issues that he has not mentioned during the treatise. In fact, in the foreword, he can act as his own critic. This is really the intention of my preface.

I have written this theoretical treatise about the half-tone, the quarter-tone, the third-tone, the sixth-tone, and the twelfth-tone systems from indulging in the pleasure of combining tones. After all, if a creative "urge" exists, it is a simple matter: one must get rid of his thoughts by expressing them or writing them down. They burden and cause a feverish condition of the brain if they cannot be put into concrete form.

Creative work is; above all, a hygienic function of the brain. Afterwards, peace of mind is gained somewhat and other thoughts and plans can ripen in the imagination.

The laws of intellectual productivity are apparently, in principle, the same as those of animal-like sexual lust and productivity. The seeds of thought also yearn to take on form. In every art form, the proper creation is a surplus of intellectual potency.

After theoretically establishing how I think of tonal material and conceive the arrangement of tones, it is still possible for me to
establish several important connections with the theoretical views of those theorists who have had a decisive influence on me.

As an eighteen-year-old youth I read a theoretical treatise by the Czech\(^1\) theorist and composer Karel Stecker.* He established the following axiom: *every tetrad can be connected directly with every other tetrad and with every triad of every key—without a preparatory modulation.*

My first composition teacher, Vítězslav Novák,* was a student of Karel Stecker.

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\(^1\)The Czechs were a tribe of people who inhabited the region of Bohemia. Later, the inhabitants of both the regions of Bohemia and Moravia were called Czechs. Czechoslovakia was the name given the new country formed in 1918 when the Czechs and the Slovaks were united.

Czech is also the name of the language spoken by most Bohemians and Moravians. It was formerly called "Bohemian."


\(^3\)Ibid. *Allgemeine Musikgeschichte* was published in two volumes in 1894 and 1903 in Prague in Czech, *Die Lehre von der Orgel-Improvisation* was published in 1903, and *Die musikalischen Formen* was published in 1905 in Prague in Czech.

According to *Baker's*, another text entitled *Die nichtthematische Improvisation* was also published in 1903 in Prague in Czech.
*Vítězslav Novák, born on 5 December 1870 in Kamenit, Bohemia. Student of Josef Jiránek (student of Bedřich Smetana), Stecker, and Dvořák. Since 1909, a teacher of composition at the Master School of the Prague Conservatory. His musical works (operas, orchestral works, piano works, Lieder, chamber music, and choral music) have appeared in Universal-Edition (Vienna), Simrock (Berlin), Urbánek (Prague), and Umělecká Beseda (Prague).

Stecker. He was no doubt aware of Stecker's axiom and expanded it in the following way: not only every triad and tetrad, but every pentad or sextad, can be connected directly with every pentad and sextad and with every triad and tetrad of every key—without a preparatory modulation.

A short time ago I learned from the conductor Vaclav Talich another axiom that the Czech theorist and composer František Skuherský* (teacher

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4Novák died on 18 July 1949.

5According to Baker's Biographical Dictionary, 1978 ed., s.v. "Vítězslav Novák," Novák was a teacher at the Prague Conservatory from 1909 to 1920 and then a professor of composition at the Master School of the Czech State Conservatory from 1918 to 1939.

6Hába uses the name Wenzel, the German equivalent of Václav.

7According to Baker's Biographical Dictionary, 1979 ed., s.v. "František Skuherský," Skuherský published several fundamental texts in Prague on music theory in Czech including O formách hudebních (1873), Nauka o hudební komposici (4 vols., 1880-84), and Nauka o harmonii (1885). It can not be clearly established whether all or any of the German titles that Hába lists are merely translations of these texts. It is possible that any or all are translations.

According to Riemann, Musikalische Formenlehre was published
of Karel Stecker) had set up: every triad is possible on every scale
degree of every key.

Stecker's principle is an expansion of Skuherský's principle,
and Novák's principle is an expansion of Stecker's principle.

My axiom states: every tone can be connected (be brought into
relationship) with every other tone of every tonal system. Every chord
of two or more tones can be connected (be brought into relationship)
with every chord of two or more tones of every tonal system.

This axiom is a logical extension of the axioms of Skuherský,
Stecker, and Novák.

Now, I would like to establish the impact of the axioms of
Skuherský, Stecker, and Novák. According to Jean-Philippe Rameau's
axiom, every scale degree of the major and the minor scales, in the
strict tonal sense of the major and the minor keys, has a specific,
unique triad:

Ex. 1.

\[ \text{Ex. 1.} \]

The major triad is stably connected with the first, fourth, and
fifth scale degrees; the minor triad can be used on only the second,
third, and fifth scale degrees, and the diminished triad on only the
seventh scale degree. This is the harmonic arrangement in the strict
tonal sense.

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in Prague by Mikuláš Knapp in 1879 in German and Harmonielehre was
published in German.
What practical consequences does Skuherský's axiom have? This can be clarified by a concrete example:

Ex. 2. [*]

[*] Every accidental applies to only one tone.

Every triad can be constructed on every scale degree of the major scale. This example shows the disintegration of Rameau's theory of scale degrees, the disintegration of the narrow concept of the key in the diatonic sense, and the establishment of the key in the sense of the chromatic tonal system. Moreover, Skuherský's axiom represents the fundamental concept of tone centrality rather than tonality. Several triads—not just a single triad—can be constructed on every tone.

Skuherský's axiom is the first creative theoretical thought since Rameau's axiom. All other theorists after Rameau have textbooks, but no theories of harmony.

Stecker's axiom has the following practical consequences:

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*Hába makes use of the designation "chromatic tonal system" in the sense of a system that utilizes chromatic tones (half tones), rather than in the sense of a traditional tonal system that has a tonal hierarchy. In the treatise, the word "tonal" is frequently utilized in the sense of "tone."

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Ex. 3.

Stecker shortens the distance from the dominant of F-sharp major to the dominant of E-flat major (see + in Example 3, a. and + in Example 3, b.).

Ex. 4. a. and b. In Stecker's sense

c. Or, according to Stecker, not suspensions or passing tones, but four separate tetrads.

The clear-cut theoretical foundation and explanation of Richard Wagner's harmony lies in Skuherský's and Stecker's axioms.

Ex. 5. Richard Wagner, Tristan und Isolde ["Prelude," mm.2-3.]

It is noteworthy that while the theorist Stecker already grasped Wagner's art with his axiom some twenty-five years ago, the theorist Ernst Kurth--twenty years after Stecker--had neither found nor clearly formulated a precise theoretical law concerning Wagner's music in his book Romantische
 Harmonik und ihre Krise in Wagners Tristan.\footnote{This treatise was published in Berlin in 1923. The name of the publisher was unable to be determined. (A reprint edition was published in Hildesheim by G. Olms in 1968.) Hába incorrectly lists the title of the book as Die romantische Harmonik.}

How many misunderstandings might musicology of the last quarter-century have been spared if Skuherský's and Stecker's ideas written in Czech had found their way abroad at the right time and in a more accessible language?

According to the general level of European music theory at this time, however, I feel that these ideas still do not come too late. In fact, they have become of immediate interest only now.

Vítězslav Novák's theoretical axiom applies to most of the music that has arisen in the last quarter century. \footnote{As Hába explains later in the text, when he uses the plural first person pronoun, "we," he is referring to himself.} We\footnote{As Hába explains later in the text, when he uses the plural first person pronoun, "we," he is referring to himself.} want to show in a practical example what Novák believed as a theorist.

Ex. 6.

Novák said that a pentad can be divided into a triad and a dyad, and these two groups logically can move to a new chord in contrary, in parallel, or in similar motion. He divided a sextad into two triadic groups and taught his students to move the individual groups logically (see Example 6).
Novák had found no term for this group-like movement within sextads. Today, the phenomenon that was suggested theoretically and also partially realized in Novák's works is called polyharmony. It is found in Richard Strauss' opera Electra,\footnote{Electra, Op. 58, written in 1909, was performed for the first time on 25 January 1909 in Dresden.} in the two operas by Arnold Schönberg,\footnote{Presumably, Hába is referring to Schönberg's only two stage works written by the time of the publication of this treatise in 1927: Erwartung, Op. 17 (1909), a monodrama was performed for the first time on 6 June 1924 in Prague, and Die glückliche Hand, Op. 18 (1909-13), a drama with music was performed for the first time on 4 October 1924 in Vienna.} and also in Franz Schreker's operas. Later on, the French moderns (Darius Milhaud and others) also used polyharmony.

Leoš Janáček's theoretical views should also be mentioned in connection with Novák's theoretical views.* Already in 1878, Janáček

was engaged in the study of the publication *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* by Hermann (Ludwig Ferdinand) Helmholtz. As Janáček said in the foreword to his *Vollständige Harmonielehre*, he had, at that time, already found Helmholtz's explanation of the relationship of tones on the basis of overtones to be unsatisfactory, especially with regard to the succession of chords. Janáček admits that the connection of successive chords and a feeling of their continuity could be explained on the basis of the relationship of the tones (through the overtones), but only if every tone of every instrument contained all its overtones and if all chords immediately followed one another.

Why is it, however, that even those chords that are separated by rests, that are only remembered, or that just occur to us, do not lack continuity? Janáček poses this question and asserts that Helmholtz's conception of the relationship of tones does not especially suffice as an explanation for the continuity and logic of creative musical ideas. In Janáček's opinion, the composer's musical thoughts are not as brilliant and lively as their actual realization; nevertheless, they contain a certain tranquility and are logically bound to one another. A composer does not have to hurry to the piano in order to make sure of what has occurred to him. He possesses a secure awareness about the effects of his musical thoughts. The listener also senses the continuity and the charm of the melody.

Janáček draws the following conclusions from these considerations: the continuity of imaginary musical occurrences lies in the central creative impulse that lives—and dies—in the succession of tones. The relationships of tones growing out of this central impulse
overcome and fill the intervals of time (rests) and unify the musical conception of the chords. If the overtones were the most important reason for the connection of chords, the smallest rest would destroy this connection. On the other hand, one knows from experience that it is precisely the rests that complement the abundance of tonal life. Even if the short reverberation of tones is not taken into consideration, associative relationships occur.*

*I agree with Janáček's statements and believe that musical thinking is subject to the same associative laws as every type of thinking. Also, the assimilation of musical ideas forms the basis for the association of sensorial perception and memory. Time is unimportant for the effect of creative propulsion. A work of art arises in stages, often only after several years, and it still has continuity and logic. Indeed, it is even possible after centuries to establish a continuity and a logic between older musical thought and new musical ideas. Variations on old themes, arrangements of chorales and fugues, etc., prove this. Therefore, e.g., the same process applies to other philosophical thoughts. Time does not sever intellectual connections. The terms, "old music," "new music," and "modern music," etc., have only historical value. At most, one tries to indicate the succession of thoughts that arise. Similarly, every composer can say that the day before yesterday these three sides occurred to me, yesterday these two sides, and today these four sides. The connection between the creative deeds of individual creators occurs by an associative process within a larger scope. One event necessitates the other event. [In the article "Die Beziehungen zwischen der alten und modernen Musik" that appeared in the Neue Musik-Zeitung 45, no. 8, (1924) [:200-205], I had already written something similar: "The young, most creatively gifted musicians have striven at all times to grasp the sense of the older development and have consciously chosen the widest paths of development from the broadest knowledge from the past. It does not matter from whom these ideas come."

Schönberg writes in his Harmonielehre, "If nearness teaches dissimilarity, then distance teaches community. If the present shows the divergence of personalities, a small distance shows the similarity of the mediums of art; a large distance suspends both perceptions and shows the personalities as indeed different, but it also shows what really binds them."

Dr. Lotte Kallenbach-Greller states her viewpoint
in the following manner, "I represent the standpoint that the continuum of culture is formed by the versatility and diversity of the endeavors by the individuals." See the foreword of her treatise Grundriss einer Musikphilosophie: nebst kritischer Darstellung des Buches von Paul Bekker, "Von den Naturreichen des Klanges" (Berlin: Breitkopf & Härtel, 1925).

All the statements mentioned say in different manners of speech, in one and the same way, that the connection between different thoughts is based on their association. I emphasize that time is no hindrance for the connection of thoughts, and in this sense emphasize the general truth and validity of Janáček's views.

Janáček mentions in the preface to the second edition of his Vollständige Harmonielehre that he had already written down these basic ideas in 1881. In 1914, he found physiological-psychological proof for his views in the works of Wilhelm Wundt (Grundzüge der physiologischen Psychologie, Leipzig: Engelmann, 1912).

Janáček constructs his theory of harmony (the theory of chordal connections) on psychological foundations. He believes that the sense of connection between chords (and between the individual tones of a melody) is rooted in the interlacing of the reverberation of the first chord with the ringing of the second chord and in the loosening of this interlacing. He differentiates between the ringing and the reverberation of a tone. The tones are connected as long as they can be compared in a listener's memory. This type of remembrance is also sufficient for making comparisons and it forms a means of connection. Janáček illustrates the interlacing in the following manner:

[Ex. 7.]

No. 1. denotes the reverberation of a tone that has sounded, No. 2. is the new tone that is already ringing.
The interlacing of tones is undoubtedly short, however, it produces an effect. The loosening between the two tones occurs when the reverberation of a certain tone fades away (Ex. 7, 1.); the ringing of the sounding tone dominates (Ex. 7, 2.).

The reverberation of a tone or of a chord lasts almost three-tenths of a second. After a tenth of a second the volume of sound drops to one-tenth its original intensity.

According to Janáček, the interlacing of the two types of ringing mentioned above is the binding agent between tones and chords.

Janáček considers tetrads, pentads, sextads, and septads as variations of the triad. He says: The impression of a triad can be "solidified" by the addition of the seventh, ninth, eleventh, or thirteenth.

[Ex. 8.]

Later, Janáček states: a triad can be "solidified" by the use of all intervals and their combinations, and all harmonies can be "solidified" by the use of all harmonies.

[Ex. 9.]

Janáček's two basic laws clearly and precisely express the
essence of modern harmony. In his Harmonielehre, Schönberg points out the nonsense of the designation "non-harmonic" tones. In the appendix of his Harmonielehre, he shows several novel chords, however, without a clear theoretical law. It is unfortunate that Schönberg knew nothing of Janáček's theoretical laws that had been formulated earlier! These laws encompass the essence of harmonic freedom (polyharmony, polyphony of harmonies, polytonality, atonality).

Janáček's two basic laws can be applied to my entire theory of harmony of the new total system with its expanded practical consequences.

Thus, the theorists Skuhrs ký, Stecker, Novák, and Janáček belong to that group of creative theorists who, beginning with Rameau, produce a variety of new original theoretical ideas that reappear, in my Harmonielehre, as a synthesis and expansion in regard to practical musical creativity.

Schönberg has expanded the concept of polyharmony through the employment of groups of 6-note to 12-note chords.

I came up with the construction of a 12-note chord when I was still an autodidact. In 1913, when still a teacher at an elementary school in a Slovakian village, I wrote a symphonic work that I ended with a 12-note quintal chord:15

15 The composition to which Hába is referring is the symphonic picture Mládí [Youth] for large orchestra. According to Jiří Vysloužil in his biography, Alois Hába: Život a dílo [Alois Hába: Life and Work] (Prague: Panton, 1974), pp. 30-44 passim (hereafter cited as Vysloužil, Alois Hába), the work was written during the period 1913-1914 and was completed on 10 February 1914. This early work was not given an opus number.

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I did not join the composition class of Vítezslav Novák in Prague until a year later. At that time I still knew nothing of Schönberg. The fact that later on I had no difficulty understanding Schönberg's music should be evident from the above remark.

As far as I know, Novák wanted to write a harmony book at that time, but he did not do so. I also feel obliged to pass on the theoretical ideas that I learned from him.

Schreker also wanted to write a harmony book (even in 1920), but as his student, I never heard him voice a single theoretical opinion. In 1923, I learned from Prof. Georg Schünemann that Schreker experimented with triadic and tetradic harmonies trying to discover which of them could best be mixed (in the polyharmonic sense). Because my Harmonielehre deals with polyharmony as well as the possibilities of polyphony of harmonies, I am mentioning Schreker's theoretical experiments, even though they were not worked out in writing. I was intimidated by the strict harmonic and contrapuntal training according to the principles of Rameau and Johann Joseph Fux that I received from Richard Stöhr in Vienna before joining Schreker's composition class. My study with Schreker loosened me again and that is to his credit. I possessed tendencies towards the modern sound much earlier, however, and I had got-
ten modern harmonic training from Novák. That is the whole secret why I
developed into a radical after half a year with Schreker.

My two older brothers, Josef and Vincenz, did me a great service,
for if they had not practiced intoning "false"\textsuperscript{16} tones with me during my
childhood, my quarter-tone and sixth-tone music would not have come
about, and without a clear idea of microtonal pitches I also would not
have been able to create the theory of the new tonal system. I have
repeatedly proven in public lectures (in Prague, Frankfurt, Dresden,
Leipzig, and other cities) that I can sing quarter tones, third tones,
sixth tones, and twelfth tones. While I was writing the theory of the
third-tone, the sixth-tone, and the twelfth-tone systems, no instrument
that could produce the pitches of these tonal systems was available to
me. I wrote the first sixth-tone quartet in 1923.\textsuperscript{17} I formulated the
theoretical foundations of my third-tone and sixth-tone systems before
the composition of the string quartet.

I spoke about the sixth-tone system with Ferruccio Benvenuto
Busoni a year before his death. He said that he wanted to compose some-
thing in this system, but that he wanted to wait until a sixth-tone
harmonium was built so that he could hear what sixth tones sounded like.
A few years ago he brought back from America reeds tuned in sixth tones
in order to build a harmonium. Unfortunately, Busoni died before the
sixth-tone harmonium was built in Berlin. Prof. Schünemann wrote to me
recently that the Hochschule für Musik [in Berlin] now owns a sixth-tone
harmonium that was built by the firm of Schiedmayer in Berlin in 1925.

\textsuperscript{16} Hába is referring to microtonal pitches, which are "false"
when compared to half tones.

\textsuperscript{17} \textit{String Quartet No. 5}, Op. 15, written in 1923.
The firm of August Förster (Löbau in Saxony [and] Georgewsalde, Czechoslovakia) designed and built a quarter-tone piano according to my specifications in 1924. The first quarter-tone concert grand piano is owned by the Prague Conservatory. The school of quarter-tone composition was founded under my direction at this conservatory in 1923.\(^ {18}\)

I gathered from Busoni's remarks that he possessed no conception of sixth tones or of the combination of tones in the sixth-tone system. That is why he could not create sixth-tone music. Busoni's remarks also confirm my contention that it is impossible to create a work of art if the artist does not possess a clear conception of the tonal material with which he wants to work. If he has unsatisfactory concepts of the tones, he must make use of an instrument that contains the scale degrees of the tonal system under consideration. If he does not possess such an instrument, the artist is left with only a creative yearning. And so it was with Busoni.\(^ {19}\)

I took a lively interest in Busoni's ideas that concern the building of new scales (see his Entwurf einer neuen Ästhetik der Tonkunst).\(^ {20}\)

\(^{18}\) This date is somewhat misleading. When Hába was hired to teach at the Prague Conservatory in 1923, he taught a course entitled, "Musical scientific seminar for experimental acoustics, oriental music, and musical analysis," basically a theory course. Although the following year Hába changed the course to "Freely accessible courses in quarter-tone music," it was only in 1934 that a true school, a Department of Composition of Quarter-tone and Sixth-tone Music headed by him, was established at the Prague Conservatory. See Vysloužil, Alois Hába, pp. 155-156.


\(^{20}\) Hába incorrectly referred to this treatise as Entwurf einer neuen Musik-Ästhetik.
I am indebted to Prof. František Spilka who, in his instruction at the Prague Conservatory, encouraged his students to form new scales. He said that every composer is able to set up several scales and to compose with the tonal material of the new scales. As will be seen, in my treatise, Prof. Spilka's stimulus has produced results.

What arises first, the theory or the music? First, a yearning exists. The creative musician forms the theoretical foundations and afterwards creates the work of art. Those musicians who have no goals of their own learn the existing theoretical foundations before they are able to create a work of art. The view—first practice and then theory—is not correct with regard to the arising of a work of art. Furthermore, it must not be forgotten that a musically gifted individual learns the laws of music through imitation analogous to the way that a child first learns a language through imitation. He accepts the laws mechanically and unconsciously by listening to music. The compositional attempts of the autodidact and the epigone confirm this. In most cases, the most gifted composers possess some theoretical view (with regard to form, the relationships of tones, and other factors). They usually create the consequences of their view, i.e., the works of art, and conceal the theories or attach no importance to formulating them. The degree of theoretical consciousness also varies, and often a clear understanding of them emerges only later—after the work is completed. Schönberg, for example, could not always comprehend immediately or in advance what he had realized in musical form. Schreker and Richard Strauss also did not always approach their work with full consciousness and theoretical certainty. Doing this causes doubts about the correctness of one's work. Unsympathetic criticism from the outside world often adds to the inner chaos.
and the insecurity of the creative man. However, it forces the creative man to prove and to justify himself.

The creative musician is not always able to communicate all his ideas to his students, especially those ideas that he himself wants to form someday. He is not always capable of deciding which ideas he would like to work on himself. He is usually anxious to pass on his theories in a worked-out rather than improvised form. Those ideas that are in their developing stages need time to ripen, and the consequence of this is silence.

Can musicology extract the maximum of a composer's theoretical views from his musical works? In my case, hardly. If I had not written this Harmonielehre, no one would believe that a conscious and clear ordering forms the basis of my music. Moreover, it is almost impossible to extract scientifically an orderly system from the free choice of tonal material that is found in my musical works. The difficulty lies in the fact that the musical works do not represent the maximum employment of my theory, but only a partial employment of the theoretical possibilities. Why does the creative musician theorize? He does so in order to more fully understand himself and other musical creators more fully. That is the ethical reason for it. As far as the method of theoretical formation of tonal systems is concerned, I state that I deviate from those working methods that are scientific and impersonal and that appear to be objective and are meant to be subjective. In this book, I stand behind the general foundations of my theories with my personal conviction. When I use the word, "we," during the text, I mean myself above all. Some reflections are meant as self-analysis and completely lack the intention of being generalizations.

I consider my booklet, Von der Psychologie der musikalischen
Gestaltung: Gesetzmäßigkeit der Tonbewegung und Grundlagen eines neuen Musikstils (published by Universal-Edition), to be a supplement to this Harmonielehre. In this treatise, I formulated the theory of vibrations as the broadest basis of musical formulation. I wrote the treatise in 1923, a year after my harmony book on the quarter-tone system written in Czech. In the preface to the 1922 harmony book on the quarter-tone system I stressed that I would write a theoretical work of greater scope in the near future. Now, I have done so.

Certainly, I could conceal the miserable beginnings of my musical development and instead emphasize my present qualities. I am partially indebted to my teacher Vítězslav Novák for not having done this. As a teacher, he never boasted of his artistic qualities in front of his students. On the contrary, if he saw that we felt desperate and discouraged, he would tell us how many times he had struggled arduously. Schreker also did the same thing. I am sincerely thankful to my teachers for possessing so much modesty. They did not kill their students through their own greatness; they encouraged them through human sincerity. I have followed the example of my teachers. I have felt obligated to show that artistic development requires much effort and love of work.

21 This 56-page booklet was translated from Czech into German by Josef Löwenbach. It was originally published in Prague in 1925 under the title O psychologii tvorění, pohybové zákonitosti tónové a základech nového hudebního slohu.

22 Hába is referring to his 40-page book, Harmonické základy čtvrttónové soustavy [Harmonic Foundations of the Quarter-Tone System] (Prague: Hudební Nátice Umělecké besedy, 1922).

An examination of this treatise reveals that some of its material is included in Hába’s article "Die harmonische Grundlage des Vierteltonsystems," Melos (June 1922):201-5, 212-13.
I could also conceal Stecker's and Novák's theoretical ideas and enter them into my account. It has been the custom among composers up to now to take over an idea whenever possible. Recklessness and unscrupulousness has been the typical behavior of young composers. Usually, they even have the courage to degrade those creators whose ideas they have used and from whom they have learned either directly or through their works.

The idolizing of the master often changes into contempt. Understanding fails to appear.

I have attempted otherwise, striving to show a genuine picture of my development. The reader should know how much the energy of others directly or indirectly contributes to the development of the creative man. The active, creatively gifted artist is an intellectual capitalist. He differs from the material capitalist in the sense that he presents the maximum of his energies and those of others who contributed to his development to his fellowmen in the works of art. He is a Communist in the best sense of the word. He usually pays materially for his Communism. He is exposed socially and is, on the financial average, much worse off than every manual laborer. Today's copyright laws cannot be labeled as "ideal." Unproductive people misuse the intellectual energies of the creative musician.

Even musicologists, the "interpreters" of works of art, are better off than he is. Anton Bruckner, e.g., could not get a teaching position at a university for a long time. Today, those people who write books about him are materially in more favorable positions than he was.

I have nothing to say about the practicing artists, concert agencies, and publishers. There are also honorable exceptions in these
categories who, at large risk, promote the recognition of artistic values.

Creative musicians do not always possess "formal" academic training. Their scholarly, scientific accomplishments are often criticized only for that reason. Ironically, someone who writes a dissertation concerning a composer's musical and theoretical works and has the required number of semesters at a university can become a doctor of musicology. Prof. Arnold Schering spoke at the Congress of Musicology (Leipzig, 1925) about the relation of the creative musician to the musicologist.\(^{23}\) I agree with his statements, but the representatives of musicology will also have to correct their viewpoint about the composer.

How do the ideas mentioned in this theoretical treatise stand in relation to present-day creations? At the moment, they are "out of fashion" so-to-speak. Several European composers are again composing in C major, even without modulation. What do I want at this time with twelfth tones? Most contemporary composers are occupied with a "revival" of the old art.\(^{24}\) Would it not be better to propagate the old art as it is--in its original form--and to create a new art? Has it harmed Richard Strauss, by any chance, that he admires Wolfgang Amadeus Mozart's art? Even so, he created *Electra* and *Salome!* He has not tried

\(^{23}\) Schering's statements from the Congress are contained in the article entitled, "Musikwissenschaft und Kunst der Gegenwart," included in the Deutsche Musikgesellschaft, *Bericht über den 1. musikwissenschaftlichen Kongress der deutschen Musikgesellschaft*, Leipzig, 4-8 June, 1925 (Leipzig: Breitkopf & Härtel, 1926), pp. 9-20.

Hába delivered a lecture at the same Congress entitled, "Welche Aufgaben bietet die Vierteltonmusik der Musikwissenschaft?," that is contained in the same publication on pages 304-11.

\(^{24}\) Hába is referring to the neo-classical movement taking place at that time.
to "revive" Mozart!

I have chosen a different path than my contemporaries, not the revival of an old style, but the expansion of the conception of the elementary foundations on which even the old art is built.

In this sense, I believe that the theoretical ideas that are presented here will accomplish their function by stimulating young composers.

Alois Hába
I. MELODIC AND HARMONIC FOUNDATIONS
OF THE DIATONIC AND THE
CHROMATIC TONAL SYSTEMS

The discussion of natural and cultural values is time-consuming
and also strenuous, but it promotes the intellectual productivity of
man.\textsuperscript{1}

\textsuperscript{1}This assertion is certainly a truism. I experienced
it and understood it because of my own development. I
still remember the moments of my life which preceded the
writing of this treatise. My musical development from
childhood has passed with the quickness of a film. I
began with rhythm. As a five-year-old child I played
the snare drum with the orchestra in my birthplace, Vizo-
vice (Ger.: Wizowitz),\textsuperscript{2} during intermissions at the the-
ater. My father and my three older brothers, who were
farmers and village musicians, played clarinet, flute,
violin, and accordion. At six years of age I learned to
play the violin. My repertoire included folk songs and
dance pieces by popular Czech composers. Easy church
music of Czech composers and organists. Participation
on violin in the "florid" masses at the small town
church. A strong impression from several pieces of
church music written by Jan Vyskocil who lived in my
birthplace (district official, violinist, and self-
taught composer). A "discovery" in my twelfth year: Mr.
Jan Rychlik (called Rychlichek), a cobbler (violinist,
violist, and baritone hornist in the Vizovice orchestra
as well as its conductor who also saw to the ordering of
music, instruments, and strings). He owned a harmony
book (in Czech, whose author I have forgotten). He lent
this harmony book to me. He also gave me a smaller collection

\textsuperscript{2}This village is located in Eastern Moravia in a region called
Wallachia.

\textsuperscript{1}The following short autobiographical account by Hába is written
in incomplete sentences very much like a diary. According to Vysloužil,
Alois Hába, p. 66, Hába did keep a diary, at least during his days in
Vienna.
of organ preludes of several Czech composers of the eighteenth century. He had the violin sonatas of Johann Sebastian Bach and admired the technical difficulties of these pieces. Therefore, this was my first encounter with artistic music of better quality. I meticulously studied the harmony book mentioned earlier. Thus, I gained my first insight into the "secret" of the "pre-luding" which I so admired as a nine-year-old to twelve-year-old boy that our organist Jan Vastatka possessed. Now, I knew how "harmonies" were made. At fifteen I went to Kroměříž (Ger.: Kremsier) in Moravia to attend the teacher's training college. Theory instruction with Prof. Stanislav Šula. (He studied theory for a short time with Vítězslav Novák, teacher of composition at the Master School of the Prague Conservatory). Choral singing, choral society concerts, and orchestra concerts in Kroměříž, the music newspaper Hudební revue with analyses of musical works by Josef Bohuslav Fürster, Novák, Rudolf Karel, and other contemporary Czech composers. Expansion of the concept of "musical art" and the knowledge of the Czech masterpieces of modern times. 1910: I hear the Czech Philharmonic for the first time. Bedřich Smetana's Má Vlast and Wagner's Tannhäuser Overture. I noted whatever I could write down in haste during the concert. I experienced the craving for culture of a gifted small-town man. Music history from the Czech theorist Stecker with classes located in the library of the teacher's training college, set up when he and the other masters had finished with their music studies. Increasing melancholy and fear that it would not be possible for me to study at the Prague Conservatory because I was poor. 1912: Assumed a teaching position in Bílovitz (in Slovakia). Starved as a student, incapable of engaging in studies in Prague without receiving funds immediately. Compositional attempts at sixteen years of age. Imitate Franz Drdla, Fritz Spindler, Jaroslav Kočíán, and Antonín Dvořák (pieces for violin and piano). First, wrote dance pieces for the dancing lessons of the students. A little later, imitated Friedrich Kuhlau sonatinas. As an elementary school teacher, study (Carl Wilhelm Julius) Hugo Riemann's Kontrapunkt with the help of a Czech-German dictionary. Autodidact. Attempted an orchestral fantasy. Aside from that, free improvisational playing on the violin; combinations of complicated chords that I would utilize only later as a mature artist (without fear of old, strict theoretical rules). 1914: Decision to study in Prague. Left for Prague with the last passenger train before the mobilization. Enrollment in Vítězslav Novák's composition class at the Master School of the Prague Conservatory. Finally, proper training. Analysis of Bach's, Ludwig van Beethoven's, Johannes Brahms', Hector Louis Berlioz's, Dvořák's, Smetana's,
Fibich's, Novák's, Förster's, Josef Suk's, and Otakar Ostrčil's works. As a student of Novák, wrote piano music and chamber music. 1915: Entrance into military service. Interruption of studies. Voluntary night-duty with the military in order to be able to compose during the night by candlelight in the hall of the barracks. 1917: Officer candidate school in Vienna. Fear that I still did not know the old theory well. Acquaintance of composer Jan Brandts-Buys. Recommendation to Prof. Richard Stöhr (theorist, composer in the Fuxian tradition). During one night, worked out all the assignments in Richard Stöhr's harmony book and brought them to him at the first lesson. Ordered into the "music history division" of the war ministry. Acquaintance of Franz Schreker's students. Entrance into his composition class, which safeguarded the developmental freedom of every student. Swift progress. Continuation of my private work with quarter tones that began as a soldier in 1915. 1919: First string quartet written in quarter tones. 1920: A student at the Hochschule für Musik in Berlin. Prof. Schäthemann, an ideal advisor. The historical matters that concern the quarter-tone system made me aware, stimulated me to a study of Oriental music, brought me to experimental acoustics and helped me become acquainted with its methods. It is not easy for a man from a village to find an environment where his talent can be developed. I was poor, but I had some luck.

The reasons for the usage of different tonal systems according to the predisposition of men, and usually it cannot be stated at all. Very often, we make no reply to the question, "Why?" In my case, the following applies:

The more I have come into contact with the "new" music (as it is called), the more certain I feel that this "new" music is very closely associated with the basic elements of the older music.

Most contemporary composers and also a number of musicologists stress the "new," the "dividing factors" when trying to differentiate one type of "new" music from another and from the creative techniques of the older composers.

\[3\text{String Quartet No. 2, Op. 7, published in 1921.}\]
My disposition drives me to seek the common aspects and to become conscious of the "dividing factors" in order to be able to progress to the "common factors."

Two questions especially concern me: a) out of which fundamental theoretical formations of the older theorists does the so-called "modern" sound arise and which principles of organization do the diatonic, the chromatic, and the bichromatic (quarter-tone) systems have in common; b) which stylistic traits does the music written in these systems have in common.

I have tried to answer the first question partially in the Czech edition of the "quarter-tone harmony book" (Prague: Hudební Maticí Unlůcké besedy, 1922) and partially in the article, "Die Beziehungen zwischen der alten und modernen Musik," in Neue Musik-Zeitung 45, no. 8 (1924): 200-205.


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4 Hába is again referring to his book, Harmonické základy čtvrttonové soustavy.

5 Hába incorrectly calls this booklet, Von der Psychologie des Schaffens, der Bewegungsgesetzmäßigkeit der Tonmaterials und den Grundlagen eines neuen Musik-Stils.

6 This collection of articles was edited by H. Grues, E. Kruttge, and E. Thalheimer.
In the article just named, I stressed that the ancient Greek theorists set up certain tones and intervals as the goal. In this way, they founded the basis of a conscious music culture for Europe, i.e., the possibility of conscious, not accidental creation.*

*Dr. Lotte Kallenbach-Greller formulated the concept of conscious creation in the following manner: music as form is conceived in the best creative sense. See her article, "Formprobleme der neuen Musik," Deutsche Kunstschau 1, pt. 20 (1924) and her treatise, Grundriss einer Musikphilosophie: nebst kritischer Darstellung des Buches von Paul Bekker, "Von den Naturreichen des Klanges" (Berlin: Breitkopf & Härtel, 1925). In addition, we want to make our statement clear regarding two essential functions of tonal psychology: the conscious discriminating of pitch levels and scale degrees (so-called perfect pitch) is an ability in the sense of perfect vision. This ability alone is not creative musical ability; it is not identical to the concept of "thinking" in the creative sense. By "thinking" we understand the following matters: (1) the ability to transform a part of the general inner (psychic) excitability into tonal connections, i.e., into a musical form (this is creative-musical talent) and (2) the ability to be able to form a tonal continuity with tones rhythmically, melodically, and harmonically; this is combinational ability, command of tonal material in the sense of compositional technique.

As a living being who responds consciously or unconsciously to the events of life, every man has psychic emotions. Not every man possesses a strong ability to show his emotion in a tonally visible form (musical form), i.e., not every man is creatively gifted musically. Every man, however, can learn the combinational possibilities and develop his own combinational ability with regard to tonal material. This ability can be regarded as an end in itself, as combinational play. The musically creative man, however, develops his combinational ability mainly for the purpose of helping him represent his emotional tendencies. It is impossible to indicate all the details of one's inner emotional condition; "expressing" cannot be the issue. Whoever maintains that he can express all his feelings musically is lying to himself. Whoever honestly tries to express his feelings musically in all their complications realizes the impossibility of this endeavor. Every emotion can be expressed only by itself, not by the tonal material. The form-building element of my music is my knowledge that life constantly produces new living situations, in
man and in all of nature. This synthetic knowledge enables me to create an absolute, superior musical form. I give expression to my basic feeling by always creating new sounds and by shaping new forms. Understandably, for that I need the most active combinational ability, and then I can deal with the formation of new sounds and forms. My emotions do not prevent me from superior sonic formation; instead, they always support a newly experienced perception that life produces new situations. My emotions stimulate my combinational abilities, and I get ideas. The conscious perception and the ability to conceive with regard to the tonal qualities facilitate the realization (the writing-down of the diverse sounds for which I have strived). Therefore, not my feeling for detail, but my knowledge of the law of life (of change) is the basic element of my music. I place the diversity of life (as an expression of creative vitality), as opposed to the diversity of sounds, as an expression of my knowledge of the law of life and of change. Thus, my musical form is as innately sovereign as is life itself. Only the ideas of change are common to both.

No doubt, it should be the task of musicologists to establish whether ancient Greek theorists were aware of these facts.* Above all,

*It does not always follow that every man or every generation is conscious of the implications and the sense of his or its deeds.

it has been important for me to grasp the fundamental relationship between the quarter-tone music and the half-tone music. By demanding from myself and eventually also from others the conscious building of quarter tones, I am closely bound up with the roots of the European musical culture. The difference consists only in the fact that the quarter-tone system deals with not only the twelve tones that we have controlled up to now but with twelve additional tones.

Now, I will show how I conceive the building of successions of tones carried out by ancient Greek theorists and will present my views concerning the harmonic and melodic ordering of the half-tone and the
quarter-tone systems in the music-theoretical sense.

I instinctively felt that I should investigate the mentality embodied in early European music before I decided on the fundamentals of the quarter-tone system.

My nature generally shows an instinctive reverence for the talents of the older culture, and I have striven with faithful trust in the old theory to gain the closest possible contact with the old mentality.

A creator who has not experienced the feeling of stretching out his hand over the centuries to older creative generations will have difficulty understanding that a creative person who feels called to a new development humbly seeks the most intensive contact possible with the past and avoids an arrogance in spirit because it is the only danger by which he could be dragged away from the right path.

It also can be observed how harmful and confusing the constant emphasis on the "new" has been for the musical development of the last fifty years. Unfortunately, creators who created the new compositions have not succeeded in stressing the cultural connections strongly enough, and partially because of this, their way of creating has been misunderstood.

It is necessary to consider once again the simplest elements in order to understand the relationships between the earliest music and the present music.

We know that the tetrachord represents the fundamental construction out of which the different scales developed. For the sake of easier orientation, I mention the most important Greek tetrachords that formed the starting point of my own study:
1. \( b - c - e \), the enharmonic (Olympic) tetrachord,
2. \( b - c - c^\# - e \), the chromatic tetrachord,
3. \( b - c - d - e \), the diatonic tetrachord,
4. \( d - e - f - g \), the Phrygian tetrachord,
5. \( c - d - e - f \), the Lydian tetrachord,
6. \( b - \frac{1}{4}\text{tone} b - c - e \), the enharmonic tetrachord.

The tone \( e \) was considered the tonic of the diatonic tetrachord (No. 3). We can conclude that the ancient Greek theorists were particularly concerned with the upward striving of the beginning tone \( b \) to the tone \( e \) (through the interval of a perfect fourth).*

*Dr. Lotte Kallenbach-Greller notices that the upward striving of a basic tone through the interval of a perfect fourth in the 12-note quartal chord set up by Schönberg and the harmonic consequences which follow from it in Schönberg's music; our statements are based on the assumption that the upward striving of the basic tone through the interval of a perfect fourth (to the tonic) also forms that basic law of Greek tonal theory. (See Klangwerte der modernen Musik by Dr. Lotte Kallenbach-Greller, published in Leipzig by Kahnt-Verlag.) I have subjectively established at the end of this discussion that I do not feel an upward striving in any single tone or chord; however, it is possible for the creative musician to use as many kinds of progressions and intervals as a tonal system offers. Because every tone of the diatonic, the chromatic, and the bichromatic tonal systems (and all tonal systems in which the octave forms the basic measure) can strive in both directions (to the lower and to the upper octave tone, \( C - C - C^1 \), and through all diatonic, chromatic, and bichromatic scale degrees into which the octave is divided), we can also renounce the concept of "inversion." If one wants to refer to nature, then we find that all overtones (the octave, and perfect fifth, the perfect fourth, and major third, etc.) have only one direction (an upward striving),

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7 Hába states later in this treatise (page 170n) that the word "tetrachord" is utilized to describe "a group with any number of tones that occupies the interval of a perfect fourth.

8 The date of this publication is not given in the text and cannot be determined.
one of rising pitch levels. No doubt, the inversion (in the direction of descending pitch levels) is a technical compositional matter. Within the limits of an octave, one could speak of complementary intervals instead of invertible intervals: the perfect fourth complements the perfect fifth in the octave measurement; likewise, the diminished fifth complements the diminished sixth in the octave measurement; the major third complements the minor sixth in the octave measurement and vice versa:

\[
(c' - g - c') \quad (c' - f^\# - c') \quad (c' - e - c') \quad \text{etc.}
\]

It is also known that, at that time, two tetrachords were combined in the following way: \( b - e - a \).

This basic construction of perfect fourths played a significant role in the formation of the Greek scales.

These scales were as follows:

1. \( c - d - e - f - g - a - b - c \)  \( \text{Lydian scale} \)
2. \( d - e - f - g - a - b - c - d \)  \( \text{Phrygian scale} \)
3. \( e - f - g - a - b - c - d - e \)  \( \text{Dorian scale} \)
4. \( f - g - a - b - c - d - e - f \)  \( \text{Hypolydian scale} \)
5. \( g - a - b - c - d - e - f - g \)  \( \text{Hypophrygian scale} \)
6. \( a - b - c - d - e - f - g - a \)  \( \text{Hypodorian scale} \)

9 The displacement of one tone to a different octave (octave transposition), "interval complementation," is sometimes also called "interval inversion." (See a. below.) What Hába refers to as "interval inversion" is also called "intervalic mirroring." (See b. below.)
7. $b - c - d - e - f - g - a - b - (c)$ Mixolydian scale

In addition, we know from the historical tradition of music that every tone of the first scale could be conceived as the beginning and the ending points of a new scale. Therefore, the second, third, fourth, fifth, sixth, and seventh scales arise from the Scale No. 1.

It is also known that the Greeks formed and used two kinds of tone rows (scales). Certain scales designated the range of one or more melodies. (Helmholtz calls such tone rows "accidental scales." ) Other tone rows (even those scales mentioned earlier) were bounded below and above by the tonic. (Helmholtz calls them "essential scales.")*

*See Helmholtz, Die Lehre von den Tonempfindungen, pp. 438-39. 10

My own views will be given following this listing of the most important elements of the ancient Greek theorists. First, let us consider the first to sixth tetrachords.

1. All these tetrachords have the range of a perfect fourth.

2. Because the last tone of a tetrachord was conceived as the tonic, it can be assumed that the Greeks felt that the upward striving through the interval of a perfect fourth was the major consideration and set it up as an axiom.

3. The first to sixth scales show that the Greeks adhered to two axioms for the formation of scales: they either set up two tetrachords separated by the interval of a whole tone and combined them to

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form a scale as we can see in the first, second, and third scales

\[ (c \quad f \quad g \quad c, \quad d \quad g \quad a \quad d), \quad \text{1st tetr} \quad \text{2nd tetr} \quad \text{1st tetr} \quad \text{2nd tetr} \]

\[ \text{whole-tone interval} \]

\[ e \quad a \quad b \quad e), \quad \text{or they set up two perfect-fourth tetrachords} \quad \text{1st tetr} \quad \text{2nd tetr} \quad \text{interval} \]

that shared a common tone and added a tone below that served as the
tonic of both tetrachords, as is the case in the fourth, fifth, and
sixth scales:

\[ \text{mid. tonic} \quad \text{mid. tonic} \]

\[ \left( f \quad g \quad \text{c \quad d \quad g \quad f}, \quad \text{lower 1st tetr} \quad \text{2nd tetr} \quad \text{lower 1st tetr} \quad \text{2nd tetr} \quad \text{lower 1st tetr} \quad \text{upper tonic} \quad \text{upper tonic} \quad \text{tonic} \quad \text{tonic} \right) \]

\[ \text{mid. tonic} \quad \text{mid. tonic} \]

\[ \left( \quad \text{e \quad a \quad e}, \quad \text{2nd tetr} \quad \text{tonic} \quad \text{tonic} \right) \]

In Scale No. 7, I am interested in something different than the tetrachords in the Greek sense as they are labeled with brackets in the earlier examples. The two tritone steps \( b - f - b \) that occur only in the seventh scale caused the Greek theorists difficulty, which they overcame in a very clever way by theoretically making the seventh scale conform to the structure of the first scale:

\[ \text{interval} \quad \text{add} \]

\[ \text{b \quad c \quad f \quad g \quad \text{2nd tetr added tone}} \]

It seems important to me that the scale

\[ b \quad c \quad d \quad e \quad f \quad g \quad a \quad b \]

\[ \text{1st half} \quad \text{2nd half} \]

has the tone \( f \) in the middle and that it consists of two diminished fifths; therefore, the scale is composed of two tritone tetrachords.
The first, second, and third scales, on the other hand, have a whole tone in the middle and, furthermore, contain two symmetrically set-up perfect-fourth tetrachords.

\[
\begin{array}{ll}
1\text{st tetr} & 2\text{nd tetr} \\
\underline{a} & \underline{b} \\
\underline{c} & \underline{d} \\
\underline{e} & \underline{f}
\end{array}
\]

The fourth scale \((f \ a \ b \ c \ d \ e \ f)\) also has two tritone steps, but it can be divided without difficulty into two connected perfect-fourth tetrachords with the tonic tone \(f\) theoretically added below.

It is very interesting that the fourth, fifth, and sixth scales were conceived as structures of two connected tetrachords with the tonic tone added below \((4. \ f \ g - c - f, \ 5. \ g \ a - d - g, \ 6. \ a \ b - e - a)\). The exchange of tetrachords is easily discovered when the succession of tetrachords of the fourth, fifth, and sixth scales is compared with the succession of tetrachords found in the first, second, and third scales:

1.) \(c - f \ g - c\), 2.) \(d - g \ a - d\), 3.) \(e - a \ b - e\)
4.) \(f \ g - c - f\), 5.) \(g \ a - d - g\), 6.) \(a \ b - e - a\)

Furthermore, the perfect fourth tetrachordal intervals, \(c - f\), \(d - g\), and \(e - a\), form the first and fourth (the Lydian and the Hypolydian scales), the second and fifth (the Phyrgian and Hypophrygian scales), and the third and sixth scales (the Dorian and the Hypodorian scales) respectively. We can conclude from this that, for the ancient Greek theorists, the perfect-fourth tetrachords, and therefore, the perfect fourth itself signified the concept of relationship. This has also been indicated by the naming of the scales.\(^\text{11}\)

The Mixolydian scale (No. 7) is an exception. It can contain

\(^{11}\)This relationship is indicated by the use of the prefix hypo-.
either of two important tetrachordal formations: \( b - f - b \) (two tritone tetrachords) or \( c - f - b \) (a perfect-fourth and an augmented-fourth tetrachord). Furthermore, the tetrachordal formation \( f - b - e \) (a diminished fifth and a perfect fourth) can be derived from the Hypolydian scale (No. 4).

Summarizing, the following basic harmonic structures can be set up from the ancient Greek theory of tetrachords:

**Triads:** \( g - c - f, f - b - e, b - f - b, c - f - b, \)

transposition of the triad \( g - c - f \) (\( a - d - g \) and \( b - e - a \)),

**Tetrad:** \( c - f - g - c \) and its transpositions \( d - g - a - e \) and \( e - a - b - e \).

We know that in the melodic sense the so-called feeling of tonality was not prevalent in ancient Greek music and that melodies did not always respect the tonic (by the use of common beginning and ending tones).

The axioms of the ancient Greek theorists lead directly to the most significant developments of modern music. Debussy, as well as Schönberg, has again made the fourth relationship of tones the starting point for melodic and harmonic combinations. While Schönberg's music is written almost exclusively in this way, Debussy's music, except for what was stated before, is still closely associated with the medieval axiom of fifth and third relationships.*

*Furthermore, Debussy also often utilizes Greek scales.

I will return later to the theoretical axioms of the Middle Ages.

I do not know if, and to what extent, Schönberg studied ancient Greek music theory. It is probable that every talented individual newly formulates certain axioms that were set up earlier by other talented individuals.
This is perhaps the only connection between older and younger generations and people of different nationalities and individuals: a connection that is not the passive acceptance of older knowledge, but an active recognition that signifies a feeling of independence in the cultural sense for those who recognize themselves.

Therefore, it will be important to compare some of the ancient Greek theories with those of Schönberg.

The following conclusions are reached:

1. The accidental tone rows of the Greeks (tone rows that contain the intervallic range of a melody) are, according to our interpretation, the same as Schönberg's basic shapes, which contain the intervallic range of a musical piece and have a range larger than an octave.

2. The ancient Greek conception that a melody could begin with an arbitrary tone of a given tonal system and could end with another tone is identical to the concept of atonality in modern music. The so-called accidental tone rows and ancient Greek atonality are the fore-runners of the essential scales and tonality (which is the consideration of a tonal center in the melodic or harmonic sense). In post-Grecian European art, however, the concept of tonality flourished strongly until the atonal music of modern times arose, excluding the polyphonic art of the Netherlands, which, in some ways, stood very close to the concept of atonality, and the Medieval chorale, which was influenced by the Greek musical conception.

3. The ancient Greek theory of perfect-fourth tetrachords is closely connected with the harmonic conception of two or more perfect-fourth tetrachords found in Schönberg's musical works.

Schönberg said very little about quartal chords in his Harmonielehre. I will show these chords in my own conception and explain their
relationships in more detail. In the Greek sense, the 12-note quartal chord $c f b^b e^b a b d^b f^# b e a d g$ could be conceived as a structure of four tonal tetrachords: $b^b c f b^b$, 
\[
\begin{array}{ccc}
\text{tetrachord} & 1\text{st} & 2\text{nd} \\
\text{tonic} & \end{array}
\]
and $d^b e b^b d b e f^# b e e$, and $a d g$.
\[
\begin{array}{ccc}
\text{tetrachord} & 1\text{st} & 2\text{nd} \\
\text{tonic} & \end{array}
\]

In Classical harmony and theory, the four quartal triads, $c f b^b$, $e^b a b d^b$, $f^# b e$, $a d g$ that can be combined to form a 12-note quartal chord can be conceived in the following manner:

$c f b^b$ is the second inversion of the basic chord $f b^b c$ (the first inversion of $f b^b c$ is $b^b c f$), $e^b a b d^b$ is the second inversion of the basic chord $a b d^b e^b$ (the first inversion of $a b d^b e^b$ is $d^b e^b a$), $f^# b e$ is the second inversion of the basic chord $b e f^#$ (the first inversion of $b e f^#$ is $e f^# b$), and $a d g$ is the second inversion of the basic chord $d g a$ (the first inversion of $d g a$ is $g a d$).

In this way, we obtain four tonal triads:

- $f b^b c$ (I, IV, and V steps in F major),
- $a b d^b e^b$ (I, IV, and V steps in A-flat major),
- $b e f^#$ (I, IV, and V steps in B major),
- $d g a$ (I, IV, and V steps in D major).

On the other hand, quartal chords in the Greek sense form the following scalar constructions:

- $b^b c f b^b$ (B-flat major),
- $d^b e^b a b d^b$ (D-flat major),
The keys that are indicated by the two quartal triadic groups (F major, A-flat major, B major, D major and B-flat major, D-flat major, E major, G major) are a minor third apart. Furthermore, the tones $\text{F} - \text{A}^\flat - \text{B} - \text{D}$ ($\text{B}^\flat - \text{D}^\flat - \text{E} - \text{G}$ and $\text{B}^\flat - \text{E} - \text{G}$ ($\text{C} - \text{E}^\flat - \text{F}^\# - \text{A}$, $\text{F} - \text{A}^\flat - \text{B} - \text{D}$) form diminished-seventh chords. (To arrive at these chords, the quartal triadic groups must be read from top to bottom.) These two examples show that even a 12-note quartal chord that gives the impression that it has nothing at all in common with tonality and with the tertian relationship stands in the closest possible relationship to the tonal chordal conception.

The relation of quartal chords to Classical music becomes even clearer when I show that the basic chords $\text{F} - \text{B}^\flat - \text{C}$, $\text{A}^\flat - \text{D}^\flat - \text{E}^\flat$, $\text{B} - \text{E} - \text{F}^\#$, and $\text{D} - \text{G} - \text{A}$ (which I have derived as inversions of the quartal chords $\text{C} - \text{F} - \text{B}^\flat$, $\text{E}^\flat - \text{A}^\flat - \text{D}^\flat$, $\text{F}^\# - \text{B} - \text{A}$, and $\text{A} - \text{D} - \text{G}$) function as the bass tones in the Classical cadence and, in addition, in the indicated successions, offer a very suitable basis of modulation (Example 1):

Ex. 1.

The next example shows this kind of employment of a complete 12-note quartal chord in the Classical sense (by the combination of tertian triads) and in the modern sense (by the combination of quartal...
triads only).

Ex. 2.

Another feature deserves attention. In Classical harmony, the tertian triad and its inversions are stable, consonant chords that need no "resolution." Tertian triads set up on different scale degrees are "connected" to one another. In modern music, quartal triads are also felt as stable, connected with one another, and not "resolved."

Ex. 3.

In general, in the Classical harmony, the quartal triad (or its inversions) resolves into the tertian triad (or its inversions), whereas, in modern harmony, the tertian triad and its inversions resolve into the quartal triad and its inversions:

Ex. 4.
I repeat once more that the stability of the quartal triad is based on the conception of construction of the ancient Greek tetrachordal theory, whereas the stability of the tertian triad is based on the agreement of the most important overtones.

This last conception has been realized in Classical music. The conception of stability without particular consideration of the agreement of the overtones is the foundation of modern harmony and is closely connected with ancient Greek theory. It also remains the basis of the harmony as well as the theoretical arrangement in the quarter-tone system. I will return to this subject during the theoretical formation of the quarter-tone system.

I would only like to stress explicitly that there is no rational reason for intentionally avoiding the tertian triad and for favoring the quartal triad. The use of the tertian triad should also not be avoided in the quarter-tone system. Later, I will explain precisely how tertian and quartal triads can be employed in quarter-tone music.

Before I go into detail about the medieval theory of thirds and fifths and about the formation of the quarter-tone system, I would like to mention several points about connecting of quartal triads. If we fill in the twelve quartal steps with diatonic scale degrees, we obtain the following series of tones:

1. \(c\ d\ e\ f\ g\ a\ b\)
2. \(c\ d\ e\ f\ g\ a\ b\)
3. \(c\ d\ e\ f\ g\ a\ b\)

The parts that are labeled by brackets form the following Greeks scales:
Even this example traces the construction of the quartal 12-note chord back to the ancient Greek tetrachordal theory with its diatonic filling-in of perfect-fourth tetrachords.

The melodic employment of successive perfect fourths that are filled in by diatonic pitches is frequently found in Russian and Slovakian folk songs. (The Czech and Russian people were influenced by the old church singing of the Eastern church. As is known, the Slavic\textsuperscript{12} apostles Saints Cyril and Methodius who belonged to the Greek (Eastern) church brought the Catholic religion and church singing to the Czech people, as well as to the Russians.)

Because Czech and Russian art music has grown out of folk music, many characteristic melodic and harmonic features which are not found in German music but are found in folk music can be discovered in the art music of the Czech and Russian composers. This can be traced to the fact that the Slavs were influenced by ancient Greek musical culture, whereas, e.g., the Germans were more involved with Latin musical culture.\textsuperscript{*}

\textsuperscript{*}In addition, we want to point out that the musical development of Western Europe also originated from Greek musical culture. However, the influence of this culture has had a different outcome with the Slavs than with the Romans and the Germans. With the Slavs, the traditional Greek influence persisted for a long time. The Romans, however, tried several times to remodel the Greek theoretical foundations (see the reformation efforts of Pope Gregory I, Glareanus' theory of modes in 1547, and Guido d'Arezzo's hexachordal theory).\textsuperscript{13}

Finally, we refer to our explanations with regard to

\textsuperscript{12}A Slav is a member of one of the Slavic-speaking peoples of eastern Europe. These peoples include the Slovaks, Czechs, Poles, Bulgarians, Ukrainians, and Russians.

\textsuperscript{13}Hába is referring to Glareanus' treatise \textit{Dodecachordon} and to Guido d'Arezzos' theoretical work in his treatises, including \textit{Micrologus de disciplina artis musicae}. 
Examples 101 to 130, which show the influence of Greek music theory on Slovakian folk songs.

Perhaps, it is required of me psychologically to take issue with the fundamentals of the ancient Greek conception of music and [yet] base my quarter-tone system on it.

I notice that, psychologically, I belong more to the East than to the West. Apparently, this can also be felt in my music.

The possible constructions of quartal triads have not been exhausted by the discussion up to now. When we arrange tertian chords and quartal chords (in root position) according to the nearest tonal relationship, we obtain two 6-note groups, each of which contains two 3-note groups which stand in a tonal tertian relationship: \( f - b^b - c \) and \( a^b - d^b - e^b \) in the first 6-note group and \( b - e - f^# \) and \( d - g - a \) in the second group. When the tones of each group are ordered according to rising pitch, two 6-note scales arise:

\[
\begin{align*}
&f \quad a^b \quad b^b \quad c \quad d^b \quad e^b \\
&b \quad d \quad e \quad f^# \quad g \quad a.
\end{align*}
\]

These scales contain the same arrangement of scale degrees and stand in a tritonal relationship (the scale \( f \ a^b \ b^b \ c \ d^b \ e^b \) transposed up or down by a diminished fifth gives the scale \( b \ d \ e \ f^# \ g \ a \)).

If both 6-note scales are combined according to rising pitch, we obtain the following tone row: \( f \ a^b \ b^b \ b \ c \ d^b \ d \ e^b \ e \ f^# \ g \ a \). This tone row is called an accidental scale [in Helmholtz's phraseology], and in Schönberg's writings, it is called a "basic shape." It exceeds the range of an octave and is the logical formation of a 12-note quartal chord in close position. The relationship between the theoretical conception of ancient Greek times and of modern times can also be seen from this
construction. Incidentally, I would like to point out the close connection between quartal triads and the tertian relationship in Classical music. Schönberg avoided this issue in his writings, and that is why the construction of quartal chords was played off against the Classical construction of fifths and thirds, a view which I do not find justified. It is seen that after careful consideration even two seemingly opposite principles of construction can be brought into relationship with one another. After all, up to now there have always been the twelve tones of the half-tone system.

Let us try to set up quartal triads, e.g., on the steps of a major scale:

Ex. 5.

\[ \text{\includegraphics{music.png}} \]

We can see that the lowest voice contains the C major scale, the middle voice the F major scale, and the upper voice the B-flat major scale.

Therefore, we see that tertian triads, as well as the quartal triads, can be chosen as the starting point for polytonality:

Ex. 6.

\[ \text{\includegraphics{music2.png}} \]

(The lowest voice is the C major scale, the middle voice the E major scale, and the upper voice the G major scale.)

It can be seen that both examples consist of transpositions
of the same scale, in this case, the C major scale which occurs as
the lowest voice. (In Example 5, it is transposed up twice by
the interval of a perfect fourth producing quartal triads and in Example
6 by the interval of a major or a minor third producing tertian triads.)

As a precaution against misinterpretation, I will explain the
concepts of tonality and polytonality in this context.

Up to now, tonality meant that melody and harmony could be
derived from one scale, that every derivation was melodically and har-
monically related to the tones of a particular scale.

Ex. 7.

\[
\begin{array}{c}
\text{\textcopyright}\hfill
\end{array}
\]

All the triads (Example 7) consist of tones from the C major
scale and are called "tonal triads."\(^\text{14}\)

Using the Greek names for the scales, the lowest voice (Example 7)
forms the Lydian (C major) scale,\(^\text{15}\) the middle voice forms the Dorian
scale \((e f g a b c d e)\), and the highest voice forms the Hypophrygian
scale \((g a b c d e f g)\).

When so-called tonal (or diatonic) triads are conceived melodically
(as I have already done [in Example 7]), they are the result of three different
superimposed Greek scales; on the other hand, the quartal triads (Example 5)

---

\(^{14}\) Throughout the treatise, Hába uses the word, "tonal," when
discussing structures made up on only the tones of a single scale. He
uses the word in the sense of "diatonic," although he uses it in connec-
tion with diatonic, non-tertian structures as well as diatonic, tertian
structures.

\(^{15}\) Hába is using the names given the scales by the ancient Greeks
rather than names given the scales by the Medieval theorists.
and the tertian triads (Example 6) have arisen out of the Lydian (C major) scale and its twice-repeated transpositions (F major and B-flat major in Example 5 and E major and G major in Example 6). This last kind of superimposition of a basic scale and its transpositions, in this case, the C major scale and its transpositions, F major and B-flat major in Example 5 and E major and G major in Example 6, is called polytonality.

Therefore, the "tonal triads" (Example 7) make use of three different scales (Lydian, Dorian, and Hypophrygian), while the polytonal quartal and tertian triadic progressions (Examples 5 and 6) make use of only the Lydian (C major) scale and its transpositions.

Generations have been accustomed to conceiving the triads that arise from the superimposition of three different scales (Example 7) as "tonal triads," i.e., as triads that (in Example 7) belong to the C major scale. On the other hand, quartal and tertian triadic progressions which use only a single major scale and its transpositions (Examples 5 and 6) are labeled as "non-tonal" (polytonal).

Therefore, it must be assumed that the three scales (Lydian, Dorian, and Hypophrygian) which form the basis of the tonal triads (Example 7) stand in a closer relationship to one another than the basic scale, C major, stands in relationship to its transpositions (F major and B-flat major in Example 5 and E major and G major in Example 6).

This closer relationship can be shown theoretically by the fact that the Lydian (C major) scale is considered the basic scale (c d e f g a b) and that the Phrygian (d e f g a b c), the Dorian (e f g a b c d), the Hypolydian (f g a b c d e), the Hypophrygian (g a b c d e f), the Hypodorian (a b c d e f g), and the Mixolydian (b c d e f g a) scales
are considered *inversions*\(^{16}\) of the Lydian (C major) scale.*

*The principle of inversion that Rameau established for the triad by connecting the sixth chord and the six-
four chord to the root position of the tertian triad also holds true, in the wider sense, for scales (Example 8) and for secundal septads (Example 9), which, according to my conception, represent the closest spacing of the tones of the scales.

This is valid in the horizontal (melodic) sense as well as in the vertical (harmonic) sense:

Ex. 8.

\[
\begin{array}{cccccc}
\text{Root pos} & \text{major scale} & 1\text{st inv} & 2\text{nd inv} \\
\text{3rd inv} & 4\text{th inv} & 5\text{th inv} & 6\text{th inv}
\end{array}
\]

Ex. 9.

\[
\begin{array}{cccccc}
\text{root pos} & 1\text{st inv} & 2\text{nd inv} & 4\text{th inv} & 6\text{th inv} \\
\text{Septad} & 3\text{rd inv} & 5\text{th inv}
\end{array}
\]

**Summarizing, it can be said that tonality can theoretically be traced back to the principle of inversion and that polytonality can be traced back to the principle of transposition.**

**Therefore, atonality would be represented by such triads, for**

\(^{16}\) Today, the more common term for this type of procedure is "circular permutation"—the first element of a set of tones becomes the last one with each permutation, and there is no reordering of the elements.

Composer and theorist Ernst Krenek used the term "rotation" for this procedure.
example, that arise through the superimposition of three different scales which stand in neither an inversional nor a transpositional relation to one another but have been freely invented:

Ex. 10.

Ex. 11.

For the purpose of review, I stress once again that Examples 5 and 6 should be considered theoretical models for the explanation of polytonality, Examples 7, 8, and 9 of tonality, and Examples 10 and 11 of atonality.

Besides polytonality that occurs by the use of the basic scale [and its transposition] (Examples 5 and 6), there is also polytonality that occurs by the use of inversions of the transpositions of the basic scale (Examples 12 and 13):

Ex. 12.

Ex. 13.

Together:
The inversions of the basic scale can be transposed to any scale degree, and, in this way, tertian intervals can be avoided (Examples 14 and 15):

Ex. 14.

1st inv, C scale | 1st inv, F# scale | 1st inv, F scale

Ex. 15

Together:

The basic scale (major and minor) can be transposed and superimposed polytonally on different scale degrees in a way to avoid tertian intervals (Examples 16 and 17):

Ex. 16.

C harmonic minor | F major | C# melodic minor

Ex. 17.

Together:

It is also possible to employ the basic scale (major and minor) of the basic scale with one of its first six inversions polytonally (Examples 18 and 19):
Through the superimposition of different scales at different pitch levels (Examples 16, 17, 18, 19), fascinating irregularities, marked by *),\(^{17}\) arise in the progression and the kind of triads similar to the irregular change of the major, the minor, and the diminished triads which occur in the succession of tonal triads in the major key. As I have mentioned earlier, tonal triads also occur when three different scales are superimposed.\(^{18}\) It can clearly be seen from the preceding examples that old music and new music theoretically make use of the same means of construction, and it is only in their employment that differences are noticed.

Inversion and transposition (both in the wider sense) have become the most important means of construction in modern music. In general, the principle of tertian construction has lost the autocracy that it exerted over Classical music. This may also be the reason

\(^{17}\)The chords marked by *) appear in Examples 17 and 19.

\(^{18}\)On page 22, Hába states that tonal triads occur by the inversion of one basic scale, not by the superimposition of three different scales.
why musicians theoretically brought up on the principles of tertian
time is responsible for this situation to a great extent. Most theo-
tists of that time partially enjoyed fighting against any new develop-
ment and partially lost themselves in theoretical speculation to which
the composers did not react at all.

We have even a higher appreciation of the ancient Greek theo-
rists' musico-theoretical achievements and their significance in the
development of European music when we realize that they gave to Eu-
pean music these fundamentals of construction: (1) the ascending per-
flect fourth with its final tone as the tonic, (2) the diatonic and
chromatic step-wise filling-in of the tetrachord, (3) the employment
of a quarter tone in one of the tetrachords, (4) the connection of two
tetrachords to form a double tetrachord of perfect fourths, e.g.,
b - e - a, (5) the transposition of a perfect fourth tetrachord up
a perfect fifth for the purpose of building an octave scale,
\[ c \rightarrow f \rightarrow g \rightarrow c \], (6) the transposition of the double tetra-
Transposition to the
chord to the diatonic scale degrees of the basic scale (Lydian, major)
by the six-time inversion of the basic scale (see my earlier state-
ments about ancient Greek theory and the naming of the Greeks scales),
(7) the indicated perfect-fourth relationship of the ancient Greek
scales to one another as indicated by the naming of the scales, e.g.,
c d e f g a b c (Lydian) and f g a b c d e f (Hypolydian),
(8) the exchange of tetrachords in the scales that
stand in perfect-fourth relationship to one another, (9) the basic concept of scalar symmetry, e.g., $c \rightarrow_{f} \rightarrow_{g} \rightarrow_{c}$, (10) the accidental scales (see my earlier explanation), and (11) the investigation of the ratios between string lengths and pitch.

It is true that much of the architecture, sculpture, poetry, and philosophy that we treasure highly and admire as perfect ancient Greek culture and as true forms of spiritual expression has been preserved for us.

Unfortunately, we do not look upon ancient Greek music as artistic expression. Nevertheless, from ancient Greek musical culture we have inherited the completely impersonal, abstract theoretical arrangement of tones and the conscious knowledge of this arrangement so that, in our music, tonal formation is conscious, not accidental as it seems to be with primitive tribes.

Generally speaking, ancient Greek music theory is the purest intellectual form of the entire ancient Greek culture, and it is the most valuable thing that Greece left to Western culture. The pure spirit of the Greeks, with its exacting musico-theoretical intellectual power, has influenced countless musical forms of European music. Whereas ancient Greek architecture, philosophy, and sculpture have lost their impact long ago, the spirit of the Greeks is still living today, fertilizing and producing new musical forms.

Therefore, it is not true that music theory arose only after European musical works had been created; on the contrary, European musical works are built on the theoretical fundamentals of ancient Greek music theory.

If music is to develop further organically, the fundamentals of construction of quarter-tone music must now be established.
Let us discuss the half-tone system a little longer, because a truly comprehensive theoretical formation of this system is necessary. Furthermore, let us remember that, even in the Middle Ages, there were very gifted music theorists who prepared new paths for the development of European music. Walter Odington (1275-1320), an Englishman, was the first person who conceived the triad as consonant. His contemporary, Marchetto of Padua, propagated the idea of free chromaticism. Gioseffo Zarlino (1517-1590), the actual founder of harmonic theory, was the first to explain mathematically the major and the minor chords with regard to the five simplest intervallic relationships up and down (*Le Istituzioni harmoniche*, 1558, [Part I], Chapter 15).

\[
\begin{align*}
C & \longrightarrow c \longrightarrow g \longrightarrow c^1 \longrightarrow e^1 \longrightarrow g^1 \text{ (harmonic division, major chord),} \\
g^1 & \longrightarrow g \longrightarrow c \longrightarrow G \longrightarrow E^b \longrightarrow C \text{ (arithmetic division, minor chord).}
\end{align*}
\]

Rameau (1683-1764), whose significance mainly lies in the formulation of a theory about the significance of certain harmonies in a composition and of a theory about the tonal functions of harmony, actually founded the theory of Classical music. He formulated these theories before Classical music reached its height in the musical works of Haydn, Mozart, and Beethoven.

Therefore, even at that time, an important propelling force in musical creation was abstract, theoretical thinking, the logic of musical intuition.

Rameau was the first one to theoretically divide the seven tones of the major and the minor scales into three triads \((c - e - g, f - a - c, g - b - d \text{ or } c - e^b - g, f - a^b - c, g - b - d)\) containing all the tones
of the scales and mutually possessing one common tone which serves as the main support for the interrelationships of the tones:

\[
\begin{array}{ccc}
\text{Subdominant} & \text{Tonic} & \text{Dominant} \\
\{ & f \rightarrow a \rightarrow c \rightarrow e \rightarrow g \rightarrow b \rightarrow d & \}
\end{array}
\]

\[
\begin{array}{ccc}
\text{Subdominant} & \text{Tonic} & \text{Dominant} \\
\{ & f \rightarrow a^\flat \rightarrow c \rightarrow e^\flat \rightarrow g \rightarrow b \rightarrow d & \}
\end{array}
\]

The theoretical tertian system has been established by this basic construction and by the determination of mutual relationships between the triads.

The result of Rameau's work was that the perfect fifth was elevated to the tonal relationship (with regard to the transposition up a perfect fifth of the scale degrees of the major and the minor scales, \(c - g - d - a - e\), etc.), thereby, displacing the tetrachordal relationship of perfect fourths utilized in the ancient Greek system.

Out of the C major scale (therefore, out of an essential scale) and its close position \(c - d - e - f - g - a - b\), a more open position of the tones arises, \(f - a - c - e - g - b - d\), which exceeds the range of an octave, forms an accidental scale, and is also, incidentally, closely related to Schönberg's principle of basic shapes. Therefore, once again, we proceed from tertian construction to ancient Greek theory and Schönberg's theoretical ideas. The difference between a C major scale, a tertian scale which consists of the seven tones of the C major scale, and Schönberg's basic shape which consists of the seven tones of the C major scale, lies only in the type of succession of the seven tones utilized:
Ex. 20.

C major scale | Accidental scale | or

Ex. 21. Basic shape in Schönberg's sense.

The difference between Rameau's conception of tonal tertian construction and the present-day conception lies in the fact that we consider the six tertian intervals $c - e - g - b - d - f - a$ one unit and do not divide this unit triadically and employ it in the same way as it is found most of the time in Classical music. Today, triadic groups following Rameau's construction are not always employed harmonically but are chosen freely from the seven scale degrees.

Ex. 22.

I. Present conception | II. Rameau's conception

I believe that this (Example 22, I.) was already partially Johann Sebastian Bach's conception of tonal formation; sometimes he followed the division of the tonal tertian constructions into three triadic groups (Example 22, II.) but most of the time he used four or five of the six tertian intervals $c - e - g - b - d - f - a$ as a unit. The practical consequences of this are seen in his polyphonic music.*
The first group of Example 22 consists of the sextad $c e - b d f a$; the second group of Example 22 contains the sextad $c e g b d f$.

I hope that I have clearly shown in Examples 1-22 (devised by myself) that, above all, musicology must search out the styles and the stylistic changes found in the various tonal conceptions and, at the same time, learn to master the most important possibilities.

The first and second sections of Example 22 illustrate the difference between the tonal music of Haydn, Mozart, and Beethoven and the seven-tone music (with transpositions), which I call diatonic, that Johann Sebastian Bach developed to its highest point.

Later, I will return to this remark in the discussion of the chromatic system and twelve-tone music.

Now, we want to point out several other possibilities of construction of the basic diatonic scale ($c d e f g a b c$).

I have shown the harmonic construction of a secundal septad and its six inversions in Example 9. This harmonic conception remained unnoticed in Classical and Romantic music and was even forbidden. Only Impressionistic and Expressionistic music (Debussy, Bartók, Schönberg, Novák, and other younger musicians) make periodic use of this kind of arrangement of tones.

Since the discussion about the construction of secundal and tertian septads has been completed, some fundamental things must now be said about quartal, quintal, sextal, and septadic constructions and about constructions built from several different types of intervals.
The first section of Example 23 contains the tones of a quartal septad, the second the tones of a quintal septad, the third the tones of a sextal septad, and the fourth the tones of a septal septad. The same tones are vertically aligned in the first, second, third, and fourth sections of Example 24. By inverting these four constructions, we can produce mixed forms.

In the quartal construction of the first section of Example 24, we successively place the three lower tones up an octave and successively place the three upper tones down an octave.¹⁹

¹⁹For further explanations of this procedure, see pages 109-10. In Example 25, only two of the upper tones are placed down an octave.
The tone d remains (as the middle point during this inversion process) and is not inverted.

In this way, a secundal construction occurs as the fifth inversion of the quartal construction. (It is the sixth inversion of the basic secundal construction \( \text{\textcolor{blue}{\text{\textbf{\textit{}}}}} \).)\(^{20}\)

Example 25 is a clear illustration of the path from quartal construction to the secundal construction.

In the quintal construction (which, by the way, is only a mirroring of the tones of the quartal construction), we can successively invert only the two lower tones up an octave and the two upper tones down an octave (Example 26):

Ex. 26.

\[\text{Eventually:}\]

\[\text{Root pos} \quad \text{1st inv} \quad \text{3rd inv} \quad b \text{ invt} \quad a \text{ invt} \quad \text{2nd inv} \quad 4\text{th inv} \quad \text{down 2 oct} \quad \text{down an oct}\]

By the continuation of the process of inversion (placing b another octave lower and then a an octave lower), the secundal septad is obtained again. (The secundal construction \( f \ g \ a \ b \ c \ d \ e \ f \) in Example 26 is the third inversion of the basic secundal construction \( c \ d \ e \ f \ g \ a \ b \ c \).

The process of inversion of the sextal construction is as follows:

\[\text{\textcolor{blue}{\text{\textbf{\textit{}}}}}\]

\(^{20}\) The basic secundal construction and its inversions are shown in Example 9 on page 24.
Ex. 27.

Root pos  Inversions to the close-position secundal construction

By the use of inversion, the septal construction can also be traced back to the secundal construction:

Ex. 28.

Root pos

Finally, through the process of inversion, the tertian construction can also be traced back to the secundal construction:

Ex. 29.

Root pos  Inversions

I have striven to expand Rameau's principle of inversion that he used theoretically for the construction of tertian triads:

[Ex. 29a.]

Root pos  1st inv  2nd inv
The true significance of inversion remained unnoticed and was not utilized by theorists after Rameau. The application of Rameau's principle of inversion occurred only within the framework of tertian construction. All theorists unconditionally adopted this principle as the basis of harmonic formation and, to some extent, developed it further.

Before going into the discussion of the constructions of the tertian system, I would like to point out that although there were tertian and other constructions shown in Examples 23-29, on the basis of contemporary musical development, the secundal construction must be considered the starting point for all other conceptions (because [the second] is the closest possible position of the diatonic scale degrees) not only melodically but also harmonically. The scale is the foundation of all melodic and harmonic formations. There are not separate laws for the formation of melodies (the scale) and for the formation of harmonies (tertian, quartal, and other systems); the scale (whether it is major, minor, chromatic, or bichromatic, etc.) is the common law for the formation of melody and harmony.*

*Schönberg's basic shape is an artistic structure derived from a scale.

The only thing that must be determined is which tones of the scale will be used harmonically and which tones are used melodically. Again, I must stress that ancient Greek theory has given us everything dealing with the construction of scales.

It clearly follows from the preceding examples that all tonal combinations other than close-position secundal chords are only more open positions or inversions of the fundamental progression of tones of a scale (in Examples 23-29, the C major scale).
Therefore, since all tones are fundamentally equal, every inversion and every position of the given tone can be chosen; in a creative sense, any construction can be used (secundal, tertian, quartal, quintal, sextal, and septal constructions and mixtures of the above). There is no reason (not even with diatonic music) that should necessarily force us in the future to be bound exclusively to the tertian system and to the triadic grouping of tones.

Up to now, in contemporary music, this is still the case to a great extent. No one knows whether it is out of necessity or out of ignorance of other possibilities of construction.

It should not be forgotten that even the young creative generation was raised almost exclusively on the foundations of the tertian system and that the avoidance of other constructions did not come about because of some conscious deliberation by the composer but out of strongly felt loyalty to certain traditional, stable chordal groupings.

At the present time, this elementary searching for new harmonic values has culminated in the effort to form a new harmony based on separate melodic conduct of several voices. This new process should be and must also be justified theoretically.

In Examples 5-19, I have theoretically shown the melodic origin of harmonies.

It is also necessary to comprehend and show how the tertian system theoretically is expressed in present-day melodies.

Earlier, one learned how to build triads vertically on the scale degrees of the major and the minor scales using diatonic tones:
Ex. 30.

It has become theoretical dogma that (with regard to the major scale) the major triad (a major third and a perfect fifth) is found on first, fourth, and fifth scale degrees, the minor triad (a minor third and a perfect fifth) on the second, third, and sixth scale degrees, and the diminished triad (a minor third and a diminished fifth) on the seventh scale degree. On the other hand, when dealing with the minor scale, the minor triad is built on the first and fourth scale degrees, the major triad on the fifth and sixth scale degrees, the diminished triad on the second and seventh degrees, and the augmented triad (a major third and an augmented fifth or two superimposed major thirds) on the third scale degree.

Diatonic seventh chords are constructed by adding a diatonic third to every diatonic triad of the major and the minor scales (i.e., a tone which is found in the major or the minor scale is added a major or a minor third above):

Ex. 31.

Seventh chords built on the first and fourth scale degrees of the major scale are constructed in the same way (major triad with a major third).
Seventh chords built on the second, third, and sixth scale degrees of the major scale are also constructed in the same way (a minor triad with a minor third).

The seventh chord built on the fifth scale degree contains a major triad and a minor third.

The seventh chord built on the seventh scale degree consists of a diminished triad and a major third. Therefore, if one adheres to the tertian principle when constructing seventh chords, four different types of seventh chords are obtained from the diatonic tones of the major scale.

In addition, three new seventh chords are obtained from the minor scale: a minor triad and a minor third on the first scale degree, an augmented triad and a minor third on the third scale degree, and a diminished triad and a minor third on the seventh scale degree. Moreover, the seventh chord on the sixth scale degree in minor is constructed in the same way as the seventh chords on the first and fourth scale degrees in major, the seventh chord on the fifth scale degree in the same way as the seventh chord on the fifth scale degree in major, the seventh chord on the fourth scale degree in the same way as the seventh chords on the second, third, and sixth scale degrees in major, and the seventh chord on the second scale degree in the same way as the seventh chord on the seventh scale degree in major.

Therefore, four triads and seven tetrads (seventh chords) are obtained by the application of the tertian principle utilizing the diatonic tones of the major and the minor scale.
Earlier theorists failed to transpose the four triads and the seven seventh chords to an arbitrary basic scale degree in order to facilitate their work. We will consider the tone c as the basic tone (beginning tone) and transpose the constructions mentioned (Examples 32 and 33) to this pitch level.

The four tonal triads (major, minor, diminished, and augmented) are transposed to the tone c in Example 34. In Example 35, the seven tonal seventh chords are transposed to the tone c.

Now, they have the tone c in common but they are no longer in
tonal form, i.e., they are not constructed from the tones of the C major and the C minor scales.

Therefore, here lies the fundamental difference between the tonal conception (Examples 32 and 33) and the central conception (Examples 34 and 35) of the same triads and seventh chords.

The tone center arises in Romantic music and destroys the harmonic relationships between the diatonic scale degrees.

Theorists tried to interpret this new conception of the tone center to which various sounds are related by so-called "alteration."

We determine that it is not a question of alteration but of transposition and of inversion of the tonal triads to an arbitrary tone center.

Classical music developed out of Rameau's theory, which dealt with the connections of harmonies that are constructed on the diatonic scale degrees or their transposition.

Romantic music does not modulate (does not change key) but usually chooses and changes its tone center by chromatic transposition.

Romantic music did not always do this, but now it is quite common. In addition, the remaining five chromatic scale degrees became tone centers for the harmonies that appeared on the diatonic scale degrees (Example 37 is an indication of this conception):

\[ \text{Example 37} \]

---

Hába is using the term "tone center" in the sense of one main tone, rather than the designation, "tonal center," which has a different implication.
Ex. 36.

The first to thirteenth chords in Example 36 appear as diatonic harmonies built on the following scale degrees:

Chord 1. the fifth scale degree in G major (as a four-two chord [seventh chord in third inversion]),

2. the second scale degree in B-flat major (as a seventh chord),

3. the third scale degree in A minor (as a seventh chord),

4. the first scale degree in F major (as a six-four chord [triad in second inversion]),

5. the second scale degree in B-flat minor (as a ninth chord),

6. the first scale degree in C major (as a ninth chord),

7. the first scale degree in A-flat major (as a triad in first inversion),

8. the second scale degree in C minor (as an eleventh chord),

9. the second scale degree in B-flat minor (as a seventh chord),

10. the fifth scale degree in F minor (as an eleventh chord),

11. the fifth scale degree in F major (as a thirteenth chord),

12. the second scale degree in G minor (as a seventh chord),

13. the second scale degree in C minor (as a seventh chord).

Very often, the tone center in Romantic and post-Romantic music is found in the top voice as a melodic pedal point:
Ex. 37.

Romantic and post-Romantic composers also liked to use motives as tone centers, combining these motives with different harmonies:

Ex. 38.

In Example 37, the chromatic change of the lower tone center is felt in the second and third harmonies (c\# - e - g - b and c - e\# - g - b). In the fourth and fifth harmonies of Example 37, the chromatic transposition of the dominant-seventh chord: \( \text{\#}\ ) is disguised by the fact that each chord appears in two different inversions: the fourth harmony is a four-two chord (in third inversion) \( \text{\#}\ ) and the fifth harmony is a four-three chord (in second inversion) \( \text{\#}\ ).

In Example 38, there is a chromatic change of the lower tone center. The construction of the dominant-seventh chord a - c\# - e - g (in second inversion and in open position) remains the same from the first to the seventh chords.

From Examples 34-38, it clearly follows that Romantic music, although making substantial use of Rameau's principle of tonal construction, has also
brought us a new principle of construction, tone centrality and its chromatic implications.

Chopin, Liszt, and Wagner wrote no theories of tone centrality but their musical works speak clearly enough.

Nevertheless, up to now, music theorists have not acknowledged the existence of this new principle of construction that was developed to its highest point particularly in Wagner's works.

Since Wagner's time, music theory has failed completely. Even Schönberg did not discuss Wagner's use of tonal material—tone centrality and chromatic transposition—in his Harmonielehre although Wagner usually based his music on this principle in almost its pure form (without mixing with tonality in Rameau's sense), and even if he used 3-note to 12-note chords and related them to an arbitrary tone center in various ways.

For those who have a strong interest in seeing how the principle of tone centrality utilized by Chopin, Liszt, and Wagner was subsequently developed in the works of younger generations, I strongly suggest the diligent study of the musical works of d'Indy to Debussy and Honegger, of Reger and Schönberg to Busoni, Hindemith and Krenek, of Smetana and Fibich to Novák and Suk, of Scriabin to Feinberg and Szymanowski, and of Bartók to Kós.

*I consider the writings of Ernst Kurth (Romantische Harmonik und ihre Krise in Wagners Tristan) and Heinrich Rietisch (Die Tonkunst in der zweiten Hälfte des neunzehnten Jahrhunderts: ein Beitrag zur Geschichte des musikalischen Technik) an enrichment of the literature, however, I do not consider them to offer precise theor-

22This book by Heinrich Rietisch was first published in Leipzig by Breitkopf & Härtel in 1900. It was the third volume in Breitkopf & Härtel's Sammlung musikwissenschaftlichen Arbeiten von deutschen Hochschulen.
ries of harmony concerning the music of the era under consideration.

I am only concerned with pointing out theoretically the essentially new sonic conception that is expressed most clearly in Wagner's music.

In addition to his music, Rameau left behind a written record of his laws of harmonic formation that lives on in the musical works of later generations.

Wagner has given us works of art but he never wrote down his law of tone centrality. However, his law also lives on and affects the musical creations [of later generations].

Therefore, one notices that a powerful intellect such as Rameau's or Wagner's is capable of creating a new theoretical foundation for constructions and a new discipline within the tonal region that remains vividly effective for a much longer time than actual works of art. Both composers still live on in the generations that came after them, because they were not only composers of music but also musical thinkers.

I do not want to create the misleading impression that I consider tonality and tone centrality as contrasting phenomena. I would like to point out that these two principles only appear as contrasting when utilized in their purest, most restricted form. In addition, I want to show the fine threads that lead from tonality to tone centrality:

Ex. 39.
The seeds of tone centrality are already present in tonality. This is seen in the most elementary tonal constructions in Example 39. The triad \( (c - e - g) \), the sixth chord \( (c - e - a) \), and the six-four chord \( (c - f - a) \) are all set up the tone \( c \).

One is not all aware of the fact that these elementary tonal constructions in Example 39 can be representatives of an opposing principle, namely, tone centrality.

The fact stands out more clearly when working with the tonal seventh chords:

Ex. 40.

\[
\begin{array}{cccccc}
\text{From C major} & | & \text{From D minor} & | & \text{From C minor B minor} \\
\begin{array}{cccccccc}
\text{3rd} & \text{3rd} & \text{5th} & \text{1st} & \text{2nd} & \text{4th} & \text{6th} & \text{2nd} & \text{3rd} & \text{7th} & \text{3rd}
\end{array}
\end{array}
\]

Sc deg: 2nd 7th 3rd 5th 1st 2nd 4th 6th 2nd 3rd 7th 3rd

(The tertian foundations of the seventh chords are easily discovered and I leave this small amount of independent work to the reader.)

Ex. 41.

Through the chromatic transposition of the second and the fourth seventh chords of Example 40 and the retention of the first and the third seventh chords, a chord progression that characterizes Wagnerian and post-Wagnerian harmonic language in Example 41.

I would like to show how the second chord of Example 41 can be
derived from the first chord of Example 41 on the basis of the tonal principle:

Ex. 42.

In this case, the operation is as follows: slowly withdraw from the seventh chord \( d - f - a - c^\# \) (the first scale degree in D minor, Example 42, 1.), pass through a major-minor seventh chord built on the fifth scale degree in A major, (Example 42, a.) into the tonal region of F-sharp major, present the triad built on the first scale degree in F-sharp major (Example 42, b.), utilize two diatonic seventh chords \( (d^\# - e^\# - g^\# - b \text{ and its root position } e^\# - g^\# - b - d^\#) \) built on the seventh scale degree in F-sharp major (Example 42, 2.), and complete the process by using the tonic chord built on the first scale degree in F-sharp major. This process is called modulation.

Therefore, according to Rameau's principle, the seventh chord \( d - f - a - c^\# \) in Example 42 is a representative of D minor and the seventh chord \( d^\# - e^\# - g^\# - b \) is a representative of F-sharp major.

According to Wagner's principle, however, the two chords are considered separate harmonies and they can directly follow one another (as in Example 41, 1. and 2.).

Rameau, that ingenious man, spared his followers from writing a theory about harmonic construction by writing one of his own and then passing it on to the younger generations. It was not necessary for Haydn,
Mozart, and Beethoven to think about construction theoretically; they only need to use Rameau's system, to rely on it, and to make music.

The generations that came after Wagner did not have it as easy. Wagner's musical works were available, but neither Wagner nor his theorist-contemporaries clearly formulated theories about how his music was constructed.

At that time, everyone was much too preoccupied with the effect of Wagner's music. It was not very seriously regarded; therefore, theorists did not think of trying to discover the theoretical origins of its harmonic constructions. Theorists who propagated, preached, and also partially watered down Rameau's theories throughout the century were not capable of formulating any theories about the constructions present in Wagner's music as Rameau had once done for Classical music.

Rameau predetermined musical development for a century. Theorists as well as Wagner's contemporaries have lost time because of this.

Therefore, the younger generation of musicians have to think for themselves and try and learn to comprehend Wagner's principles of construction even though he did not explain them theoretically.

By the way, it is a psychological fact that when hearing an unfamiliar musical work, every individual who feels the urge to compose usually has an half-conscious feeling: how is it put together? Because he wants to become an expert, he is not interested in how the music affects him for he senses this anyhow but in something that he does not know--how it is put together; its laws of construction interest him most of all. Other factors are of interest to the musical aesthete and to the epicure.

Therefore, from the start of every young composer's musical development, the theorist lives as the second central figure alongside
with his own creative drive. Composers, however, usually deny this.

It is very easy to develop the musical effects that characterize the writing of a particular creator. To formulate general laws theoretically is somewhat more difficult, i.e., they must be perceived.

After theoretically showing the principles of tonality and tone centrality using tertian constructions of ninth, eleventh, and thirteenth chords (i.e., pentads, sextads, and septads), it will be clear that the use of ninth, eleventh, and thirteenth chords enlarge and complicate the chordal relationships but, in essence, only express again these two principles.

The tonal ninth chords are as follows:

Ex. 43.

Ex. 44.

There are ten different tonal ninth chords (Example 44, 1.-10).

The analysis of the ninth chords has been carried out on the basis of the seven types of tonal seventh chords in Example 33. It is necessary only to determine which type of third (major or minor) has been added to the seven tonal seventh chords. Three types of ninth chords arise: a ninth chord consisting of the seventh chord e - g - h - d in Example 33, 2.
and a minor third (Example 44, 9.), a ninth chord consisting of the seventh chord $g - b - d - f$ in Example 33, 3. and a minor third (when it appears in a minor key) (Example 44, 4.), and a ninth chord consisting of the seventh chord $a^b - c - e^b - g$ in Example 33, 1. and a major third (Example 44, 10.).

The ninth chords in Example 44, 1. consist of the seventh chords in Example 33, 1. and a minor third, the ninth chords in Example 44, 2. consist of the seventh chords in Example 33, 2. and a minor third, the ninth chord in Example 44, 3. consists of the seventh chord in Example 33, 3. and a major third (the dominant in a major key), the ninth chord in Example 44, 4. consists of the seventh chord in Example 33, 3. and a minor third (the dominant in a minor key), the ninth chords in Example 44, 5., 6., and 7. consist of seventh chords in Example 33, 4., 5., and 6. and a minor third, and the ninth chord in Example 44, 8. consists of the seventh chord in Example 33, 7. and a major third.

Similarly, the ninth chords can be transposed (in the sense of tone centrality) to any scale degree, just like the seventh chords in Example 35 (in Example 45, we again choose the tone $c$ as the basic scale degree):

Ex. 45.

Now, it is appropriate to discuss the construction of the ninth, the eleventh, and the thirteenth chords:
Ex. 46.

Example 46 shows the eleventh chords of the major and the minor keys.

Example 47 shows twelve different types of eleventh chords:

Ex. 47.

These twelve constructions can be transposed (in the sense of tone centrality) to any scale degree:

Ex. 48.

Again, in Example 48, we have chosen the tone C as the basic scale degree. Finally, I want to show the construction of tonal thirteenth chords:

Ex. 49.
We notice that a different thirteenth chord is found on each scale degree (Example 49). Therefore, there are fourteen tonal thirteenth chords. Now, we will transpose these chords to the tone c according to the principle of tone centrality:

Ex. 50.

According to Rameau's principle of inversion, which consists of the octave transposition of the lowest tone of a chord, many new constructions may be obtained by inverting triads, seventh, ninth, eleventh, and thirteenth chords.

I am expanding Rameau's principle of inversion when I state that not only every tone of a triadic and a tetradic tertian construction but that also every tone of a ninth, eleventh, and thirteenth chord (Examples 43-50) can appear as the lowest tone (the bass tone) of the constructions mentioned.

With this axiom, I have expressed theoretically what Schönberg and his contemporaries demonstrated in their compositions. Apparently, Schönberg was the first one who used inversions of the ninth chord in his works; these inversions were perceived as "illegal" by the theoretical preachers of Rameau's theory of inversion.

Since the triad consists of three tones, a root-position tertian chord and two inversions are possible: 23

Ex. 51.

\[ \text{Root pos|1st inv|2nd inv} \]

23 Example 51 is identical to Example 29a.
The seventh chord consisting of four tones can be set up in root position (as a tertian construction) and in three inversions:

Ex. 52.

The ninth chord may be set up in root position and in five inversions:

Ex. 53.

The tone c appears as the lowest tone for the second time at the *) in Example 53. This construction can also be interpreted as an inversion of the tone d combined with the basic seventh-chord construction:

\[ c - e - g - b - d. \]

The older (Rameau's) theory does not speak of the possibility of inversion to a position below; it was not necessary to speak about this type of inversion when dealing with only triads and seventh chords.

Ex. 54.
The root position and seven inversions of an eleventh chord are shown in Example 54.

The tones c and e each appear twice as the lowest tone (at 1* and 2* in Example 54). These chords can also arise from the downward inversion of the tones f and d at 1* and of the tone f at 2*:

Ex. 55.

The following chords arise from the inversion of the thirteenth chord:

Ex. 56.

The diatonic secundal construction and consequently the principle of diatonic seven-tone music to which I already referred earlier is attained by inverting the tertian thirteenth chord.

I set up the diatonic secundal construction in Example 9. Example 56 clearly shows that the vertical secundal construction is not an arbitrary formation but is closely related to Rameau's principle of inversion of tertian constructions. The secundal chords that frequently occur in modern music (Bartók, Schönberg, Debussy, and other composers) are not absurd, and the constructions in Example 56 are only theoretical representations of existing musical practice.
The diligent reader should be able to carry out the inversion of the 3-note to 7-note chords (Examples 34, 35, 48, and 50). In this way, he will gain an understanding of modern harmony. Then, it will also be possible for him to comprehend and appreciate the value of different artistic movements.

On the basis of my preceding statements I can state that every tone of an established tonal system (be it diatonic with seven tones, chromatic with twelve tones, bichromatic with twenty-four quarter tones, or an other tonal system) can be effectively used in any combination, not only melodically but also harmonically (in chords with other tones) on the basis of the logic that operates in all works of art helping to form harmonies.

I will return to this principle in connection with the theoretical manipulation of the half-tone and the quarter-tone systems and support it by additional arguments.

I have brought the basic constructions of 3-note to 7-note chords and their inversions shown in preceding examples in close position.

One highly significant fact is that the basic constructions and their inversions can be used in various groupings in different octaves of the available tonal range, i.e., chords can be used in open position. Naturally, in practice, this occurs in various forms:

Ex. 57.
Ex. 58.

Ex. 59.

Ex. 60.

Example 58, a. shows a triad and its inversions, Example 58, b. seventh chord and its inversions, Example 58, c. an ninth chord and its inversions, Example 58, d. an eleventh chord and its inversions, and Example 60, e. a thirteenth chord and its inversions. All these examples are in open position.

The doubling or the omission of some tones of a chord is one of the basic laws of construction. These laws are as follows:

1. Construction of a progression of tones (horizontally or vertically, melodically or harmonically).
2. Inversion of the progression of tones.
3. Construction of open position formations, i.e., variation of the progression of tones (the use of accidental scales, open position
harmonies, basic shapes).

4. Transposition of the progression of tones.

5. Doubling of some or all tones in one or more octaves.

6. Omission of some tones in close or open position.

7. Arrangement of the whole progression of tones into several smaller groups (triads, seventh chords, and similar chords).

8. Combination of smaller groups with one another and their transposition.

With Examples 58, 59, and 60 I wanted to incite the reader to construct new positions of tones in addition to those I have mentioned.

An inversion of the thirteenth chord in open position, e.g., can be considered an accidental scale and can serve as the basis for the formation of a melody:

Ex. 61.

\[ \text{2nd inv. of Ex. 60} \]

In a similar way, all indicated inversions (Examples 58, 59, and 60, and many others) can be considered accidental scales (scales of range) and can be used for the formation of melodies. Example 61 is a theoretical example of that kind of melodic formation often found in the music of Schönberg and his students. These composers had a predilection for very large intervallic leaps in the formation of melodies.

Classical and Romantic music usually contains closer scale degrees than the ones shown above; even Wagner's melodies very often contain half tones.
Ex. 62.

Let us compare Examples 61 and 62. In both examples the same seven pitches $c \ - \ d \ - \ e \ - \ f \ - \ g \ - \ a \ - \ b$ are present. Example 61 theoretically characterizes Schönberg's modern melodic formation, while Example 62 shows the old kind of melodic formation.

It can be expressed concisely: close position--open position. Either one is possible. By the way, Schönberg very often also uses closed position in his melodic formation:

Ex. 63.

Example 63, a. illustrates Rameau's melodic principle and Example 63, b. illustrates the ancient Greek melodic principle with an accidental scale as the foundation, a formation we would today label as seven-tone music.

The melody of Example 63, a. and the melody of Example 63, b. are harmonically based but the basic harmonic forms differ. The melody of Example 63, a. is made up of tonal triads in close position, while the melody of Example 63, b. consists of the inversion of the tonal thirteenth chord in open position.

The spider first erects the basic lines before beginning to
construct the rest of the web.

The bee sketches the hexagon before beginning to construct the cells of wax.

The composer also has certain instincts about construction and follows them even though he is not able to formulate and express them verbally. Here, we are faced with psychological mystery of the human soul and its versatility in being able to vary certain fundamental laws.

The creative urge always tries for variation even within the limits of given borders, whether it is a system or the particular range of tones that we can perceive with our ears (from the lowest to the highest tones).

I will characterize the harmonic usage of ninth, eleventh, and thirteenth chords with several examples.

In Classical and Romantic music, the use of ninth, eleventh, and thirteenth chords is usually confined to those diatonic chords that can be built on the fifth scale degree of the major and the minor scale using diatonic tones:

Ex. 64.

![Ex. 64](image)

Ex. 65.

![Ex. 65](image)
Ex. 66.

Ex. 67.

Once more, I mention that Rameau set up the seven tones of the major and the minor scales in the following three-part units:

\[
\begin{align*}
& f \quad a \quad c \quad e \quad g \quad b \quad d \quad f \\
& \text{Subdominant} \quad \text{Tonic} \quad \text{Dominant}
\end{align*}
\]

\[
\begin{align*}
& f \quad a^b \quad c \quad e^b \quad g \quad b \quad d \quad f \\
& \text{Subdominant} \quad \text{Tonic} \quad \text{Dominant}
\end{align*}
\]

The dominant-seventh chord contains the first tone \( f \) of the established basic construction.

All harmony was related to the three groups of tones.

The four-voice chord became the norm for harmony at that time. In order to obtain a four-voice chord, the bass tone of the triad was doubled.

The number of tones in ninth, eleventh, and thirteenth chords were reduced and the ninth, the eleventh, and the thirteenth were made dependent on the tones of the seventh chord to which they belonged (Examples 65, 66, 67).
This treatment of tones has been theoretically called a "suspension." The seventh chord possessed the maximum harmonic range at that time. Therefore, quite logically at that time, all other tones that exceeded the range of the tertian seventh chord were labeled as "non-harmonic" and were resolved to the tones of the seventh chord.

If we consider the chord \( g - b - d - f - a - c - e \), there is one non-harmonic tone in the ninth chord, two in the eleventh chord, and three in the thirteenth chord. A simple suspension is shown in Example 65 (\( a \) to \( g \) and \( a^b \) to \( g \)), a double suspension in Example 66 (\( a - c \) to \( g - b \) and \( a^b - c \) to \( g - b \)), and a triple suspension in Example 67 (\( a - c - e \) to \( b - d \) and \( a^b - c - e \) to \( g - b \)).

Schönberg rebelled against the suspension and non-harmonic tones in his *Harmonielehre*.

I can state matter-of-factly that from their standpoint the old theorists were right.

It is only necessary to express another standpoint theoretically, namely:

*The thirteenth chord can be spoken of as the maximum of the harmonic range and, from this standpoint, there are no non-harmonic tones and no suspensions.* This view is just as valid as Rameau's view, but it is impossible to label Rameau's standpoint as false just because another conception of construction is possible.

We need not attack the older musicians, and we also need not believe that we compose better music than they did. We only make music differently. It is necessary to acknowledge that the older generation had a standpoint and that we also possess a standpoint. Therefore, we
are different but also the same; we, just like them, are entitled to have a standpoint. In a sense, we are richer artistically because we know of both standpoints and can use both possibilities. The question is now whether to decide on one possibility or the other.

The next examples should characterize the musical consequences that arise when ninth, eleventh, and thirteenth chords are considered harmonic units similar to the seventh chord.

In this case, we are concerned with five-voice, six-voice, and seven-voice harmonies.

The chords can be formed not only in the tonal sense (similar to the seventh chord) but also in the sense of tone centrality with the aid of chromatic transposition:

Ex. 68.

Ex. 69.
Realization of this harmonic principle (a uniform conception of tertian septads, their inversion, and their transposition) is found in the last works of Busoni, particularly (I assume) in his opera, Doktor Faust.\(^{24}\) (This was my impression after a single hearing of that work.) My brother Karel Hába frequently uses these sounds in his own individual way. Even Igor Stravinsky in his newest work, the Piano Concerto,\(^ {25}\) tries to incorporate sounds from the domain that I have shown in Example 43-71. Ladislav Vycpálek also partially constructs his music using this principle. This is only the beginning. I am convinced that many beautiful and interesting musical works can be

---

\(^{24}\)Doktor Faust, unfinished at the time of Busoni's death, was completed by Philipp Jarnach and was first performed in Dresden on 21 May 1925.

\(^{25}\)Hába is probably referring to Stravinsky's Concerto for Piano and Wind Instruments, which was performed for the first time on 22 May 1924 in Paris.
created on the basis of a good knowledge of the possibilities of
collection using ninth, eleventh, and thirteenth chords.

Above all, it is necessary to be as well-acquainted with the inver-
sions and the positions of ninth, eleventh, and thirteenth chords as with
the inversions and the positions of the "orthodox" triads and seventh chords.

There is one more important fact concerning diatonic music which
we now want to deal with more thoroughly. *It is the combination of
Rameau’s harmonic units.* Already in Classical music, we often find the
dominant-seventh chord on the fifth scale degree was harmonically used
concurrently with the triad on the first scale degree (the tonic).
Theoretically, this phenomenon (the combination of the first and fifth
scale degrees) was labeled as an anticipation:

Ex. 72.

![Musical notation](image)

*Here lies the beginning of a new principle of construction—the
combination of tonal triads and seventh chords with the aid of chromatic
transposition.* Strauss and Schreker are the main representatives of
this type of combination and they have fully developed this principle in
their works.

The [work of] young French moderns (Milhaud and his contempora-
ries) is a continuation of this artistic direction and an example of how
much this principle of construction can be varied if musical inspiration
is present.
For the purpose of deriving a theoretical representation of the combination of triads and seventh chords built on different tonal scale degrees, we must once again look carefully at the constructions of ninth, eleventh, and thirteenth chords (Example 73 is the same as Example 45):

Ex. 73.

We can consider the middle tone of every ninth chord as the point of division and the common tone of two triads. The brackets set off the two triadic groups from which each of the first to tenth ninth chords is constructed.

The first ninth chord consists of a C major and a G major triad.
The second ninth chord consists of a C minor and a G minor triad.
The third ninth chord consists of a C major and a G minor triad.
The fourth chord consists of a C major and a G diminished triad.
The fifth chord consists of a C minor and a G major triad.
The sixth chord consists of a C augmented and a G-sharp diminished triad.
The seventh chord consists of a C diminished and a G-flat major triad.
The eighth chord consists of a C diminished and a G-flat minor triad.
The ninth chord consists of a C minor and a G diminished triad.
The tenth chord consists of a C major and a G augmented triad.
Ex. 74.

The chords of Example 74 consist of the two triads that comprise the first to ninth chords of Example 73. (The lower triads are in root position and the upper ones are in first inversion, i.e., they are sixth chords.)

The arrangement of eleventh chords into triads and seventh chords (Example 75) or into seventh chords and triads (Example 76) is shown below:

Ex. 75.

Ex. 76.

In Example 75:

The first eleventh chord contains a diatonic triad built on the first scale degree in the key of C major and a diatonic seventh chord built on the fifth scale degree in the key of G major.

The second eleventh chord contains a diatonic triad built on the
first scale degree in the key of C major and a diatonic seventh chord built on the first scale degree in the key of G major.

The third eleventh chord contains a diatonic triad built on the first scale degree in the key of C minor and a diatonic seventh chord built on the fourth scale degree in the key of D minor.

The fourth eleventh chord contains a diatonic triad built on the first degree in the key of C minor and a diatonic seventh chord built on the first scale degree in the key of G minor.

The fifth eleventh chord contains a diatonic triad built on the first scale degree in the key of C major and a diatonic seventh chord built on the fourth scale degree in the key of G minor.

The sixth eleventh chord contains a diatonic triad built on the first scale degree in the key of C major and a diatonic seventh chord built on the second scale degree in the key of F minor and the seventh scale degree in A-flat major.

The seventh eleventh chord contains a diatonic triad built on the first scale degree in the key of C minor and a diatonic seventh chord built on the fifth scale degree in the keys of C major and C minor.

The eighth eleventh chord contains a diatonic triad built on the third scale degree in the key of A minor and a diatonic seventh chord built on the seventh scale degree in the key of A minor.

The ninth eleventh chord contains a diatonic triad built on the second scale degree in the key of B-flat minor and a diatonic seventh chord built on the sixth scale degree in the key of B-flat minor.

The tenth eleventh chord contains a diatonic triad built on the second scale degree in the key of B-flat minor and a diatonic seventh chord built on the first scale degree in the key of G-flat minor.
The eleventh eleventh chord contains a diatonic triad built on the first scale degree in the key of C minor and a diatonic seventh chord built on the second scale degree in the key of F minor.

The twelfth eleventh chord contains a diatonic triad built on the first scale degree in the key of C major and a diatonic seventh chord built on the third scale degree in the key of E minor.

In Example 76:

The first eleventh chord contains a diatonic seventh chord built on the first scale degree in the key of C major and a diatonic triad built on the seventh scale degree in the key of C major.

The second eleventh chord contains a diatonic seventh chord built on the first scale degree in the key of C major and a diatonic triad built on the first scale degree in the key of B minor.

The third eleventh chord contains a diatonic seventh chord built on the second scale degree in the key of B-flat major and a diatonic triad built on the first scale degree in the key of B-flat major.

The fourth eleventh chord contains a diatonic seventh chord built on the second scale degree in the key of B-flat major and a diatonic triad built on the third scale degree in the key of G minor.

The fifth eleventh chord contains a diatonic seventh chord built on the fifth scale degree in the key of F major and a diatonic triad built on the first scale degree in the key of B-flat major.

The sixth eleventh chord contains a diatonic seventh chord built on the fifth scale degree in the key of F major and a diatonic triad built on the first scale degree in the key of B-flat minor.

The seventh eleventh chord contains a diatonic seventh chord
built on the first scale degree in the key of C minor and a diatonic triad built on the seventh scale degree in the keys of C minor and C major.

The eighth eleventh chord contains a diatonic seventh chord built on the third scale degree in the key of A minor and a diatonic triad built on the seventh scale degree in the keys of C minor and C major.

The ninth eleventh chord contains a diatonic seventh chord built on the seventh scale degree in the key of D-flat major and a diatonic triad built on the first scale degree in the key of B-flat minor.

The tenth eleventh chord contains a diatonic seventh chord built on the seventh scale step in the key of D-flat minor and a diatonic triad built on the third scale step in the key of G-flat minor.

The eleventh eleventh chord contains a diatonic seventh chord built on the second scale step in the key of B-flat major and a diatonic triad built on the first scale step in the key of B-flat minor.

The twelfth eleventh chord contains a diatonic seventh chord built on the first scale degree in the key of C major and a diatonic triad built on the first scale degree in the key of B major.

Some triads and seventh chords are ambiguous, i.e., they belong to several scales. I will let the reader establish that fact himself. I have only briefly mentioned the ambiguous tonal quality of the triads and the seventh chords.

A thirteenth chord can consist of three triads, two seventh chords, a triad and seventh chord, or a seventh chord and a triad:
Ex. 77.

Ex. 78.

Ex. 79.

Ex. 80.

The reader can easily determine the scales to which the tones of these chords belong.

By the use of chromatic transposition, inversion, as well as the exchange of triads and seventh chords that belong to ninth, eleventh, and thirteenth chords (in Examples 73, 75, 76, 77, 78, and 79), numerous harmonic constructions can be obtained using the tonal material that I have shown in Examples 73, 75, 76, 77, 78, and 79 (close position tertiary chords which are treated polyharmonically). A study of these formations should be included in every course dealing with harmonic theory, after the formation of the diatonic, the chromatic, and the bichromatic systems. I will show how to master all the material.
Now, I will show a few examples of the use of more open positions, inversions, and exchanges of the tertian ninth, eleventh, and thirteenth chords. (The creative musician can decide how and when he makes use of these and other formations.)

Ex. 81.

Ex. 82.

Ex. 83.
Ex. 84.

Invs of upper & lower pt of 1st constr
Invs of upper & lower pt of 12th constr

Ex. 85.

1. 2. 3. Mixture of Constr of Ex. 77 3rd & 4th constr, Ex. 77

Basically, I would like to establish that, with the principle of polyharmony, we are again concerned with Rameau's triads and seventh chords, only the type of usage has changed.

Another principle that is hidden in the superimposition of triads and seventh chords is the principle of chordal polyphony.²⁶

Ex. 86:

²⁶ He also calls this phenomenon "polyphonic harmony."
This principle has not yet been worked out in actual compositions. Up to now, composers have usually made use of harmonic combinations in the homophonic sense.

Traces of polyphonic harmony combined with melody are already found in my Piano Sonata, Op. 3. Later, in the Symphonic Fantasy for Piano and Orchestra, Op. 8, I made substantial use of it. My brother Karel Hába also made substantial use of polyphonic harmony (combined with melody) in his Violin Concerto (with orchestra).²⁷

A standardized conception of tertian septads (thirteenth chords) leads before long to polyphony. Every voice is continued individually or in dyads but not in groups of triads or tetrads since that would obviously again be construed as polyphonic harmony.

It is difficult to differentiate clearly between polyphony and polyphonic harmony. I could be maintained that every voice in Example 86 was devised as a separate voice; however, I think the passage is a combination of three harmonic-melodic groupings.

In the next example (Example 87), each of the six voices has been devised as a separate voice:

²⁷Karel Hába's Violin Concerto was performed for the first time on 6 March 1927 in Prague. He also wrote Škola čtyrtónové houslové hry [School of Violin Playing the the Quarte-tone System], which remains in manuscript, in 1927.

At one time a student of his brother, Karel Hába wrote only three works in the quarter-tone system, although he retained the thematic method of composing that was one of Alois Hába's fundamental musical principles.
The scale on which this six-voice texture is based is as follows:

Ex. 88.

The harmonic tertian construction constructed from this scale is as follows:

Ex. 89.

Only the tones of the scale (Example 88) were used in the formations of the individual voices in the six-voice texture (Example 87). This texture (Example 87) is tonal in the strictest sense because it consists only of diatonic tones.

It is "atonal" only in the relative sense because it neither consists of tones of the major or the minor scales nor is based on a standard nine-voice tertian construction (Example 89) with its harmonic
division into triads and seventh chords. By the way, Example 87 is a short example of nine-tone music. The six-voice texture is harmonic because it is based on inversions and position changes of the tertian construction (Example 89) (with three of the nine tones always omitted). The six-voice texture is melodic because each voice shows individuality and makes melodic sense without the other voices.

Viewed as a unit, however, the six-voice texture is polyphonic.

This kind of polyphony is based on a threefold awareness, namely, a harmonic, melodic, and polyphonic awareness. The basis of construction in Example 87 was the scale. The lowest voice (bass voice) was composed first and the other voices were composed in turn, from the lowest to the highest. The voices make use of the same scale, but, otherwise, they are independent and not thematically related. This is the fundamental difference between this kind of polyphony and polyphony utilizing Schönberg's basic shape, which is thematic, i.e., the individual voices possess common melodic elements that are usually rhythmically varied, appearing differently in every voice.

I have decided to use athematic polyphony, and I consider the scale as the basis of construction rather than Schönberg's basic shape.

I mention this only for the sake of clarifying certain principles. I will deal with this question in more detail later.

Finally, with Example 87, I wanted to prove that even when dealing with a complicated polyphonic texture, it is possible to possess a harmonic awareness based on the same theoretical principles of construction that I formulated and explained earlier.

---

²⁸ Hába uses the term "Grundgestalt-Polyphonie."
The constructions shown up to now (beginning with Example 30) have concerned the vertical building of 3-note to 7-note diatonic tertian chords on the scale degrees of the major and the minor scales and the application of the tertian principle, i.e., the superimposition of diatonic tones at intervals of a third. Different 3-note to 7-note chords arise depending on the arrangement of major and minor thirds.

In connection with Example 30 I mentioned that the superimposition of diatonic tones at intervals of a third was the basis of the theory of harmony.

It used to be believed that the harmonic principle could not be reconciled with the polyphonic one. That is why the theory of harmony and counterpoint (the theory of polyphony) were theoretically set up as two separate areas.

It will now be proven that it is possible to also attain the same 3-note to 7-note tertian constructions (Examples 30-85) melodically and polyphonically.

In regard to Examples 5-19 and 23-29, we repeat that we consider the major and the minor scales to be the two basic constructions. Six inversions can be obtained from each of these constructions:

Ex. 90.
Ex. 91.

The six inversions of the major scale indicated (Example 90) have been known since the Middle Ages as the Dorian, Phrygian, Lydian, Mixolydian, Aeolian, and Hypophrygian scales. As was already mentioned at the beginning of this discussion, the Greek theorists named these same progressions of tones by the following names: Phrygian, Dorian, Hypolydian, Hypophrygian, Hypodorian, and Mixolydian. The six inversions of the minor scale (Example 91) did not receive any names.

If we do not think of the superimposition of diatonic tones of the major scale a third apart and just think of singing or playing the major scale and its second and fourth inversions simultaneously as three seven-tone melodies, we obtain the succession of diatonic triads of the major scale:

Ex. 92.

Triads arise from the combination of the major scale and its second and fourth inversions into a three-voice structure.

Now, let us go on accordingly. The major scale and its second, fourth, and sixth inversions produce a four-voice texture consisting of
diatonic tetrads (seventh chords):

Ex. 93.

The major scale and its second, fourth, sixth, and first inversions produce a five-voice texture consisting of diatonic pentads (ninth chords):

Ex. 94.

The major scale and its second, fourth, sixth, first, and third inversions produce a six-voice texture consisting of diatonic sextads (eleventh chords):

Ex. 95.

The major scale and its second, fourth, sixth, first, third, and fifth inversions produce a seven-voice texture consisting of diatonic septads (thirteenth chords):
Three-note to 7-note diatonic chords of the minor scale arise in the same way:

Ex. 96a. Triads.

Ex. 97. Seventh chords.

Ex. 98. Ninth chords.
Ex. 99. Eleventh chords.

![Eleventh Chords Diagram]

Ex. 100. Thirteenth chords.

![Thirteenth Chords Diagram]

Examples 92-100 clearly show that harmony can either be produced by melody and polyphony or can produce melody and polyphony. The use of the principle of close and open position, of the inversion of chords, and of [different] rhythm gives variety to the polyphonic textures that we find in mature works of art.

We want to emphasize that it is not necessary to pit harmony, melody, and polyphony against one another. On the contrary, it is rather important to possess a threefold awareness, namely, an awareness of the simultaneous arising of several melodies (harmony), of each melody as an independent unit, and of all independent melodies functioning together (polyphony). Unfortunately, there are very few musicians and listeners who are capable of comprehending music with a threefold awareness. Poor education is responsible for this situation and the fact, already mentioned, that harmonic awareness, melodic awareness, and polyphonic awareness are continually separated from one another for
no reason at all instead of being applied to one another and combined.

Harmony is actually the starting point of several melodies.

The succession of harmonies is simultaneously the arising of several melodies and of a polyphonic texture.

These statements and their general validity do not alter the "working methods" of the creative musician. When composing in a texture of several voices, these individuals probably write one voice (melody) first and only then the second, third, etc. We regret that this "work" is so difficult and that it is not so easy to think about and write eight or twelve melodies simultaneously. When we hear a piece of music, however, the result resembles the original statement. We do not know all the melodies of a composition of several voices in advance; we follow the development of the melodies.

It is remarkable, however, that, in spite of the fact that several generations have been concerned with the succession of diatonic triads and seventh chords, the constructions that we established in Examples 92-100 did not occur to them. The concentration on the superimposition of diatonic tones was so great that the superimposition of the basic scale and its inversions escaped their attention.

Until now, ninth chords, eleventh chords, and thirteenth chords, e.g., were set up only on the fifth degree of the major or the minor scale, while triads and tetrads were built on all degrees of the major or the minor scale.

The inversions of the major and the minor scales can be transposed to the basic scale degree\(^{29}\) in the same way as the 3-note to

\(^{29}\) The "basic" scale degree refers to the first scale degree of the basic scale.
7-note chords in Examples 30-80 (e.g., to the basic tone C of C major and the C minor scales). In this way, we also move from the principle of tonality (melodies of diatonic tones) to the principle of tone centrality (melodies in an unstable [non-diatonic], changing tonal relationship to a freely-chosen basic tone). Classical and Romantic music is built on the first principle, modern music on the second.

Already especially in Wagner's music (Tannhäuser and Tristan und Isolde), the change of the tonal center happens so quickly that often one tone serves as a tonal center only to its nearest neighbors (a half tone or a whole tone below and above).

The transposition of the inversions of the C major and the C minor scales to the basic scale degree C produces the following progression of tones:

Ex. 101.

<table>
<thead>
<tr>
<th>Basic scale</th>
<th>Transposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>C minor</td>
<td>C minor</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

Ex. 102.

<table>
<thead>
<tr>
<th>Basic scale</th>
<th>Transposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>C minor</td>
<td>C minor</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
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<tr>
<td>E</td>
<td>E</td>
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<tr>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

30 The brackets are Hába's own.
These progressions of tones (transposed inversions of the major and the minor scales that are also called Greek scales or church modes) frequently form the foundation of Slovakian folk songs. The connection of Slovakian music with Greek theory (mentioned on pages 19–20) can clearly be seen in the following examples of Slovakian folk songs:

Ex. 103. First inversion (Dorian) of the scale $b^b \, c \, d \, e^b \, f \, g \, a \, b^b$.

Ex. 104. Second inversion (Phrygian) of the scale $a^b \, b^b \, c \, d^b \, e^b \, f \, g \, a^b$.

Ex. 105. Third inversion (Lydian) of the scale $g \, a \, b \, c \, d \, e \, f^# \, g$.

Ex. 106. Lydian scale mixed with the major scale.
Ex. 107. Fourth inversion (Mixolydian) of the scale $f \ g \ a \ b^c \ c \ d \ e \ f$, mixed with the Lydian scale on $c$ and on $f$.

Ex. 107a. Fourth inversion (Mixolydian) of the scale $f \ g \ a \ b^c \ c \ d \ e \ f$.

Ex. 108. Major scale mixed with the fifth inversion (Aeolian).

Ex. 108a. Fourth inversion of the minor scale $f \ g \ a \ b \ b^c \ (d^b) \ d \ e \ f$.

Ex. 109. Third inversion of the minor scale $g \ a \ b \ c \ d \ e^b \ f^# \ g$. 
Ex. 110. C melodic minor scale mixed with the first inversion (Dorian) scale $b^b c d e^b f g a b^b$.  

The special charm of Slovakian folk songs lies in the variety of scales that the folk singers use in the formation of melodies.

It can be clearly seen that the scales shown in Examples 103-10 are identical to those scales that the Greek theorists set up and that the composers in the Middle Ages used, with different names, as church modes.

It is interesting that Greek scales have been preserved in their pure form in Slovakian folk songs to this time, while Western European music has used only the major and the minor scales for a long time; the creators of art music have lost interest in the charm of the inversions of both the major (the Greek scales or church modes) and the minor scales.

Because of the lack of contact with Western European musical culture, the music of the Slovakian people in the Tatra Mountains has remained almost in its original form, and even today, Slovakian folk songs document a part of a lively musical culture, in contrast to the culture that has fallen into oblivion in Western European lands.

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31 Béla Bartók made use of this Slovakian folk song in his set of eighty-five piano pieces entitled For Children in two volumes of graded difficulty first published in 1909 and revised in 1945. It is No. 13 in the second volume. The first volume originally called Gyermeknek was based on Hungarian folk songs and the second volume, Pro deti, on Slovakian folk songs. See Halsey Stevens, The Life and Music of Béla Bartók (New York: Oxford University Press, 1953), p. 325.
At a time when the tritone (the augmented fourth) was labeled as the "devil in music" by Western European musicians, Slovakian folk singers created folk songs in the Lydian scale (e.g., c d e f♯ g a b c) and apparently found great pleasure in the tritone for there are many folk songs based on the Lydian scale.

Examples 103-10 show how irrelevant was the argument carried on by some of Smetana's enemies who racked their brains trying to decide whether Czechs and Slovaks sang in major or minor.

As we see from the short examples, not only the major and the minor scales but also inversions and transpositions of inversions to a basic tone are contained in Slovakian folk songs. The use of a central tone to which the inversions of the major and the minor scales are transposed is one of the strongest distinguishing characteristics of Slovakian folk songs.

Czech folk songs, on the other hand, arise from the major and the minor scales. Smetana's melody has its roots in these folk songs.

Pavel Krčíkovský, the first composer who wrote valuable choral music that had folk character, unconsciously used certain features in his melodies that can be traced to Moravian-Slovakian folk songs. Dvořák's melodies and rhythms are also related to Moravian-Slovakian folk songs, even though Greek scales are not used consistently in his music.

With Novák and with Janáček, on the other hand, the use of Greek scales was the result of intensive study of Moravian and Slovakian folk songs. Janáček frequently uses the scale g♯ a♯ b c♯ d e f♯ g♯, i.e.,

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Moravia-Slovakia is a region located on the border between Moravia and Slovakia.
the fifth inversion of the melodic minor scale b c# d e f# g# a# b and the scale g# a# b c# d# e f# a#, i.e., the fifth inversion of the B major scale b c# d# e f# g# a# b.

In Novák's music, there are frequently melodic features that can be traced to the Dorian, Phrygian, and Mixolydian scales, i.e., the first, second, and fifth inversions of the major scale. In his melodies, however, he not only uses all inversions of the basic major scale, but also the major and the minor scales themselves.

Characteristic features of Greek scales (the inversions of the major scale) can also be observed in Vycpálek's melodies (Vcypálek was a student of Novák).

Suk frequently repeats the same short motives using the tones of the different scales shown in Examples 101 and 102. Example 111 illustrates this procedure:

Ex. 111.

This kind of motivic variation is also often found in Novák's music.

I strive for even richer variations of melodic movement by the use of quarter tones.
I view the use of quarter tones as a joining of art music with the popular type of singing of Slovakian folk singers. It is clear from the phonographic recordings of Slovakian folk songs that I have made that the whole tones and half tones are freely varied by the use of more subtle divisions of half tones. This was one of the fundamental findings that influenced my music.

Besides the Czech art music that has developed from the tradition of Moravian-Slovakian folk songs, there is a second line of development in Czech music that begins with Smetana and is logically continued in the works of Fibich, Förster, Ostrčil, Zich, Karel, Jirák, and Burian. This line is much more closely connected with Western European music.

The characteristic harmonic features that have arisen through the melodic use of the inversions of the basic scales\(^{33}\) i.e., the Greek scales or church modes) bestow a special charm to Czech music that can be traced to the following axioms: the fifth degree of the major and the minor scales also functions as the dominant (in a cadence) when composing using the first, second, third, fifth, and sixth inversions of the basic major scale. When composing using the fourth inversion of the basic major scale (which begins with the fifth scale degree), the first scale degree of the basic major scale functions as the dominant:

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\(^{33}\)There are two basic scales, the basic major scale and the basic minor scale.
Ex. 112., 113., 114.

112. C major

113. 1st inv (Dorian)

114. Dorian

Ex. 115., 116.

115. 2nd inv (E Phrygian)

116. E minor

Ex. 117., 118.

117. 3rd inv (F Lydian)

118. F major

Ex. 119.

4th inv (G Mixolydian)

1st sc deg of C as dom func
The consistent formation of a cadence by the use of a tertian chord built on the fifth scale degree of C major (in Examples 113, 115, 117, 123) and on the first scale degree of D major (in Example 119) gives each of the inversions of the basic major scale (the church modes) an individual character in spite of their mutual dependence on the cadence and the use of the same dominant chord as used in the cadence in C major.

The use of independent dominant scale degrees similar to the dominant of C major scale (Examples 114, 116, 122, 124) when composing using the first, second, fifth, and sixth inversions of the basic major scale gradually gave a minor character to these inversions. The use of independent fifth scale degrees in the third and fourth inversions of the basic major scale changes them into the F major and the G major scales (Examples 118, 120).
By transposing (transferring) the intervals and the harmonic functions of the major scale to its inversions (the church modes) these inversions become "independent" but lose their individuality (compare Examples 113, 115, 117, 119, 121, and 123 with Examples 114, 116, 118, 120, 122, and 124). On the other hand, when the church scales are conceived as inversions of the major scale and are unaltered as in Examples 113, 115, 117, 119, 121, and 123, they retain a certain individuality. The dependence of the inversions of the major (and the minor) scales is also proven by the fact that the superimposition of inversions of the basic scales major and minor thirds apart produces 3-note to 7-note tonal chords that we already established earlier.

Similarly, the fifth scale degree of the minor scale can also be used for the building of the cadence in the inversions of the basic minor scale:

Ex. 125. First inversion of the minor scale $c$ $d$ $e^b$ $f$ $g$ $a^b$ $b$ $c$.

Ex. 126. Second inversion of the minor scale $c$ $d$ $e^b$ $f$ $g$ $a^b$ $b$ $c$. 
Ex. 127. Third inversion of the minor scale $c\, d\, e^b\, f\, g\, a^b\, b\, c$.

Ex. 128. Fourth inversion of the minor scale $c\, d\, e^b\, f\, g\, a^b\, b\, c$.

Ex. 129. Fifth inversion of the minor scale $c\, d\, e^b\, f\, g\, a^b\, b\, c$.

Ex. 130. Sixth inversion of the minor scale $c\, d\, e^b\, f\, g\, a^b\, b\, c$. 
Examples 113, 115, 117, 119, 121, 123, 125, 126, 127, 128, 129, and 130 give a tonal impression because melodically and harmonically they consist only of the tones of the C major and the C minor scales. They do not remind us of the keys of C major or of C minor, however, but, instead, represent new keys. It is possible to form seven keys from each of the two basic scales (major and minor). The two basic major and minor scales form the basis of the two main major and minor keys. Six additional neighboring keys arise from the six inversions of the major scale and six from the six inversions of the minor scale.

On the whole, fourteen keys can be formed using the basic major and minor scales. Aside from a few exceptions, Western European musical practice is confined to major and minor keys. Even in Czech music, keys other than the major and the minor are not used consistently. However, the inversions of these scales are used periodically.

According to our knowledge, this is the first comprehensive discussion of the relationship of the basic major and minor scales to their inversions and the use of the inversions of the basic scales for the formation of other keys that differ substantially from the major and the minor keys.

As stated before, the formulation of these theories was stimulated by a very careful study of Moravian and Slovakian folk songs.

This conception of the relationship of the basic major and the minor scales to their inversions signifies a complete deviation from the way older theorists explained the so-called church modes. Our conception arises from the Moravian and Slovakian folk music, which is still living today.

Incidentally, this discussion is the first attempt to comprehend
theoretically the essence of Czech music from a purely musical standpoint, pointing out its unique features. Unfortunately, within the limits of a discussion of harmony, it is not possible to discuss the rhythmic characteristics of Moravian and Slovakian folk music and to clarify its influence on Czech art music. This area would be very rewarding for the musicologist.

In any case, from a historical point of view, the concept "national music" can be used in regard to Czech art music because it has, at its foundation, many features that have been derived from folk music.

Furthermore, every musician can utilize my theories, according to his desire and nature, and compose in fourteen rather than two keys because Czech musicians have also made use of ideas of musicians from other cultures. We only want to point out that Czech music has developed independent of outside influences to a great extent and represents an essential part of Czech and Slovakian culture.

To complete this discussion of the diatonic tonal system, an axiom can be derived from Examples 113-30, namely, that every triad, major and minor as well as well as diminished and augmented, can be used as a tonic chord and a cadential chord. This axiom retains its validity when it is expanded and states that every chord can be used as a tonic chord and a cadential chord.

From the Slovakian folk songs (Example 103-10) one can learn what is necessary to give the impression of any key (not only the major and the minor keys). It is necessary to repeat the original tone (the tonic) several times in the course of the melody (especially if it is long) and also often return to another central tone in the melody which functions architecturally as a deviation from the beginning tone (the tonic). Every chord can function as the beginning chord
(the tonic) if it is especially stressed and repeated (similar to a single tone) and as a deviation. Likewise, every chord can function as the closing of a section of a musical piece when it is consciously approached as the intuitively-felt tonal goal. It is also possible to feel a number of keys in the course of a musical piece if one consistently thinks melodically and harmonically in a certain scale. When composing with the 24-step quarter-tone scale, for example, a number of different scales can be produced. Therefore, in the first place, the key is not only established by the use of the major or the minor scale but also by the use of any chosen series of tones; secondly, at the same time, the basic major or minor triad is not automatically considered the tonic, but the chord that receives the most conscious stress in considered the tonic. *

*I have consciously adhered to these principles in my works including the second and third quarter-tone string quartets (String Quartet No. 2, Op. 7 and String Quartet No. 3, Op. 12), the sixth-tone string quartet (String Quartet No. 5, Op. 15), the quarter-tone Choral Suite, Op. 13, the Fantasy for Violin and Quarter-tone Piano, Op. 21, three suites and fantasies for cello solo (including the Fantasy, Op. 18), partially in the Fantasy for Piano and Orchestra, Op. 8 (in the half-tone system, and in earlier works such as Opuses 1 to 6 in the half-tone system, two suites for quarter-tone piano (Suite No. 1, Op. 10 and Suite No. 2, Op. 11), and the Fantasy, Op. 9a, and Music, Op. 9b, for violin solo (in the quarter-tone system). 34

These axioms are not only valid in the 7-step (diatonic) system, but also in the 12-step (chromatic), 24-step (bichromatic) tonal systems, and every other tonal system. Further statements will prove that this

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34 Hába lists every composition with an opus number written by the time of the publication of this treatise, i.e. Opp. 1-18, except Opp. 14, 16, and 17.
is true.

We have theoretically said almost everything about the 7-step (diatonic) tonal system, including what is contained in this system and how the chordal combinations and other constructions can be used in it.

We have referred to 2-note to 7-note secundal, tertian, quartal, quintal, sextal, and septal constructions, have explained the principle of close and open position, have established the fundamental difference between inversion and transposition, and have established the difference between tonality and tone centrality.

We also have stated that the secundal construction of a diatonic septad (e.g., \( c d e f g a b c \) or \( c d e f g a b b c \)) is considered to be the basic construction (close position). All other chordal constructions mentioned above and their mixed forms (quartal constructions mixed with tertian and secundal constructions) can be derived from this construction.

In the same way, we have established the principal difference between Rameau's division into groups of the seven scale degrees (into the tonic, dominant, and subdominant chords) and the other new possibilities for the division of the seven scale degrees and referred to the fact that it is possible to consider the seven diatonic scale degrees as one unit and to form a new kind of seven-tone music from this unit.

Finally, from the start, we established the principles for the formation of scales and pointed out the merits of the Greek theorists.

These fundamental findings are also valid in the 12-step and 24-step tonal systems, and the number of possibilities is expanded.

In the twelve-tone system, the basic secundal construction consists of twelve tempered half-tones:
Ex. 131.

It is symmetrical. The middle tone $f^\#$ is placed seven half tones from both $c$ and $c^\flat$.

On the other hand, the secundal construction in the seven-tone system (the lower designation of Example 131) is asymmetrical. We arrive at $c$ from the middle tone $f^\#$ by moving by two half tones and two whole tones. To move from $f^\#$ to $c^\flat$, one moves by a half tone, two whole tones, and a half tone (see Example 131).

If all the vibrations, e.g., from $c$ to $c^\flat$ (132-264 vibrations), were used as steps, we would obtain 132 steps within the range of that octave. These 132 vibrational steps could be considered a basic secundal construction in which the 132 scale degrees could follow one another in closed position or could ring simultaneously. We mention this only to show the validity of the principle of the basic secundal construction. Even the smallest interval, i.e., the difference in the number of vibrations between two tones, can be considered a "second."

Furthermore, let us now look at the basic secundal construction in the twelve-tone system (shown in Example 131): in this construction, a half tone is considered a second. This construction is also symmetrical because it consists of successive minor seconds. In the seven-tone system, two major seconds, three minor seconds, two major seconds, and a minor second follow one another; therefore, it is asymmetrical.

\[35\] Here and later in the text, the terms "major second," and "minor second" are used in place of Haba's terms "whole tone second" and "half-tone second."
This basic difference between 7-note and 12-note secundal constructions also becomes apparent in the fact that the successions of intervals in the six inversions of the diatonic scale differ from the successions in the transpositions, while the inversions of the chromatic scale have the same succession of intervals as its transpositions (twelve half tones):

Ex. 132.

Ex. 133.
The differences between inversions and transpositions of the chromatic scale can only be indicated by enharmonic spelling. Tonally, however, they are the same in the well-tempered twelve-tone system.

The comparison of 7-note and 12-tone secundal constructions leads us to the understanding that the greater number of tones in the 12-note secundal constructions offers more melodic and harmonic possibilities but that the symmetrical succession of half tones prevents a variation of this succession by the principle of inversion. The asymmetric succession of whole tones and half tones, on the other hand, offers the possibility of variation by the principle of inversion.

We know, e.g., that two variations of the major and the minor triads can be produced by inverting the basic triad (a sixth chord and a six-four chord) because it consists of two unequal intervals of a third. (The major triad contains a major and a minor third and the minor triad contains a minor and a major third.) However, because the augmented triad consists of two identical (major) thirds, an augmented triad is again produced when the augmented triad is inverted. Likewise, because the diminished triad is also composed of two identical (minor) thirds, a diminished triad is again produced when the diminished triad is inverted.

Because new variations of the basic secundal constructions of the symmetrical twelve-tone system cannot be obtained by inversion or by transposition another procedure must be utilized, namely, the omission of one or more half tones from the symmetrical secundal construction. With this procedure, secundal constructions of fewer than twelve tones arise; and they now contain major seconds as well as minor seconds:
Ex. 134.

The inversion of the unequal secundal construction (the first 10-step scale in Example 134), which contains two whole tones (c - d, g - a) in addition to the half tones, produces nine new variations.

In the diatonic 7-step scales (the major and the minor scales), the two or three half tones (among the whole tones) were the cause of the variation when these two scales were inverted. In the chromatic 10-step scale (Example 134), the two whole tones as exceptions among the half tones give rise to the possibility for variation of the basic scale (Example 134) through inversion.

In Example 134, it can be clearly seen how the two whole tones change their position within the scale when it is inverted (similar to how the two half tones change their position within the major and the minor scales when they are inverted; see Example 90).

In addition to the equally-spaced symmetrical half-tone scale, there is one more equally-spaced symmetrical secundal construction—the 6-step whole-tone scale. Accordingly, the basic half-tone scale can be
divided into two whole-tone scales:

Ex. 135.

As we said before, the 12-step half-tone scale can be considered a 12-note chord in closed position (a secundal construction), similar to the way that the major and the minor scales in the discussion of the seven-tone system were conceived as septads in close position (unequally-spaced secundal constructions).

Let us now try to determine whether, and how, the tertian construction of a 12-note chord can be set up as chords (in a somewhat more open position). First, we shall deal with the two whole-tone scales. These scales can be divided into the following augmented triads:

Ex. 136.

These augmented triads can be combined in the following ways to form sextads:

Ex. 137.
The sextads in Example 137 consisting of the first and fourth, the second and third, the third and first, and the fourth and second augmented triads (the number of the lower triad is listed first) contain a minor third in the middle; the sextads consisting of the first and second, the second and first, the third and fourth, and the fourth and third augmented triads contain a major second in the middle, and the sextads consisting of the first and third, the second and fourth, the third and second, the fourth and first augmented triads contain a perfect fourth in the middle. There are actually only three different sextadic constructions (in Example 137); the sextads consisting of the first and fourth, the first and third, and the first and second augmented triads. The other sextads (in Example 137) are only transpositions of these three basic constructions. The inversions of these constructions are as follows:

Ex. 138.

Ex. 139.

Ex. 140.
The inversions of the individual triads contained in the sextads can be established using the numerical designation given in Example 137: 36

Ex. 141.

The sextad $c - e - g^\# - a^\# - d - f^\#$ (Example 139) consists of the diatonic tones of the whole-tone scale $c - d - e - f^\# - g^\# - a^\#$. Secundal septads that consist of major seconds arise in the second, third, and fourth inversions of Example 139.

The septad $c - e - g^\# - b - d^\# - g$ (Example 138) is related to the whole-tone scale (of Example 135, a.) because of its use of the tones $c - e - g^\#$ and to the whole-tone scale (of Example 135, b.) because of its use of the tones $b - d^\# - g$. Because of this, minor seconds appear in the first through fifth inversions of Example 138. The triads $c - e - g^\#$ and $b - d^\# - g$—both augmented triads—differ in pitch by a half tone.

The tones of the sextad $c - e - g^\# - c^\# - f - a$ (Example 140) also belong to two whole-tone scales; the tones $c - e - g^\#$ belong to the whole-tone scale $c - d - e - f^\# - g^\# - a^\#$, and the tones $c^\# - f - a$ are taken from the scale $c^\# - d^\# - f - g - a - b$. The triads $c - e - g^\#$ and $c^\# - f - a$ also differ in pitch by a half tone. For this reason, minor seconds also arise in the inversion of this sextad.

The sextads $c - e - g^\# - b - d^\# - g$ (Example 138) and $c - e -$

36 All the twelve possible permutations ("inversions") are given in Example 137 of this chapter.
$g\# - c\# - f - a$ (Example 140) can also be perceived as diatonic chords.

Ex. 142.

Since Vladimir Rebikov and Debussy, who often wrote six-tone music, European composers have written three types of six-tone music based on the following three scales:

Ex. 143.

Ex. 144.

Ex. 145.

Scale I.a. (Example 143) can be conceived as the following sextad:
The sextad (Example 146) consists of three augmented fourths 
\((c - f^\#, \, g^\# - d, \, e - a^\#)\) and two major seconds \((f^\# - g^\#, \, d - e)\).

It is seen that the tritone (the augmented fourth) has a greater
significance in the six-tone music utilizing the whole-tone scale than
in the Lydian scale (the third inversion of the major scale, Example
105).

The six-tone scale, III.a., can also be conceived as the follow-
ing sextad:

Ex. 147.

This chord consists of two minor thirds, \(f - g^\#(a^b)\) and \(c^\# - e\), and
three perfect fourths, \(c - f, \, g^\# - c^\#,\) and \(e - a\).

The following sextad can be formed from Scale II.a.:

Ex. 148.

It consists of three minor thirds, \(c - d^\#(e^b)\), \(g^\# - b\), and \(e - g\), and
two perfect fourths, \(d^\# - g^\#,\) and \(b - e\). The three sextads (Examples
146, 147, 148) are mixed intervallic constructions similar to the
sextads consisting of the first and fourth, the first and second, and the first and third augmented triads (Example 137).

The close position sextads mentioned up to now correspond to the following open position sextads:

Ex. 149.

Ex. 150.

Ex. 151.

Two basic types of inversion of intervals and chords can be established after a study of the inversion used in Examples 138, 139, and 140 (or earlier in Examples 23-29 and others) and in Examples 149, 150, and 151:
As can be seen, there is a possibility of simple inversion up or down of every interval. For example, the perfect fifth $c - g$ in the triad $c - e - g$ (Example 152, a.) becomes a perfect fourth in two ways: either the tone $g$ is considered the center and the tone $c$ is shifted up an octave, $c^1 - g^1 - c^2$, or the tone $c$ is considered the center and the tone $g$ is shifted down an octave, $g - c^1 - g^1$. The double inversion arises when several tones are transposed up and several are transposed down:

Ex. 153.
Example 153 illustrates the invertibility of chords (sextal constructions arise from tertian constructions).

Example 154 shows the inversional relationship between the septal and secundal constructions, the tertian and sextal constructions, and the quintal and quartal constructions in the seven-tone system.

The inversions in Examples 23-29 were carried out in order to prove that all constructions (whether symmetrical or mixed) can lead to the secundal construction as the basic construction.

It might be advantageous for the reader to practice double inversions of all constructions that were mentioned earlier in connection with the explanations of the seven-tone system.

Using the sextads that arise from the three 6-step scales mentioned earlier (Example 143, I.a., Example 144, II.a., Example 145, III.a.), it should be said that it is possible to set up still other constructions in addition to those shown in Examples 137, 146, 147, and 148.

Ex. 155.

Example 155 shows a mixed construction (I.) that consists of a minor seventh $f^\# - e$, a major third $e - g^\#$, a diminished fifth $g^\# - d$, a minor sixth $d - a^\# (b^b)$, and a major second $a^\# (b^b) - c$. The second construction of Example 155 arises through double inversion.

$f^\# - e$ in I. becomes $e - f^\#$ in II.,

$e - g^\#$ in I. becomes $g^\# - e$ in II.,
\[ g^\# - d \quad \text{in I. becomes} \quad d - g^\# \quad \text{in II.}, \]
\[ d - a^\# \quad \text{in I. becomes} \quad a^\# - d \quad \text{in II.}, \]
\[ a^\# - c \quad \text{in I. becomes} \quad c - a^\# \quad \text{in II.} \]

For the sake of simplicity, double inversion is carried out in the following way: for example, the first construction in Example 155 is read from top to bottom but is written from bottom to top in the second construction.

The investigation of which of the sextadic constructions utilizing the tones of the three different six-tone scales are found in the music of Debussy, Rebikov, Scriabin, Schönberg, and Novák continues to be reserved for musical analysis by theorists. We cannot deal with this within the scope of a treatise only dealing with the theoretical formation of harmonic systems. The reader must be satisfied with the general statements made by this author, in whose musical works the established principles can be found.

Now, let us try to obtain the diatonic chords produced by the three 6-step scales (Example 143, I.a., Example 144, II.a., Example 145, III.a.) in the same way as we obtained the diatonic 3-note to 7-note chords of the major and the minor scales in Examples 92-100:

Ex. 156.
Ex. 157.

Whole-tone basic scale | 2nd inv |
---|---
4th inv

Together as triadic progression

Ex. 158.

Whole-tone basic scale
---
4th inv

5th inv

Together as tetradic progression

Ex. 159.

Whole-tone basic scale | 2nd inv |
---|---
4th inv

5th inv

1st inv

Together as pentadic progression

Ex. 160.

Whole-tone basic scale | 2nd inv |
---|---
4th inv

5th inv

1st inv |
3rd inv

Together as sextadic progression

Ex. 161.

Basic scale | 1st inv |
---|---
2nd inv

3rd inv | 4th inv

5th inv
Ex. 162.

Basic scale | 2nd inv | 4th inv | Together as triadic progression

Ex. 163.

Basic scale | 2nd inv | 4th inv | 5th inv | Together as tetradic progression

Ex. 164.

Basic scale | 2nd inv | 4th inv | 5th inv | 1st inv | Together as pentadic progression

Ex. 165.

Basic scale | 2nd inv | 4th inv | 5th inv | 1st inv | 3rd inv | Together as sextadic progression

Ex. 166.

Basic scale | 1st inv | 2nd inv | 3rd inv | 4th inv | 5th inv
The triadic progression in Example 157 consists of one basic triad (two superimposed major thirds) that appears, by successive transpositions, on the five whole-tone scale degrees.

The triadic progression in Example 162 also contains only one basic triadic construction; this construction is not transposed to the
five whole tones, but is transposed, in turn, by a minor third, a minor second, a minor third, a minor second, and a minor third.

The construction of the augmented triad also forms the basis of the triadic progression in Example 167; however, it is transposed to scale degrees different than those in Example 162 (in turn, by a minor second, a minor third, a minor second, a minor third, and a minor second).

The scale degrees used in the transposition of the three scales are as follows:

Ex. 171.

The constructions of tetrads in Examples 158, 163, 168 are subject to the same transpositional axiom as the construction of triads (Example 171).

There are three different basic tetrads derived from the three six-tone scales:

Ex. 172.

The first chord in Example 172 is the basic construction of the
tetradic progression in Example 168, the second chord is the basic construction of the tetradic progression in Example 158, and the third chord is the basic construction of the tetradic progression in Example 163. All other tetrads in Examples 158, 163, and 168 are transpositions of these three basic tetrads.

Furthermore, the first and third tetrads in Example 172 are also connected with the diatonic seven-tone system; the first tetrad is the first inversion of the tetrad that is found on the first scale degree in A minor:

Ex. 173.

The third tetrad:

Ex. 174.

is found on the third scale degree in A minor; both chords do not appear in transposition on any other scale degree in A minor.

The pentadic progression in Example 159 consists of transpositions of the first construction, composed of two major thirds, a major second, and a major third:

Ex. 175.
Two alternating constructions are found in the pentadic progression in Example 164; the first, third, and fifth constructions contain two major thirds, a minor third, and a major third, and the second, fourth, and sixth constructions contain two major thirds, a minor second, and a major third.

The succession of the two constructions just mentioned is reversed in the pentadic progression in Example 169: the constructions that contain two major thirds, a minor second, and a major third are found on the first, third, and fifth scale degrees, and the constructions that contain two major thirds, a minor third, and a major third are found on the second, fourth, and sixth scale degrees.

On the whole, three new pentadic constructions are obtained from the three 6-note scales mentioned in addition to those which we already constructed in Example 73 using the tones of the two 7-step major and minor scales:

Ex. 176.

\[\text{\includegraphics{ex176.png}}\]

In addition to the augmented triad \(c - e - g^\#\) that all three pentads contain, the first pentad has the tones \(a - c^\#\) which move chromatically to \(a^\# - d\) in the second pentad and then to \(b - d^\#\) in the third pentad.

The three new sextadic constructions were already shown in Example 137:

Ex. 177.

\[\text{\includegraphics{ex177.png}}\]
The remaining three augmented triads \( a - c^\# - f, a^\# - d - f^\#, \)
and \( b - d^\# - g, \) which stand in chromatic succession, are, in turn,
combined with the augmented triad \( c - e - g^\# \) and together make use of
all twelve tones of the chromatic scale.

In comparison to the number of different 3-note to 7-note chordal
constructions obtained from the major and the minor scales, the 6-step
scales offer fewer possibilities of new chords. The augmented
triad is already known from the minor scale, as is the second and
third tetrads of Example 172. Only the following chords are new tertian-
secundal and tertian constructions derived from tones of the 6-step
scales:

Ex. 178.

![Musical notation image]

The new secundal constructions are as follows:

Ex. 179.

![Musical notation image]

All other secundal constructions are transpositions of these three basic
constructions. (See the inversions of the six-tone scale in Examples
160, 165, and 170.)

Other possible constructions in open position are as follows:
Ex. 180.

The first construction consists of an augmented fourth, a major third, an augmented fourth, a major third, and an augmented fourth. The reader can establish for himself which intervals are contained in the other constructions.

The aim of the first to third, fourth to sixth, and seventh to ninth constructions it to move from a more close position into a more open one by the superimposition of larger intervals.

There are other mixed constructions than the ones shown in Example 180; the superimposition of intervals can be varied substantially.

In addition, it is also possible to separate individual groups of intervals from one another by one or two octaves:

Ex. 181.

After having explained the nature of the whole-tone scale and of six-tone music, we would like to show the formation of 8-note, 9-note, 10-note, 11-note, and 12-note chords.
First, it is necessary to show that the fourteen different septadic tertian constructions (listed in Example 50) can all be used in the construction of 8-note tertian chords:

Ex. 182.

The expansion of the sextads (Example 178) to 8-note chords through the utilization of two of the remaining six tones of the 12-step chromatic scale is as follows:

Ex. 183.
In this way, we obtain twenty-three 8-step scales (8-note secundal chordal constructions), thirteen tertian constructions (Example 182), nine mixed constructions (Example 183), and three 8-note chordal constructions of diminished-seventh chords.

By the use of double inversion, the 8-note septal construction is obtained from the secundal construction, the 8-note sextal construction from the tertian construction, and the 8-note quartal-quintal-sextal-septal construction from the quartal-quintal-tertian-secundal construction:

Ex. 184.

Example 184 contains several of the inversional possibilities of the eleventh 8-note chordal construction in Example 182. All the constructions mentioned in Examples 182 and 183 can be developed in the same way.

Now, we want to turn to the formation of 9-note chords. Let us consider the 8-note chordal constructions already shown as the basis, to which another near-by scale degree (if possible, a third) is added:
The following 9-note chords arise through the superimposition of three augmented thirds:

Ex. 186.

The first and fourth, second and fifth, and third and sixth
9-step scales of Example 186 consist of identical scale degrees because the first and fourth, second and fifth, and third and sixth 9-note chords are composed of identical tones; however, the structure of each of the chords contained in each pair differs.

The construction of inversions of 9-note chords arises in the same way as the 8-note chords:

Ex. 187.

Example 187 shows inversions of the fourth construction of Example 185. All constructions (Examples 185 and 186) can be developed according to this model.

On the basis of the 8-note and 9-note chords given so far, the formation of 10-note chords is only a continuation of the agreed method of getting from the 7-note to the 12-note chord. Furthermore, the 9-note chordal construction is expanded to a 10-note chordal construction by the addition of a new tone, if possible, a third away:

Ex. 188.
Ex. 189.
Augmented triads form the basis for the 10-note chords in Example 189.

The third and seventh scales in Example 188 are identical; they both consist of the same tones.

The inversions of the constructions are formed in the same way as those in Example 187:

Ex. 190.

The first, second, and third 10-note chords in Example 189 contain the same 9-note chord composed of three augmented triads \((c - e - g^#, a - c^# - f, f^# - a^# - d)\). The tone \(d^#\) in the first 10-note chord, the tone \(g\) in the second, and the tone \(b\) in the third are added.
to this 9-note chord. The tones $d^# - g - b$, when combined, form the fourth remaining augmented triad.

The fourth, fifth, and sixth 10-note chords contain the same 9-note chord and, in turn, the tones $f - a - c^#$, while the seventh, eighth, and ninth 10-note chords contain the 9-note chord connected, in turn, with the tones $f^# - a^# - d$.

Together, Examples 188 and 189 contain twenty-three different 10-step scales (secundal constructions) and just as many tertian thirteenth chords containing intervals of seconds, fourths, sixths, and sevenths. Only the second, fourth, eleventh, and thirteenth 10-note chords of Example 188 are consistent tertian constructions composed only of major and minor thirds.

The first thirteenth chord of Example 190 is the tenth construction of Example 188. Every tone of the 10-note chord can be considered the bass tone (the lowest tone) (see Example 190, b.) and the remaining tones superimposed at different intervals.

In modern musical works, chords are often found that can theoretically be considered mixed constructions. Constructions of only one type of interval--thirds, fourths, fifths, and sixths--occur more rarely. Harmonic freedom lies in the use of the multiplicity of constructions.

Following the methods whoen in Example 190, the reader can carry out double inversions (Example 190, a.) and the simple inversions (the change of bass tones and the regrouping of the remaining tones as in Example 190, b.) of all remaining 10-note constructions in Examples 188 and 189.

The 11-note chordal constructions can be considered continuations of 10-note chords. If possible, a third is chosen for the comple-
tion of the 11-note chord; if this is not possible, the next larger interval that is not contained in that particular 10-note chord is added:

Ex. 191.
The scales (the secundal constructions) in Examples 191 and 192 are not all different. Because each of them contains eleven tones, it can be assumed that a whole tone will be present among the eleven half tones. The similarities and differences between the 11-step scales can be established by determining the position of the whole tone among the half tones.

The third scale (Example 192) has a whole tone between the first and second scale degrees.

The thirteenth scale (Example 191) has a whole tone between the second and third scale degrees.

The fourth and twelfth scales (Example 191) have a whole tone between the third and fourth scale degrees.

The third, sixth, and seventh scales (Example 191) have a whole tone between the fourth and fifth scale degrees.

The eleventh scale (Example 191) has a whole tone between the fifth and sixth scale degrees.
The second and fifth scales (Example 191) have a whole tone between the sixth and seventh scale degrees.

The ninth scale (Example 192) has a whole tone between the seventh and eighth scale degrees.

The first scale (Example 191) has a whole tone between the eighth and ninth scale degrees.

The fourth scale (Example 192) has a whole tone between the ninth and tenth scale degrees.

The eighth and fourteenth scales (Example 191) and the sixth scale (Example 192) have a whole tone between the tenth and eleventh scale degrees.

The first scale (Example 192) has a whole tone between the eleventh and twelfth scale degrees.

We can consider these eleven 11-step scales as inversions, transposed to the scale degree c, of the basic scale that contains a whole tone between the first and second scale degrees (the third scale of Example 192). The inversions of the basic scale, not transposed, are as follows:

Ex. 193.
It can be clearly seen in this example that the whole tone (or whole tones) among the half tones guarantees a variety of scalar inversions in the same way as do the half tones among the whole tones in the major and the minor scales. The difference is that in the major and the minor scales the whole tones are predominant, while in the 11-step scale (Example 193) the half tones are predominant.

In addition to the scales (secundal constructions), Example 191 and 192 predominantly contain mixed constructions of 11-note chords.

There are four consistent tertian constructions: the second, third, eleventh, and twelfth constructions of Example 191.

Double inversions of 11-note chordal constructions are formed in the same way as earlier chords:

Ex. 194.

It can be seen once again that by the use of double inversion (Example 194, a.) the tertian construction becomes a sextal construction and the quartal-tertian-diminished quintal construction (Example 194, b.)
becomes a quintal-sextal-diminished quintal construction. Just as with the chords mentioned earlier, every tone of an 11-note chord can be used as the bass tone and the other tones can be superimposed at various intervals:

Ex. 195.

In this way, it is possible to vary each of the 11-note chordal constructions in Examples 191 and 192. Furthermore, the eleven 11-note chords (Example 195) form one organic, harmonic eleven-voice texture. Each voice goes its own way:

Ex. 196.
The melodic lines of Example 196 numbered from one to eleven are the melodies of the individual voices of Example 195 shown in a clearly arranged form.

The 11-voice texture (Example 195) is tonal with regard to the 11-step scale:

Ex. 197.

It consists of the diatonic tones of the scale just shown. The tone $f\#$ not contained in the 11-step scale is also not found in the 11-voice texture in Example 195.

The concept of "expanded tonality" that is mentioned as a characteristic of modern music and used by some music writers certainly is justified. Our examples clearly show how expanded tonality arises and how tonal music can be formed, e.g., from the 11-note chords that belong to a certain scale.

Example 195 also proves that the concept "atonal" is useful only if one wants to say that the music is not tonal (diatonic) in the sense of the major or the minor scale.

Since music that uses only the tones of one provable scale is considered tonal and one can prove that there are scales with more than seven steps, then every piece of music is tonal and the concept "atonal" turns out to be misleading and superfluous.*

*This misconception arises out of the inability to consciously comprehend tonalities other than major and minor.
The emergence of the 11-voice texture (Example 195) came about approximately as follows: first, the intention (idea) was to use all the tones of the scale $c\ c^\#\ d\ e^b\ d\ f\ g\ g^\#\ a\ b^b\ b$ one after the other in the bass as the melody and to set up 11-note chords over these tones in different constructions. The first voice (the lowest voice) in Example 195 arose and then the second voice (Example 196, 2.). The two voices form the interval of a major seventh, $c - b$. This distance is reduced by contrary motion to $d - g^\#$. Subsequently, this type of movement occurs four more times: a larger interval moving to a smaller interval by oblique and contrary motion. The movement of the first and second voices (Example 196, 1. and 2.) can be schematically shown in the following manner: \[\text{Diagram}\]. The remaining voices of the first and second constructions in Example 195 were then arise one after another (from top to bottom).

After this came the idea of leading the highest tone $b$ in the second construction of Example 195 down to the tone $e^b$ in the third 11-note chord. I also decided to lead the fourth, fifth, and seventh voices upwards during the formation of the third 11-note chord. These were decisive factors that influenced the formation of the third 11-note chord (Example 195). It would be too far afield to describe the entire psychological process involved in the formation of the remaining 11-note chords. We only want to mention that after the third 11-note chord was formed, our consciousness was awakened for the movement of the highest melody (the eleventh group of tones in Example 196), and we decided that we wanted to reach the climax of the highest melody at the seventh 11-note chord and then to descend melodically in contrary motion to the
bass voice. We worked on Example 195 for 25 minutes, finishing around two-thirty in the morning after five hours of previous work on this treatise.

Now, before we make several general observations, we want to show the constructions of 12-note chords:

Ex. 198.

Ex. 199.

Examples 198 and 199 contain mixed constructions of 12-note chords. It is seen that it is not possible to arrive at 12-note chords by adhering to the principle of tertian construction that is used in the formation of tertian septads from the tones of the major and the minor scales.

There are, however, several tertian constructions of 12-note chords:
Example 200 shows tertian constructions that are composed of major and minor thirds. A 12-note chord cannot be formed using only major or only minor thirds. Double inversion of the first, second, third, and fourth 12-note chords (Example 200) will produce sextal constructions (similar to the double inversion of the 11-note chordal constructions in Example 194, a.). Separate sextal constructions can also be set up:

Ex. 201.

However, 12-note sextal chords exceed the usable range of tones and, for that reason, cannot be used; 12-note septal chords also exceed the usable range of seven octaves (Example 202). On the other hand, quartal and quintal constructions of 12-note chords are still usable:

The 12-note chord (the fifth chord of Example 202) alternately consists of augmented and perfect fourths.

The septad (the second chord in Example 202) consists of minor sevenths. The sixth seventh is identical to the first (lowest) tone. The tones of this septal construction form the whole-tone scale $c \ d \ e \ g^b \ a^b \ b^b$.

The tertian construction (the third chord of Example 200) is composed of three diminished-seventh chords. The tertian construction (the fourth chord of Example 200) consists of four augmented triads.

We have already established in our discussion of tertian chords that they can be divided in several different ways (into smaller groups of tones) (see Example 73 for the division of pentads, Examples 75 and 76 for the division of sextads, and Examples 77, 78, 79, and 80 for the division of septads).

Similarly, the 8-note, 9-note, 10-note, 11-note and 12-note chords can be conceived either as units or as combinations of different smaller chordal groups of chords, e.g., the 8-note chord $c - e - g - b^b - d - f^# - a - c^#$ (taken from the first 12-note chord in Example 200) can be divided in the following manner:
The division of a 9-note chord (taken from the first 12-note chord in Example 200) is as follows:
The division of a 10-note chord into groups is as follows:

The division of a 11-note chord is as follows:
The division of a 12-note chord (the first construction in Example 200) is as follows:

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

\[c - e - g - b^b - d - f^# - a - c^# - e^# - g^# - b - d^#\]

etc.

The following example shows the group-like conduct of a 12-note chord:

Ex. 203.

Because of the prominent use of \(g - d - f - b\) in the lowest position, the first 12-note chord in Example 203 gives the impression of a
dominant. The 12-note chord does not necessarily have to lead to the dominant or the tonic of C major. It can do so, however, if that is desired.

The next example shows a 12-note chord (a 12-voice harmonic texture) $g - b - d - f - a - c^\# - e - g^\# - b^\# - d^\# - f^\# - a^\#$ in its basic tertian structure, in open position, and its seventh, tenth, and second inversions:

Ex. 204.

The tone $g^\#$ is considered the bass tone of the seventh inversion of the tertian construction (of Example 204, close position tertian structure), the tone $f^\#$, the bass tone of the tenth inversion, and the tone $d$, the bass tone of the second inversion.

The relationship between a 12-note chord and its inversions is the same as the relationship of a triad and its inversions, for example. Some tones remain the same from chord to chord and others move to a different octave.

The essence of all past, present, and future harmonies is expressed by this basic law. This formula is true in every tonal system and for harmonies with any number of tones.

The principle of simple and double inversion of chords of two or more tones (see Examples 152, 153, and others) is also generally accepted
on the basis of the octave relationships given in nature.

The principle that every chord can also be conceived as a construction of smaller groups of tones or as a single unit also remains valid. Furthermore, the following law is true for all tonal systems: every tone can be combined with every other tone, successively as a scale degree or simultaneously as a chord. (The very small difference between two different pitches ringing simultaneously is often called a beat.)

On the basis of this law, another law is also true:

Every chord of two or more tones can be combined with every other chord of two or more tones. Theoretically, all chordal combinations are possible and equal in importance. By studying the works of different epochs and different composers, one can determine which chordal combinations were preferred and which not used at all, which were newly invented and which were taken over from tradition.

In addition, the following law complements the law just stated:

Every chord of two or more tones can be combined with each of its transpositions.

Every chordal relationship should be conceived as one possibility (one form of combination) but not as the generally accepted law.

A particular work of art has its own system of laws determining every chordal relationship (creative individuality). Outside of the work under consideration, this chordal relationship is but one of many possible relationships. Only in a work of art, arises the necessity of a particular chordal relationship; outside the work of art, i.e., as a theoretical observation, this or that chordal relationship may exist.

The fundamental difference between our conception and all earlier conceptions of theory of harmony is that we stress the general laws that determine which chordal relationships can arise but do not elevate these
possibilities to laws.

We show how a 12-note chord, for example, can be divided into smaller groups of triads, tetrads, pentads, and sextads, however, we do not maintain that only the possibilities that we have mentioned are "the" possibilities. We have set up the axiom that every chord can be considered a single unit or a combination of smaller groups of chords. The main purpose of the possibilities shown in the examples is to stimulate the reader's own thinking and inventing.

We have not a priori labeled or assumed that, e.g., the tertian system or the quartal system was the basic law of all harmonic thinking. Instead, our intention was to show other possible constructions (sextal, septal, and quintal constructions and mixed forms of these) and to clarify their mutual relationships, namely, that all constructions that consist of intervals larger than a second can be traced back to the secundal construction (the scale).

Even though examples from different musical works are not shown in this treatise, it will be possible for everyone who has attentively studied it to know thoroughly the harmonies of all works. Because he can find the explanation for all the various chordal groups and the way they evolved in this treatise, he will be able to understand secundal or septal constructions as logical rather than as arbitrary constructions.

Furthermore, study of this treatise will clarify the representation of the 14 7-step, the 3 6-step, the 23 8-step, the 17 9-step, the 23 10-step, and the 11 11-step scales that are derived from the 12-step half-tone scale.

For the most part, so far, our treatise has been a continuation and a theoretical harmonic building based on traditional theoretical foun-
ations thought out to completion. Now, we want to leave the traditional kind of theoretical chordal conception and its formation and to show how triads, tetrads, and other chords can also be theoretically set up.

Completely uninfluenced by the types of constructions mentioned earlier, we proceed from the following general principles:

The dyad is the simultaneous ringing of two different tones.

The triad is the simultaneous ringing of three different tones, etc. 37

Because the half-tone system consists of twelve different tones, it is possible to set up 2-note, 3-note, 4-note to 12-note chords.

We said that every tone can be combined with every other tone. Therefore, the following (already known) formula concerning the relationship of c to all tones of the half-tone scale arises for the dyads in the half-tone system:

Ex. 205.

\[ \text{Inversion} \]

For triads:

1. \( C - d^b \) to all tones of the half-tone scale:

Ex. 206.

\[ \text{Inversion} \]

\[ \text{Inversion} \]

37This statement should be extended to apply to the formation of 4-note to 12-note chords.
2. \( C - d \) to all remaining tones of the half-tone scale lying higher:

Ex. 207.

3. \( C - e^b \) to all remaining tones of the half-tone scale lying higher:

Ex. 208.

4. \( C - e \) to all remaining tones of the half-tone scale lying higher:

Ex. 209.

5. \( C - f \) to all remaining tones of the half-tone scale lying higher:


6. \( C - f^\# \) to all remaining tones of the half-tone scale lying higher:

Ex. 211.
7. $C - g$ to all remaining tones of the half-tone scale lying higher:

Ex. 212.

\[ \text{Diagram} \]

8. $C - a^b$ to all remaining tones of the half-tone scale lying higher:

Ex. 213.

\[ \text{Diagram} \]

9. $C - a$ to all remaining tones of the half-tone scale lying higher:

Ex. 214.

\[ \text{Diagram} \]

10. $C - b^b$ to $b$:

Ex. 215.

\[ \text{Diagram} \]

We have obtained fifty-five triadic constructions in this way.\(^\text{38}\)

\(^\text{38}^\text{The formula for calculating the number of possible chordal structures of a certain number in a tonal system using } m \text{ as the total number of tones in the system and } n \text{ as the number of tones in the chordal structure is:}

\[
\frac{m!}{n! \ (m-n)!}
\]

If one tone functions as an invariable (in this case, $c$), the
In Example 206, we began with the construction $c - d^b - b$; in order to be consistent, the additional examples (Examples 207, 208, etc.) would have to begin with a construction that contains a major seventh as the second interval, e.g., $c ---- d ---- c^#$ or $c ---- e^b ---- a$, $c ---- e ---- e^b$, etc.

This is not necessary, however, because the missing constructions (Example 216) can be derived in open position from some of the constructions already shown in Examples 205-15:

Ex. 216.

The possible number of distinct chordal structures with one tone functioning as an invariable in the half-tone, the quarter-tone, and the third-tone systems is shown below, along with the number of possibilities Hába discusses in connection with each of these systems:

<table>
<thead>
<tr>
<th>Chord</th>
<th>Half-tone system</th>
<th>Quarter-tone system</th>
<th>Third-tone system</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 notes</td>
<td>55</td>
<td>55</td>
<td>253</td>
</tr>
<tr>
<td>4 notes</td>
<td>165</td>
<td>195</td>
<td>1,777</td>
</tr>
<tr>
<td>5 notes</td>
<td>330</td>
<td>176</td>
<td>-</td>
</tr>
<tr>
<td>6 notes</td>
<td>462</td>
<td>110</td>
<td>-</td>
</tr>
<tr>
<td>7 notes</td>
<td>462</td>
<td>31</td>
<td>-</td>
</tr>
<tr>
<td>8 notes</td>
<td>330</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>9 notes</td>
<td>165</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>10 notes</td>
<td>55</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>11 notes</td>
<td>11</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

39 In other words, Hába feels that when constructing all the possible triads that contain a certain invariable dyad, it is best to begin by adding the largest interval (less than an octave) above the upper tone of the dyad, and then writing progressively smaller intervals between the upper two voices of the triad ($M7, m7, M6$, etc.).
The basic constructions of the triads shown in Example 216 are as follows:

Ex. 217.

Each chord is found once in the following earlier examples: 1.: 206; 2.: 207, 206; 3.: 208, 207, 206; 4.: 209, 208, 207, 206; 5.: 210, 209, 208, 207, 206; 6.: 211, 210, 209, 208, 207, 206; 7.: 211, 210, 209, 208, 207, 206; 8.: 213, 212, 211, 210, 209, 208, 207, 206; 9.: 214, 213, 212, 211, 210, 209, 208, 207, 206.

Every triad (not only the types of major, minor, diminished, and augmented triads up to now labeled as triads) has two possible inversions. Since the two tones, in addition to the basic tone, can be used as "bass tones" (the lowest tone), each of the fifty-five triads shown can appear in two inversions:

Ex. 218.
Ex. 219.

The first triad in Example 218 consists of a minor second \( c - d^b \) and a minor seventh \( d^b(c^\#) - b \) and is considered the basic construction. The first inversion \( d^b - d - c \) of the triad \( c - d^b - d \) (Example 219, 2.) also consists of a minor second and a minor seventh. The first inversion of the triad \( c - d^b - b \) (Example 218, 2.) contains the minor seventh \( d^b - b \) and the minor second \( b - c \). The second inversion of the triad \( c - d^b - d \) (Example 219, 3.) also contains a minor seventh and a minor second. The second inversion (Example 218, 3.) resembles the construction of the root position triad (Example 219, 1.). In the final analysis, we find that this is true because both triads are composed of three successive half tones: \( c - c^b - b, b - c - d^b \); it could be said that the triad (Example 219, 1.) is an inversion and a chromatic transposition of the triad (Example 218, 1.).

The inversions of the other fifty-four triads are created in a way similar to that illustrated in Examples 218 and 219.

The principle for the formation of the triads shown in Examples 205-15 is also true for the harmonies up to now labeled as triads (the major, the minor, the diminished, and the augmented triads); the four kinds of triads already mentioned are also found among the fifty-five constructions in Examples 205-15. Some triadic constructions, especially those that contain a minor or a major third or a perfect fourth or a perfect fifth, remind us of the triads and tetrads that we already know from the tertian system:
Ex. 220.

The first, second, fifth, and sixth triads can also be considered tetradic constructions that lack perfect fifths. The tenth and eleventh triads can also be conceived as tetradic constructions: a third $c - e$ or $c - e^b$ would have to be added for them to be complete. The third and fourth triads are sixth chords (first inversion triads), the eighth and ninth six-four chords (second inversion triads), and the twelfth and thirteenth incomplete dominant-seventh chords (in third inversion).

Those triads (from the fifty-five constructions mentioned) that are composed of a minor second and another interval especially produce new, i.e., less traditional, effects. These chords (in close and open positions) are essential parts of the "sonic novelty"\(^\text{40}\) of contemporary music:

Ex. 221.

We obtain the tetradic constructions using the same principles that were mentioned earlier. In this case, combine three tones with the remaining tones of the half-tone scale.

\(^{40}\)Hába uses the term "Klangneuheit."
Ex. 224.

1.2.10. to 3.-9. tone 1.3.10. to 4.-9. tone

1.4.10. to 5.-9. tone 1.5.10. to 6.-9. tone

1.6.10. to 7.-9. tone 1.8.10. to 9. tone

1.7.10. to 8.& 9. tone

Ex. 223.

1.2.11. to 3.-11. tone 1.3.11. to 4.-11. tone

1.4.11. to 5.-10. tone 1.6.11. to 7.-10. tone

1.5.11. to 6.-10. tone 1.7.11. to 8.-10. tone 1.9.11. to 10. tone

1.8.11. to 9.-10. tone

Ex. 222.

1.2.12. tone of half-t sc to 3.-11. tone of same sc

1.2.12. tones to 4.-11. tone 1.4.12. to 5.-11. tone

1.5.12. to 6.-11. tone 1.6.12. to 7.-11. tone

1.7.12. to 8.-11. tone 1.9.12. to 10.-11. tone

1.8.12. to 9.-11. tone 1.10.12. to 11. tone

Ex. 223.
Ex. 225.

1.2.9. to 3.-8. tone
1.4.9. to 5.-8. tone

1.3.9. to 4.-8. tone
1.6.9. to 7.-8. tone

1.5.9. to 6.-8. tone

Ex. 226.

1.2.8. to 3.-7. tone
1.4.8. to 5.-7. tone

1.3.8. to 4.-7. tone
1.6.8. to 7.-tone

1.5.8. to 6.-7. tone

Ex. 227.

1.2.7. to 3.-6. tone
1.4.7. to 5.-6. tone

1.3.7. to 4.-6. tone
1.5.7. to 6. tone

Ex. 228.

1.2.6. to 3.-5. tone
1.4.6. to 5. tone

1.3.6. to 4.-5. tone

Ex. 229., 230.

229.
1.2.5. to 3.-4. tone

230.
1.2.4. to 3. tone

1.3.5 to 4. tone

One hundred and ninety-five tetrads are obtained in this way.

The triads that we showed earlier are contained in these tetrads.

The tetrads (their open positions and inversions) composed of
minor sevenths and minor seconds especially produce new effects:

Ex. 231.

New kinds of tetrads are also obtained by the change of position of one of the middle intervals:

Ex. 232.

A simpler representation of Example 232 and other examples just shown is given below:

Ex. 233.

The inversions and the change of position of the other 194 tetrads are formed in a way similar to that illustrated in Examples 231 and 232.

The tones of each of the 55 triads and the 195 tetrads and their inversions can be transposed to the twelve degrees of the half-tone scale simultaneously, one at a time, or in groups:
Ex. 234. Transpositions of triads.

Ex. 235. Transpositions of tetrads.

The progression of the individual tones of the tetrads (Example 235) to the next transposition of the same chord, however, forms some new passing constructions that we also can consider independent tetrads:

Ex. 236.

The fifth tetrad is the transposition of the first, the second is new, and the third and fourth can be considered transpositions of the following basic constructions (on the scale degree c) (Example 237, 3., 4.):

Ex. 237.
The first, second, third, fourth, and fifth constructions in Example 237 have the same intervalllic content as the first, second, third, fourth, and fifth constructions in Example 236.

Above all, with the careful analysis of the transpositions of tetrads that appear in Example 236, we wanted to point out the fact that there are conscious and unconscious transpositions. We only wanted to transposed the first construction; that the passing constructions (Example 236, 3. and 4.) are also transpositions (of the constructions in Example 237) and must necessarily arise was not our primary aim. Nevertheless, as Example 237 illustrates, these are transpositions of other independent tetrads to the basic scale degree c. The second, third, and fourth tetrads (Example 237) are also found among the 195 tetrads mentioned.

Consequently, the general rule would be as follows: new independent chords or transpositions of some other independent chords arise from a stepwise transposition of [one or more notes of] the beginning chord. By the simultaneous transposition of all scale degrees of a chord, the transposition of the same chord is formed immediately without the appearance of other independent chords or their transpositions.

Because we have shown a self-contained and logical explanation for every chord, we can renounce the concepts of the older theorists (namely, the suspension and the anticipation).

It has already been said in another context that, for the simplest orientation, close or open position chords, inversions, and transpositions must necessarily be derived from one theoretical, harmonic construction. We also agree with the view, already expressed by Schönberg in the Harmonielehre, that there are actually no non-harmonic tones. We have justified this view in Examples 235-37 by proving that a certain harmonic construction can be changed into a new construction by the altera-
tion of one tone. (We can also confirm this aurally.)

The deficiency of the older theoretical conception of chords lies in the fact that the formation of the few types of triads, tetrads, and other chords was far below the variety of combinational possibilities in the diatonic and the chromatic tonal systems. Because of this, it was necessary, unfortunately, to label certain tones that were not contained in the few chordal constructions as suspensions, anticipations, and non-harmonic tones (see Example 236,a.).

We want to show in the following example the difference between our interpretation and the old interpretation of harmonies:

Ex. 238. The first two tetrads of Example 236.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The first tetrad (Example 238) cannot logically be explained on the basis of the older tertian system that did not allow the constructions of chords up to twelve tones. One kind of solution according to the older method would be that it simultaneously possesses a minor and a major third ($c - e^b - e$). A theoretical interpretation utilizing the principle of chordal construction in the tertian system does not seem to be valid in this case, yet it does work to a certain extent:

Ex. 239.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
The tones $e^b$ and $e$ are found in the 9-note tertian chord in Example 239, however, this chord is not a diatonic tertian chord. An important objection to this interpretation remains unanswered: why must a tetrad be explained with a 9-note chord?

*We have overcome this objection by taking a consistent position in regard to the transition of tones and by recognizing the transition of tones as a valid theoretical principle to be used in the interpretation of harmonies.* The 55 triads and 195 tetrads arise from this principle, and this principle makes it possible to conceive every triad and tetrad as it is. Therefore, we can state that the first tetrad (Example 238) is a mixed construction that consists of a minor third, a minor second, and a perfect fifth $(c - e^b - e - b)$ set up in open position $(c - e^b - b - e)$. Or, stated in a different way, the first tetrad (Example 238) consists of the first, fourth, fifth, and twelfth tones of the C chromatic scale. Although the tertian triad $c - e - (g) - b - (d) - f$ can be conceived as a tertian sextad with the tones $g$ and $d$ missing, it is actually just a tetrad in open position.

*After discussion the variety of theoretical interpretations of chords, we want to stress that the formation of triads and tetrads that we have carried out in the preceding examples is another example of the principle of tone centrality. We already mentioned earlier that the seeds of tone centrality are present in older music (Example 39).*

Ex. 240.\textsuperscript{41}

\begin{figure}
\centering
\includegraphics[width=0.3\textwidth]{tetrad.png}
\end{figure}

\textsuperscript{41}Example 240 is identical to Example 39.
Older theorists acknowledged the independence of the individual triads of Example 39, each of which possesses, in turn, one new tone in relationship to the previous chord because they had a theoretical explanation for them--root position chord, sixth chord, six-four chord. From this, we can conclude that older theorists also believed that the change of one tone in a chord suffices in order to be able to conceive it as a new chord. The difference is that while we have consistently utilized this principle, older theorists did not utilize it but instead tried to interpret new chordal combinations with the older principles.

If older theorists called the triad, e.g., $c - f - a$, a six-four chord, i.e., they were characterizing it according to its individual intervals; then, we find it logical to label a complicated chord according to its intervals. Therefore, we can say that $c - e^b - b - e$ (Example 238, 1.) is a three-six-four chord; it consists of a minor third, a minor sixth, and a perfect fourth. We remain traditional in the sense that we try to conceive every chord as it is. It is necessary to adapt the theoretical system to the chords, not vice versa--to try to bring new chords into a limited system.

It was often maintained that modern music cannot be analyzed harmonically. However, it can be analyzed, but only from the standpoint that we have already stressed, namely, that every chord and every change of a chord is conceived as it is and not conceived as we would like it to be for the sake of a limited theoretical conception. The harmony of modern music is not illogical; however, it is illogical not to seek out the logic in modern music, in view of the fact that logic was sought out and found through theory even in earlier music.

For the analysis of modern music, it is necessary, above all, to accept
the concept of mixed chordal constructions, i.e., to acknowledge that the seven, twelve, or twenty-four tones of the diatonic, the chromatic, or the quarter-tone systems can be combined to form chords containing many intervals.

Now, we want to establish and continue the process that we began with the 55 triads and 195 tetrads by showing that pentads can also be obtained from the principle of tone centrality. First, we want to establish the number of groups of tones that can be combined with the first tone c to form pentads and according to which rules the remaining tones of the half-tone scale can be combined with tetrads to form pentads.

Example 241 shows the following combinations of half tones: 42

\[
\begin{array}{c}
1, 2, 3, 12 \\
: 4, 5, 6, 7, 8, 9, 10, 11
\end{array}
\]

i.e., the first, second, third, and twelfth tones of the half-tone scale in combination with in turn the fourth, the fifth, the sixth, the seventh, the eighth, the ninth, the tenth, and the eleventh tones of the same scale, etc.:

\[
\begin{array}{c}
1, 3, 4, 12 \\
: 5, 6, 7, 8, 9, 10, 11
\end{array}
\]

\[
\begin{array}{c}
1, 4, 5, 12 \\
: 6, 7, 8, 9, 10, 11, 2
\end{array}
\]

\[
\begin{array}{c}
1, 5, 6, 12 \\
: 7, 8, 9, 10, 11, 2, 3
\end{array}
\]

\[
\begin{array}{c}
1, 6, 7, 12 \\
: 8, 9, 10, 11, 2, 3, 4
\end{array}
\]

\[
\begin{array}{c}
1, 7, 8, 12 \\
: 9, 10, 11, 2, 3, 4, 5
\end{array}
\]

\[
\begin{array}{c}
1, 8, 9, 12 \\
: 10, 11, 2, 3, 4, 5, 6
\end{array}
\]

\[
\begin{array}{c}
1, 9, 10, 12 \\
: 11, 2, 3, 4, 5, 6, 7
\end{array}
\]

\[42\]Hába's use of numbers to represent particular pitches resembles present-day set theory, except that the first (lowest) pitch uses the number one rather than a zero.
Ex. 241.

The preceding constructions are intended as follows:

Ex. 242.

Ex. 243.

Ex. 244.

Ex. 245.
Ex. 246, 247, 248.

Example 242 has the following mathematical scheme:

Example 243

Example 244

Example 245

Example 246

Example 247

Example 248

We have obtained 176 pentads in this way. We have placed the
fifth tone of each of the pentads an octave higher in order to arrive at
pentads in more open positions. As the reader knows, in the close
position of the tertian pentad c - e - g - b - d, the ninth is a second
and, according to the normal progression of tones, should actually appear
after the tone c (c - d - e - g - b).

By this representation of triads, tetrads, and pentads, we want to
clarify the variety of mixed constructions and show the reader as much of the materials of modern music as possible so that he can orientate himself more easily in these works of art. It should not be difficult for him to derive all new harmonies from the indicated mixed constructions.

As for the inversions and open positions of the pentads, we must again confine ourselves to only a few examples and recommend that the reader independently study all the basic constructions. In a mathematical textbook, e.g., all examples are not solved in the book by the author but are set up as problems for solving by the reader. On the basis of the explanations that we have laid down about inversion and changes of position in this discussion, we can demand the participation of the reader.

Ex. 249.

Example 249 shows all four inversive possibilities (in some open positions of each inversion) of the first pentad in Example 241.

Each of the five tones of the basic construction can be used as the bass tone.

All tetrads, their inversions, and their close and open positions can be transposed to the twelve steps of the half-tone
scale.

The formation of sextads is fundamentally only a continuation of the chosen path. All the remaining tones of the half-tone scale are successively combined with each of the pentads:

Ex. 250.

Ex. 251.

Ex. 252.

Ex. 253.

Ex. 254., 255., 256.
The sextads consist of the following relationships of tones of  the 12-step half-tone scale:

Example 250

1. 2. 3. 12. 4. : 11:10:9:8:7:6:5
1. 3. 4. 12. 5. : 11:10:9:8:7:6
1. 4. 5. 12. 6. : 11:10:9:8:7:2
1. 5. 6. 12. 7. : 11:10:9:8:2:3
1. 6. 7. 12. 8. : 11:10:9:2:3:4

Example 251

1. 2. 3. 11. 4. : 10:9:8:7:6:5
1. 3. 4. 11. 5. : 10:9:8:7:6
1. 4. 5. 11. 6. : 10:9:8:7:2
1. 5. 6. 11. 7. : 10:9:8:2:3
1. 6. 7. 11. 8. : 10:9:2:3:4
1. 7. 8. 11. 9. : 10:2:3:4:5

Example 252

1. 2. 3. 10. 4. : 9:8:7:6:5
1. 3. 4. 10. 5. : 9:8:7:6
1. 4. 5. 10. 6. : 9:8:7:2
1. 5. 6. 10. 7. : 9:8:2:3
1. 6. 7. 10. 8. : 9:2:3:4

Example 253

1. 2. 3. 9. 4. : 8:7:6:5
1. 3. 4. 9. 5. : 8:7:6
1. 4. 5. 9. 6. : 8:7:2
1. 5. 6. 9. 7. : 8:2:3
1. 6. 7. 9. 8. : 8:2:3:4

Example 254

1. 2. 3. 8. 4. : 7:6:5
1. 3. 4. 8. 5. : 7:6
1. 4. 5. 8. 6. : 7:2

Example 255

1. 2. 3. 7. 4. : 6:5
1. 3. 4. 7. 5. : 6

Example 256

1. 2. 3. 6. 4. : 5

Examples 250-56 contain 119 sextads. Open positions and inversions are formed in similar way as was done with pentads:

Ex. 257.
For the formation of septads, open position must also be chosen in order to arrive at mixed constructions:

Ex. 258.

Thirty-one septads are obtained in this way. The following tones of the 12-step half-tone scale are combined:

Succession in close pos

\[
\begin{align*}
&1.2.3.4.5.6:7:8:9:10:11:12 \\
&1.3.4.5.6.7:8:9:10:11:12 \\
&1.4.5.6.7.8:9:10:11:12:2 \\
&1.5.6.7.8.9:10:11:12:2:3 \\
&1.6.7.8.9.10:11:12:2:3:4 \\
&1.7.8.9.10.11:12:2:3:4:5
\end{align*}
\]

Succession, Ex. 258 (open pos)

\[
\begin{align*}
&1.4.5.6.7.8:7:8:9:10:11:12 \\
&1.5.7.3.6.4:8:9:10:11:12 \\
&1.6.8.4.7.5:9:10:11:12:2 \\
&1.7.9.5.8.6:10:11:12:2:3 \\
&1.8.10.6.9.7:11:12:2:3:4 \\
&1.9.11.7.10.8:12:2:3:4:5
\end{align*}
\]

The formation of other open positions and inversions of septads is left to the eager reader. It will be easy to carry this out following the examples of the inversion of pentads and sextads.

The following tones of the 12-step half-tone scale can be used for the formation of 8-note, 9-note, 10-note, and 11-note chords:
### 8-note chords

<table>
<thead>
<tr>
<th>1. 5. 7. 2. 4. 6. 3.</th>
<th>8: 9: 10: 11: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 6. 8. 3. 5. 7. 4.</td>
<td>9: 10: 11: 12: 2</td>
</tr>
<tr>
<td>1. 7. 9. 4. 6. 8. 5.</td>
<td>10: 11: 12: 2: 3</td>
</tr>
<tr>
<td>1. 8. 10. 5. 7. 9. 6.</td>
<td>11: 12: 2: 3: 4</td>
</tr>
<tr>
<td>1. 9. 11. 6. 8. 10. 7.</td>
<td>12: 2: 3: 4</td>
</tr>
</tbody>
</table>

### 9-note chords

<table>
<thead>
<tr>
<th>1. 4. 6. 8. 2. 5. 3.</th>
<th>9: 10: 11: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5. 7. 9. 3. 6. 8. 4.</td>
<td>10: 11: 12</td>
</tr>
<tr>
<td>1. 6. 8. 10. 4. 7. 9. 5.</td>
<td>11: 12: 2</td>
</tr>
<tr>
<td>1. 7. 9. 11. 5. 8. 10. 6.</td>
<td>12: 2: 3</td>
</tr>
</tbody>
</table>

### 10-note chords

<table>
<thead>
<tr>
<th>1. 4. 6. 8. 2. 5. 7. 9. 3.</th>
<th>10: 11: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5. 7. 9. 3. 6. 8. 10. 4.</td>
<td>9: 10: 1</td>
</tr>
<tr>
<td>1. 6. 8. 10. 4. 7. 9. 11. 5.</td>
<td>12: 2</td>
</tr>
</tbody>
</table>

### 11-note chords

<table>
<thead>
<tr>
<th>1. 4. 6. 8. 10. 2. 5. 7. 9. 3.</th>
<th>11: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5. 7. 9. 11. 3. 6. 8. 10. 4.</td>
<td>12: 2</td>
</tr>
</tbody>
</table>

---

**Ex. 259.** Eight-note chords.

---

**Ex. 260.** Nine-note chords.

---

**Ex. 261.** Ten-note chords.

---

**Ex. 262.** Eleven-note chords.
Example 259 contains 21 8-note chords, Example 260 13 9-note chords, Example 261 7 10-note chords, and Example 262 3 11-note chords.

The principles already applied to earlier chords are valid in the formation of open positions and inversions of these chords.

Examples 242 and 251 utilize only eleven tones of the half-tone scale.

Examples 243 and 252 utilize only ten tones of the half-tone scale.

Examples 244 and 253 utilize only nine tones of the half-tone scale.

Examples 245 and 254 utilize only eight tones of the half-tone scale.

Examples 246 and 255 utilize only seven tones of the half-tone scale.

Examples 247 and 256 utilize only six tones of the half-tone scale.

Examples 258, 259, 260, and 261 utilize all twelve tones of the half-tone scale.

All constructions differ from one another only in the fact that, in turn, one tone is omitted and a new one is added, e.g., the first pentad of Example 241 consists of the first, second, third, twelfth, and fourth tones of the 12-step half-tone scale while the second pentad consists of the first, third, fourth, twelfth, and fifth tones: the second pentad contains the fifth tone of the half-tone scale rather than the second. The third, twelfth, and fourth tones are common to both chords. There is only one 12-note chord, which has eleven inversions and many positions.
By the formation of 3-note to 11-note chordal constructions, we did not intend to show all the possibilities of combination that could be produced using the twelve tones of the half-tone scale.

We only wanted to clarify the principle mentioned before and to show a number of the possibilities that arise when the principle is followed, i.e., when one tone, consciously chosen as the basic tone, is combined with all other tones of the half-tone scale.

We expressed this principle as early as 1921 in an article entitled, "Vývoj hudební tvorby a theorie vzhledem k diatonce, chromatice a čtyrttónové soustavě" [The development of musical composition and theory in regard to the diatonic, the chromatic, and the bichromatic system] that appeared in Listy Hudební Matice 1, no. 3 (December 1921) on pages 35-40 and 51-57 as follows:43

"In my compositions (e.g., the Symphonic Fantasy for Piano and Orchestra, Op. 8) and in the musical works of other composers (Schönberg, Finke, Szymanowski, Prokofiev, Vycpálek, Vomáčka, and others) I have determined the following inherent law: The harmonies in new music are vertical combinations of two to twelve tones of the chromatic scale in various intervals, i.e., not exclusively in thirds or fourths. This simple statement will put an end to the misunderstandings between the defenders of modern musical creations and critics and theorists of the old school."

At that time, we knew neither Schönberg's nor Hauer's theories about twelve-tone music.

Schönberg, like Hauer, was theoretically concerned with the melodic principle in twelve-tone music. Certainly, it is seen from two of

---

43 The original Czech title and the page numbers of this article were obtained from Vysložil, Alois Hába, p. 379.
Schoenberg's remarks, "Harmony is beyond discussion," and "The theory of harmony will arise only after one hundred years," that he considered the formulation of a theory of harmony, which would contain the laws of modern music, to be extraordinarily difficult. We assume that by his remark, "Harmony is beyond discussion," he meant that every chord is justified as formative musical material.

We stressed earlier that it is necessary to cultivate a three-fold awareness, i.e., a melodic, a harmonic, and a polyphonic awareness, when composing a musical work or when listening to one. Gaps, deficiencies, and difficulties arise because of the neglect of one or more of these functions.

In this treatise, it was necessary for us to create an extremely extensive collection of chordal structures. Uncreative musicians cannot acquire an understanding of musical works solely on the basis of this collection. Those musicians who possess creative intentions will find quite an abundant treasure of chords and only need to learn the combinations, i.e., to take part in the free combining of tones creatively.

Laws for the combination of chordal structures into a unified musical totality cannot be set up. This matter must be left to every student as part of creative freedom. He should practice his own free combining of tones.

Up to now, the fundamental deficiency in the instruction of harmonic theory is that students are only taught to practice those combinations of chordal structures that other composers have already created. We, on the other hand, stress the opposite: the student should be taught as many chordal structures as possible. The combination of these chordal structures, however, must be demanded by his own creative activity. On the basis of a thorough knowledge of the possible chordal structures it will be easier
for every musically gifted individual to form melody and polyphony more freely if he is aware of the variety of groups of tones. He will be able to choose rather than having to seek laboriously. Because of this, he comes closer to his goals of being able to reproduce his immediate intentions in a perfect form.*

*We have striven for and carried out the formation of a listing of chords for creative youth and for analysis.

As the conclusion of the statements about the diatonic and the chromatic tonal systems, several other axioms that concern the formation of scales should be mentioned. In connection with the formation of 3-note to 12-note tertian constructions we pointed out some new 6-step to 11-step scales. For completeness, we want to mention that it is possible to compose tonal music consistently with each of the 8-step to 11-step scales indicated in the same way as with the major and the minor scales and their inversions:

Ex. 263.

44 These scales were indicated in Examples 185 (8-note scales), 186 (9-note scales), 188 (10-note scales), and 191 (11-note scales).
These possibilities have remained unnoticed for the time being. Many so-called modern composers are trying it "once again" with "C major" rather than thinking of and forming new tonal possibilities, an act that is artistically more valid and necessary than concerning themselves with imitating the old masters.

Just for this reason, we think it is appropriate to describe the possibilities for the formation of different types of scales systematically and to point out the charm of the new scales as the basis for melodies.

Already at the beginning of this discussion we tried to cover the principle of construction that forms the basis of the Greek scales. Two kinds of symmetrical division of the octave of the Greek scales were determined (these scales were called inversions of the major scale):

1. \[ \begin{array}{c}
middle \\
\text{c} \quad \text{f} \quad \text{g} \quad \text{c} \\
P4th \quad \text{whole tone} \quad P4th
\end{array} \]

2. \[ \begin{array}{c}
\text{d} \quad \text{g} \quad \text{a} \quad \text{d}
\end{array} \]

3. \[ \begin{array}{c}
\text{e} \quad \text{a} \quad \text{b} \quad \text{e}
\end{array} \]

4. \[ \begin{array}{c}
\text{d5th} \quad \text{middle} \quad \text{d5th}
\end{array} \]

5. \[ \begin{array}{c}
\text{g} \quad \text{c} \quad \text{d} \quad \text{g}
\end{array} \]
6. \[ a \longrightarrow d \longrightarrow e \longrightarrow a \]\n\[ \text{d}5\text{th middle d}5\text{th} \]

7. \[ \leftarrow b \longrightarrow f \longrightarrow b \]

One possibility for the symmetrical division of the octave consists of inserting a whole tone in the middle to which two perfect fourths are connected.

The other possibility consists of having only one point of support in the middle, to which two diminished fifths are connected.

However, the filling-in of the two perfect fourths with additional scale degrees is not symmetrical; the scale degrees

\[
\begin{array}{c}
c \downarrow d \downarrow e \downarrow f \\
1/1 \quad 1/1 \quad 1/2
\end{array}
\]

are transposed up a perfect fifth to

\[
\begin{array}{c}
g \downarrow a \downarrow b \downarrow c \\
1/1 \quad 1/1 \quad 1/2
\end{array}
\]

and together they form the major scale

\[
\begin{array}{c}
c \downarrow d \downarrow e \downarrow f -- g \downarrow a \downarrow b \downarrow c. \\
1/1 \quad 1/1 \quad 1/2 \quad \text{mid} 1/1 \quad 1/1 \quad 1/2
\end{array}
\]

tone

The scale beginning on e also has a similar structure:*  

*The intervals of this scale represent the inverted succession of those intervals that form the foundation of the C major scale.
On the other hand, the arrangement of scale degrees in between the perfect fourths

\[
g \downarrow \downarrow \downarrow \downarrow \downarrow d \downarrow \downarrow \downarrow \downarrow \downarrow g\quad \text{and}
\]
\[
a \downarrow \downarrow \downarrow \downarrow \downarrow d \downarrow \downarrow \downarrow \downarrow \downarrow e \downarrow \downarrow \downarrow \downarrow \downarrow a
\]

is asymmetrical:

<table>
<thead>
<tr>
<th>1st half</th>
<th>2nd half</th>
</tr>
</thead>
<tbody>
<tr>
<td>[g - a - b - c]</td>
<td>[d - e - f - g]</td>
</tr>
<tr>
<td>1/1 1/1 1/2 mid</td>
<td>1/1 1/2 1/1</td>
</tr>
</tbody>
</table>

When the scale degrees \(g - a - b - c\) are transposed to the tone \(d\) the following tone row appears: \(d - e - f^\# - g\); however, the tone \(f^\#\) is not found in the scale \(g a b c d e f g\).

In the same way, the second half of the scale \(a b c d e f g a\) would have to contain the tones \(e - f^\# - g - a\) if one wanted to conceive it as the transposition of the first half.

\[\begin{align*}
\text{1st half} & \quad \text{2nd half} \\
\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow d - e - f - g & \quad \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow a - b - c - d \\
1/1 1/2 1/1 & \quad 1/1 1/2 1/1
\end{align*}\]

Only the scale \(\[d - e - f - g\] \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow a - b - c - d\) is perfectly symmetrical, not only because of its use of perfect fourths, but also because of the symmetrical filling-in of the scale steps.

\[\begin{align*}
\text{1st half} & \quad \text{2nd half} \\
\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow f - g - a - b - c - d - e - f & \quad \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow f - g - a - b - c - d - e - f \\
1/1 1/1 1/1 1/2 1/1 1/1 & \quad 1/1 1/1 1/2 1/1 1/2
\end{align*}\]

The scale \(\[f - g - a - b - c - d - e - f\] \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow\) consists of two symmetrical diminished fifths \(f - b - f\). It has three whole-tone scale degrees in the first half and two half-tone and two whole-tone scale degrees in the second half. The filling-in of the two symmetrical diminished fifths \(f - b - f\) is asymmetrical; each half even contains a different number of scale degrees.
The scale \( b - c - d - e - f - g - a - b \) is an inverted succession of the two halves of the scale \( f \ g \ a \ b \ c \ d \ e \ f \); it is also asymmetrical in the number and the succession of scale degrees that fill in the symmetrical basic division of the octave \( b - f - b \).

On the basis of the facts already mentioned concerning the construction of scales, the following mixed forms of symmetry and asymmetry can be set up:

a) a symmetrical basic division of the octave (into a whole tone and two perfect fourths) combined with a detailed division of the first half and its transposition (transfer) in the second half (scales beginning on \( c \) and \( e \));

b) a symmetrical basic division of the octave (into a whole tone and two perfect fourths) combined with a free asymmetrical division of each of the two symmetrical halves (scales beginning on \( g \) and \( a \));

c) a symmetrical basic division of the octave (into a whole tone and two perfect fourths) combined with a symmetrical detailed division of both halves (the scale beginning on \( d \));

d) a symmetrical basic division of the octave (into two diminished fifths) combined with an asymmetrical detailed division of both symmetrical halves (scales beginning on \( f \) and \( b \));

e) a symmetrical basic division of the octave (into two diminished fifths).}

\(^{45}\) Hába called this type of detailed division, tetrachordal detailed division; a scale in which the tones in the second half (the second tetrachord) are a transposition of the tones in the first half (the first tetrachord) is called a tetrachordal scale.
ished fifths) combined with a symmetrical detailed division of both symmetrical halves.

The last possibility is not found in the Greek scales; it should be considered a new possibility set up by use for the formation of scales.

All four of the principles, a), b), c), or d), already are used in the Greek scales.

We have discovered that these principles possess general validity and can be used as the basis for the formation of countless new scales.

If the basic divisions

\[
\begin{align*}
\text{P4th} & \quad \text{middle} & \quad \text{P4th} \\
\text{d5th} & \quad \text{d5th}
\end{align*}
\]

are retained, a great number of 5-step to 12-step symmetrical and asymmetrical half-tone scales can be created by the use of the five laws, a), b), c), d), e).

We want to give some of them:

Ex. 264. Symmetrical scales with a whole tone in the middle.

\[
\begin{align*}
\text{5-step scales} & \\
\text{Middle} & \\
\text{7-step scales} & \\
\text{Dorian [scale]} & \\
\text{9-step scales} & \\
\text{11-step scales}
\end{align*}
\]
Ex. 265. Symmetrical scales with one central tone (x) and a symmetrical detailed division.

46 Hába labeled two examples as Example 265; we have relabeled them as Examples 265 and 265[a].
Ex. 265[a]. Scales with a central tone and asymmetrical detailed division.

5-step scales

6-step scales

A slash (/), used beginning with the six-step scales in Example 265a., sets off the groups of quarter notes that are successively to be combined with the basic group of tones shown in whole notes; however, Hába does not use this notation consistently.

Hába explains this notation on page 181.
7-step scales

Minor [scale]

8-step scales
9-step scales

10-step scales

11-step scales

Ex. 266. Scales with a symmetrical basic division (perfect fourth—whole tone—perfect fourth) and a tetrachordal detailed division.
Ex. 267. Scales with a symmetrical basic division and an asymmetrical detailed division.
Ex. 268. Scales with an asymmetrical basic division and an asymmetrical detailed division.
The scales labeled with * (Example 265a) are tetrachordal scales
e.g.:

Ex. 269.

The system for the detailed division of the basic division is based on the
successive insertion of all remaining scale degrees of the 12-step half-
tone scale. In Example 264, e.g., the tones $c^\#$, $d$, $e^b$, and $e$ are suc-
cessively added to fill in the perfect fourth $c - f$ and the tones $b$, $b^b$,
a and $g^\#$ are successively added to fill in the perfect fourth $g - c$.
Thus, all eleven tones of the half-tone scale are used in the four five-
step scales in Example 264:
(Example 264): $c \quad \quad \quad f \quad \quad \quad g \quad \quad \quad c$. The whole tone $f - g$
$c^\# \quad d \quad e^b \quad e \quad g^\# \quad a \quad b^b \quad b$

$(c \quad \quad \quad f \quad \quad \quad g \quad \quad \quad c)$ forms the middle of the scales in Example 264
rather than the tone $g^\#$ $(c \quad \quad \quad f^\# \quad \quad \quad c)$. The tone $f^\#$ has been used
as the middle in Examples 265 and 265a.

Ex. 270.

\[ \text{Diagram showing notes} \]

The notation is to be understood in the following way: the
whole notes denote the first half of the scales and the quarter notes
represent the possible variations in the second half of the scales.
Therefore, Example 270 is read $c \quad c^\# \quad f \quad f^\# \quad g \quad b^b \quad c$, $c \quad c^\# \quad f \quad f^\# \quad g^\# \quad b^b \quad c$, etc. (See Examples 265-68.)

Examples 264-68 contain 581 scales. Many of them contain the
same numbers of tones of the half-tone scale as the chords shown in
Examples 241-61 and the scales and chords shown in Examples 134-93.

We did not intend to indicate all the scales that can be obtained
from the twelve tones of the half-tone system on the basis of the prin-
ciples of symmetry and asymmetry (as well as hybrids). Our aim was to clari-
fy the implications and the signigicance of conception with as many examples
as possible and to make the reader realize that every tonal system is much
richer than is general assumed. The ability to combine, i.e., the gift
to select and group the tones of a tonal system in a discriminating manner
is the decisive factor in composition. If someone maintains that certain
tonal systems are exhausted, it means he has very little imagination in
combining tones.

The scope of combinational possibilities is only outlined
with the formation of the 581 scales.

Each scale can be transposed to the twelve steps of the half-tone scale and can also be inverted.

Many basic shapes (in Schönberg's sense) and countless melodies can be obtained using the diatonic tones of the 581 scales.

Ex. 271.

Ex. 272.

Examples 271 and 272 make use of the tones of the first 5-step scale (Example 264). The transition from the clearly arranged ordering of tones (the scale) to the basic shape and to the free melody is clarified by the examples shown. Basic shapes arise either by the modification in the succession of the tones of the scale (Example 271, 1.) or by the modification in the succession and by the transfer of one or more of the tones into a different octave (Example 271, 2.-5.).

The free melody makes use of a modification of the succession and the position of the diatonic tones of the scale, the repetition of tones, and a more diverse rhythm.

This process characterizes all relationships between each scale
and the basic shapes and free melodies derived using its tones. Accordingly, the scale is the basis of every creative invention (tonal variation), and it would be more appropriate to label the scale as the basic shape. As we shown in examples mentioned before, the basic shape as Schönberg conceives it is only a derivation of the basic shape of the scale. In the final analysis, the naming is trivial. We do not want to dispute Schönberg but only to clarify the difference between the two musical phenomena. We do not like to leave unanswered one more question that the reader, after having gained an insight into the variety of combinations of tones, will now ask himself: what should I do with the combinations: We reply that it is necessary to awaken creative feelings in oneself and attempt to build one's own chordal combinations. Nothing is forbidden. We have mentioned earlier the axiom that relationships between one chord and another can be established.

This axiom leads to the following conclusions:

1. Every chord can be combined with each of its transpositions, in open or close position.

2. Every chord can be combined with every transposition of its inversions, in open as well as close position.

3. Every chord can be combined with another new chord.

4. Every tone of a chord can be doubled by one or more tones in different octaves. It is also possible to double all tones of a chord simultaneously, however, this is not always necessary.

Concerning the first statement.
Ex. 273. ⁴⁸

Concerning the second statement.

Ex. 274.

Concerning the third statement.

Ex. 275.

Concerning the fourth statement.

Ex. 276.

⁴⁸The tenth and twelfth triads in this example should be B-flat major triads rather than B minor triads.
Transpositions of the major triad are found in Example 273, a.

Example 273, b. consists of transpositions of the sextad $d e g^\# c^\# f a$.

Example 274, a. consists of combinations of the transposed inversions of the major triad. The second, third, and fifth chords of Example 274, b. are inversions of the first septad of Example 274, b. ($c^\# f^\# g c d f g^\#$); the fourth septad is a transposition and inversion of the first septad. (The chord $d g d^\# c^\# d^\# f g^\#$ a would merely be transposed root position of the first septad $c^\# f^\# c d f g^\#$; a $d^\# g g^\# d f c^\#$ is an inversion of the transposition.)

A comparison of 3-note to 7-note chordal combinations clearly shows that the laws that govern the building of triadic combinations are also valid for other chords. Example 275 shows how a harmonic texture can be increased from chords of two tones to chords of twelve tones and how a 12-note chord can be connected to a doubled triad (Example 275, 1. and 2.).

We particularly would like to point out the splitting of some tones into two tones that arises during the progression from dyads to triads.
tetrads, and pentads, etc. (Example 275, e<sup>f</sup><sub>a</sub>b, f<sup>c</sup>g<sup>b</sup>, f<sup>g</sup>b, etc.). Furthermore, it is seen that the progression (Example 275) contains a great deal of contrary motion. Some voices strive upwards while others strive downwards; in this way, a balance in the direction of the chords and in the voice-leading in the chordal texture results from this.

The creative energy apparent in every chordal progression can be expressed as a phenomenon and a theoretical law in the following way:

Some voices strive upwards, some downwards (by step or leap), and some remain unchanged (as a tone that is held out longer or repeated). This axiom has already been mentioned earlier in another context (see the combinations of the inversions of a 12-note chord in Example 204). Nevertheless, those readers who want to learn the combination of chords could still be asking themselves (or the author of this treatise): how can I create another chordal group after I have set up the first? Therefore, let us assume that the reader has set up any chord:

Ex. 278.

![Ex. 278](image)

Already, the formation of a chord is a result of thoughtful energy that has its origin in the general aspiration to create a chord. As long as a chord is begin set up, a powerful psychic tension is felt, if only for a split second.

The longing to create a chord is "dissonance" (psychic strain). When the chord has finally been invented and written down, the longing is fulfilled and the psychic strain slackens. For a moment, the creator
finds himself in a phase without longing (in a consonant phase); for a short time, he is without ambition and stable, just like the chord. Shortly after that, there is again a longing (a psychic strain) to create a new chord to follow the first.

Ex. 279.

![music notation]

The situation changes fundamentally. The first chord that was previously the goal has now become only a resting point and this forces the creator to think of how to move from it to another chord. He can proceed in a variety of ways (and everyone would proceed differently). At first, I wanted to have contrary motion: \( \uparrow \). Then the following idea occurred to me: move the e (of the first chord) up to the f (of the second chord), the \( b - c^\# \) (of the first chord) by contrary motion to the \( c - b \) of the second chord), the \( f - g^\# \) (of the first chord) by contrary motion to the \( f^\# - g \) (of the second chord), and the \( a - d^\# - f^\# \) (of the first chord) using similar motion to the \( b - e - g^\# \) (of the second chord). Thereby, this new longing, and the powerful psychic tension connected with it ends. The second chord is now the goal, a "consonance"--a point of stability. This chord could also be considered a resting point if a new, third chord was going to be added. After sincere self-analysis (which would, apparently, turn out in a similar way with every creative musician), we can maintain that every chord is stable and without tension in connection (succession) with other chords. By itself, it is neither consonant nor dissonant and is neither the goal of the psychic creative process nor
the resting point. Only the composer's position in relationship to a chord is changed. One time, a composer strives for a certain chord and the next time he moves away from it. The concepts of consonance (the attainment of a goal) and dissonance (the striving for a goal) occur only in the mind of the composer—not in the chords. Unfortunately, out of faulty knowledge of the creative psychic process, theorists up to now have attributed consonance or dissonance to chords.

It is completely different with the layman. For him, a dissonance is that chord that he still does not know completely and that he perceives as sounding strange. On the other hand, every chord that he has often heard and that he "knows" is a consonance to him. Such a chord does not excite him any more; it leaves him in peace or it provides pleasing excitement to him. At best, that chord that he consciously perceives and for which he already possesses a theoretical explanation is consonant to him.

On the other hand, for the composer, every chord is already consonant at the moment he has written it down, i.e., when he has reached the goal of his creative aspirations.

The ideal music listener is that listener who, already at the moment that the chord sounds, perceives it theoretically and aurally without deliberation, doubt, and misunderstanding.

Because such listeners are exceptions, every piece of really "new" music is considered dissonant by most listeners. They do not understand it. The same music is completely consonant, however, for the individual who has created it as the combination of chords invented by himself.*

*With these statements, we have dealt with a substantial part of the problem discussed by the scholar Dr. Lotte Kallenbach-Greiller in her treatise Grundriss einer Musikphilosophie; nebstd kritischer Darstellung des
Buches von Paul Bekker, "Von den Naturreichen des Klanges" (Berlin: Breitkopf & Härtel, 1925): Instead of studying acoustics from a purely psychological point of view, we should study acoustics from the point of view of the psychology of the composer.

However, it is the worst thoughtless dogmaticism that leads some theorists still today to label the dominant-seventh chord, e.g., and other seventh chords as "dissonances." They have forgotten that seventh chords became "well-known" long ago, are provocative no more, and therefore, consonant. This will also be the case with other, still incomprehensible, dissonant chords. In time, they will also become "understood" and become consonances, and hopefully, in the meantime, new dissonances, i.e., new musical creations that are "incomprehensible," will continue to arise.

We want to emphasize that consonance and dissonance are psychological phenomena for the composer and the average listener (even if, at times, they do not agree). From an acoustical standpoint, there is only a stable sound—neither consonant nor dissonant; a sound neither strives for something nor gravitates towards somewhere. Only the composer strives for something and creates successions of sounds. Only a succession of sounds gives a sense of "motion." Motion does not lie in the sounds themselves, however, but in the work of the composer. The sound continues as long as the body of a vibrating body is in motion, but by itself it possesses no progressive tendencies.

The progressive tendencies of the composer can be established from his succession of sounds. It is a mistake to attribute the progressive tendencies to the sounds. Then, the composer would be superfluous and the sound would be able to produce another from itself as its follower.
But only an isolated sound can do this—in nature—producing the overtones as natural phenomena. It cannot, however, establish its own relationships with other tones.

On the other hand, the creative sovereignty of a composer lies in his ability to combine tones and to create structures of tones. His technical superiority as compared to the tones consists in the fact that it is even possible for him to change the nature of a tone by the elimination of overtones and, in this way, vary the tone color of a tone. It is impossible to change the nature of a tone (by the addition of new overtones). For example, it is not possible to produce the fifth as the first overtone instead of the octave. It is seen that the nature of a tone is individual in certain respects. Because of this, it is all the more important to know to what extent the composer can operate in the tonal region. We will complete our statements in our discussion of the quarter-tone system.

As a conclusion to our statements about the diatonic and the chromatic tonal systems and as an introduction to a theoretical building of the quarter-tone system, we want to respond to the main objection to our formation of 2-note to 12-note chords. The reproach, very often chosen by the "cautious protector of correct musical development" in an attempt to "dispose of" really new musical efforts, is that new music and its theoretical axioms have nothing in common with the natural harmonic model of the overtones; it is against nature and, therefore, wrong and bad.

If the assumption were true that the new creative and theoretical efforts (including the quarter-tone system) were opposed to the natural harmonic model of the overtones, this objection would be correct; however, it is not true. Now, we want to prove this by clarifying to what extent the natural succession of overtones can generally serve as the model for us.
The example just shown contains sixty-three overtones within the range of five octaves that stand in relationship to the basic tone $c^1$ that produces them. These overtones form the natural harmony of the tone $c^1$. The difference between the basic tone $c^1$ and each of the overtones, in turn, amounts to 33 Hz\(^{49}\) ($c^1$: 33 Hz, $C$: 66 Hz, $G$: 99 Hz, $c$: 132 Hz, $e$: 165 Hz, etc.). Therefore, the overtones represent a tone row in which each succeeding tone undergoes a regular increase in the number of cycles per second.

As seen in the succession of overtones shown above, asymmetrical intervals, however, arise through the symmetrical increase in the number of cycles per second. The basic tone $c^1$ is at 33 Hz. The first overtone (66 Hz) forms an octave, the second (99 Hz) forms a perfect fifth, the third (132 Hz) form a perfect fourth, etc. The increase in the number of cycles per second is always the same: 33 Hz + 33 Hz = 66 Hz + 33 Hz = 99 Hz + 33 Hz = 132 Hz, etc.

This is another characteristic feature of overtones that can be

\(^{49}\)The standard designation Hz (Hertz) is used rather than the older designation cps (cycles per second).
expressed as a general law in the following way: asymmetrical intervals arise through a symmetrical increase in the number of cycles per second.

Now, let us devote our attention to the tones within the range of an octave: how many overtones exist within the range of each of the six octaves and into which types of intervals (parts) is each octave divided by the overtones? We see that the first overtone forms the octave. Since the octave is repeated by the third, seventh, fifteenth, thirty-first, sixty-third, and ninety-fifth overtones \((C - c - c^1 - c^2 - c^3 - c^4 - c^5)\), it appears that nature emphasizes the octave as the basic interval. In this way, the entire range of tones is divided into octaves.

The overtones that fall within each of the six octaves clearly demonstrate the possibilities for the division of an octave into different scale degrees. Although the same increase of vibrations exists from \(C\) to \(G\) and from \(G\) to \(c\), the octave \(C - c\) (the first and third overtones), is divided by the second overtone \((G)\) into two asymmetrical parts \((C \quad \underline{G} \quad \underline{G} \quad \underline{C})\). In the next octave \(c - c^1\) (the third and the \(\underline{P5th} \quad \underline{P4th}\) seventh overtones), both the perfect fifth and the perfect fourth are divided into two unequal parts by the fourth and sixth overtones; the perfect fifth \(c - g\) is divided into a major and a minor third \((c - e, e - g)\) and the perfect fourth \(g - c^1\) also consists of two unequal parts: third \(g - b^b\) and a major second \(b^b - c^1\).

Each of the four intervals contained in the octave \(c - c^1\) is divided into two unequal intervals in the octave \(c^1 - c^2\): \(c^1 - e^1\) into \(c^1 - d^1\) (a major second) and \(d^1 - e^1\) (a minor second); \(e^1 - g^1\) into \(e^1 - f^#2\) and \(f^#1 - g^1\); \(g - b^b\) into \(g^1 - g^#1\) and \(g^#1 - b^{b1}\); and \(b^{b1} - b^1\) and \(b^1 - c^2\).
Each of the intervals of the octave $c^1 - c^2$ is divided in the next octave $c^2 - c^3$.

In the octave $c^3 - c^4$, all tones of the octave $c^2$ and $c^3$ are also divided.

It is also seen that the perfect fifths (in the octaves, $c - c^1$, $c^1 - c^2$, $c^2 - c^3$, $c^3 - c^4$) contain the same number of smaller scale degrees as the perfect fourths even though they are not the same size.

It is noticed that the octave consistently prevails as the organizing principle, not only between the tones $c^1 - c - c^1 - c^2 - c^3 - c^4$ but also between other tones ($G - g - g^1 - g^2 - g^3$, $e - e^1 - e^2 - e^3$, $b^b - b^{b1} - b^{b2} - b^{b3}$, $d^1 - d^2 - d^3$, $b^1 - b^2 - b^3$, etc.).

The primary law that nature has given us in the overtones is the principle of distance and the division of distance in general.

Furthermore, in the overtones, nature gave us a practical model of widely meshed and closely meshed scales.

The fact that narrower scale degrees (overtones) fall between wider scale degrees is not important, but the general knowledge that several narrower scale degrees can be used between wider scale degrees.

The following statement can be made concerning the natural model itself (the intervals that are formed by the overtones): the diatonic system stands close to the natural model in that it contains the octave, the perfect fifth, the perfect fourth, the major and the minor thirds, and the major and the minor seconds.

The overtones that fall within the range of the first four octaves can be used as a model for the diatonic tonal system.

The chromatic tonal system is partially connected with the succession of overtones in the fifth octave ($c^2 - c^3$).
The quarter-tone system is also connected with the natural model of the succession of overtones.

In addition to the whole-tone and half-tone scale degrees, quarter-tone scale degrees are also seen in the succession of overtones in the sixth octave ($c^3 - c^4$).

Furthermore, the succession of overtones within the limits of the sixth octave ($c^3 - c^4$) is actually a synthesis of all of the overtones found in the lower octaves and includes a number of new overtones.

The sixth octave contains the octave, the perfect fifth, the perfect fourth, the major and minor thirds, the major and the minor seconds, and in addition, intervals smaller than the minor second.

The quarter-tone system is principally based on the inherent law of division shown by the overtones in the sixth octave of the overtone series. The symmetrical (tempered) division of the octave into twenty-four quarter tones is an artificial form just as the tempered chromatic or diatonic tonal systems. However, all these tonal systems are based on the basic law of the filling-in of larger scale degrees (overtones) by different numbers and different sizes of smaller scale degrees.

We have already said in the preface to the first quarter-tone quartet that the quarter-tone system was a development of the half-tone system. The following can also be said about the natural model (the succession of overtones within the octaves $c^2 - c^3$ and $c^3 - c^4$): the succession of overtones in the octave $c^3 - c^4$ is an expansion of the overtones in the octave $c^2 - c^3$.

The quarter-tone system (in its well-tempered form) is basically a synthesis of the diatonic and the chromatic systems with an expansion in the number of scale degrees.
If one goes even further, one can see that, in this case, the octave \( C^1 - C \) (the basic tone and the first overtone) remains the basic measure throughout the overtone series, supplemented by new scale degrees, and it can be seen as a symbol of the entire musical development, even a symbol of the entire development of culture and life. What is cultural development? It is old experiences augmented by new ones. Life is also a mixture of old and new traditions.

This law also expresses the succession of overtones shown in the six octaves: the basic tone with the first overtone forms the octave; the next two overtones form two new intervals (the perfect fifth and the perfect fourth), however, they also form the fundamental interval (the octave); the next four overtones form additional new intervals, however, they too form the previous intervals (the octave, the perfect fifth, and the perfect fourth). And so it goes on.

Therefore, since the quarter-tone system retains the basic law as the foundation of the new possibilities in regard to the principle of filling in larger scale degrees by smaller ones, respects nature (the overtones) as the model for the majority of its scale degrees, and stresses cultural bonds by uniting the tones of the old system with the tones of the new system it is a logical outcome of man's drive to create new forms. It is already the usual habit of many to label those matters they cannot reconcile with their limited knowledge and experiences as naturally or culturally adverse. Nevertheless, creative individuals have gone their own way unperturbed.
II. MELODIC AND HARMONIC FOUNDATIONS
OF THE QUARTER-TONE SYSTEM

The summary of the melodic and harmonic foundations of the
diatonic and the chromatic tonal systems will substantially facilitate
an understanding of the quarter-tone system. Before we begin our state-
ments about the quarter-tone material, we would like to mention some
general considerations:

The question whether, and why, quarter-tone music is justified
belongs in the realm of psychology. In my case, the initial contact with
quarter tones came about in the following way: my father and brothers trained my
perfect pitch throughout my childhood. They sang, whistled, and played
tones for me that did not belong to the half-tone system and wanted to
trick me in order to prove that I could not differentiate all tones.
At first, I sang, whistled, or played on the violin the closest-lying
correct tone of the half-tone system, indicated the tone that was given
to me to guess, and then stated whether the indicated tone lower or high-
than the tone of the half-tone system lying closest to it. This even-
tually led me to the scale degrees of the quarter-tone system.

The mathematical and acoustical arguments and calculations of
Hans Schümann and R. Wagner that concern the quarter-tone scale degrees
and their temperament are probably known to those who have followed the
development of the quarter-tone question.*
An investigation of the use of quarter tones throughout history belongs in the realm of music history. We are referring to the enharmonic tetrachord of ancient Greek theory, the quarter tones seen in the Codex Montpellier, and the reproduction of melodies at the time of neumatic notation, and especially Arabic music, the Arabic quarter-tone system, and the formation of scales with quarter tones.* Prof.

*See Helmholtz, Die Lehre von den Tonempfindungen. ³

Georg Schünemann, Prof. Erich Moritz von Hornbostel, Prof. Robert Lachmann, and Prof. Walter ⁴ are especially eager explorers of Oriental

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¹Hans Schümann also wrote a book on the same topic entitled Monozentrik: eine neue musiktheorie (Stuttgart: Carl Grünninger Nachf. Ernst Klett, 1924).


⁴The first name of Prof. Walter cannot be determined.
music. Their methods of research stem from Alexander John Ellis (real name Sharpe).

Naturally, just as in the half-tone system, the intonation of quarter tones in singing and in the playing of string instruments deviates from the correct pitches. The examination and measurement of deviations of intonation that Dr. Otto Abraham of Berlin carried out on the basis of phonograph recordings will one day also deal with quarter-tone music. Perhaps, on the basis of examinations of this type, we will be able to come somewhat closer to the concept of consonance and come to understand it acoustically, in the narrow sense as the consonance of an individual tone, or to expand its significance psychologically by adapting the ear to comprehend very complicated harmonies and to differentiate them consciously.

I observed the variations in the intonation in the singing of the peasants in Slovakia years ago. I have found psychological motivation for this in the fact that when the folk singers are in high spirits they sing the whole tones higher. In serious songs, they sing intervals smaller than the normal half tones and whole tones. Furthermore, the reasons should be seriously pondered why laymen untrained in the half-tone system exactly intone all sorts of tones without effort and at the same time have such difficulty hitting the diatonic and chromatic scale degrees as Dr. Abraham has proven on the basis of phonograph recordings and measurements of tones. The layman reproduces only the approximate contour—the ascent and descent—of a melody; he chooses the scale degrees very freely. Therefore, even in Europeans, the half-tone system does not seem to be inborn; they have to learn it.
Examinations of the effect of the overtones, which belong to the quarter-tone rather than to the half-tone system, will also lead us to new findings and scientific conclusions that we can barely foresee today. One day, perhaps, it will even be possible to awaken in musicians the harmonic feeling not only for an individual tone but also for the mixtures and the effects of overtones—thus, to obtain harmonic tones from the musical imagination on the basis of the proper training of the ear. Kurth has been right when he maintains that we can only imagine the tone but not its natural harmony—the ringing of the overtones as the consciously felt charm of the tone. However, this will change someday.

These suggestions belong in the realm of experimental acoustics. New research in this direction will furnish us with valuable suggestions concerning the construction and the improvement of quarter-tone instruments.

New research in the area of the psychology of the perception of tones will also have to be continued.*

*The investigations by Helmholtz and Carl Stumpf usually concern the tonal material of the half-tone system.

Up to now, we have had little experience in how laymen perceive quarter-tone music. It can almost be concluded from the discussion of quarter-tone music so far that it does not have a disagreeable effect but an unusual one.

As a musician, I can speak of my perception of sound and that of my students. We perceive the majority of chords in the quarter-tone system as euphonious. We label only a few of them as unusual and harsh. This could be due to the dynamic intensity and the tone
color that intensifies or mitigates the unusual features of chords. The human voice very strongly mitigates the harshness of the new sonic complexes. It is hoped that, one day, additional acoustical research will also be able to reveal why this is so.

I set up the concept of harmony on the following basis:

The tone and its naturally given harmonic structure of overtones is an individual, in itself consonant and organically united. Every chord, which is composed of two or more tones, is a society that consists of tonal individuals. The relationship between the tonal individuals and their capacity for fusion consists in the fact that many times they have parts of their inner life (their overtones) in common. The independence of the tonal individuals consists in the fact that they possess the smallest possible number of common features in regard to their inner life (their overtones) and rest firmly in themselves.

The harmonic problem of the present-day artist consists in choosing tonal individuals that can remain individual within the tonal society, i.e., within the chord. The present-day artist does not strive for individualism of tones (tone centrality) in the sense that the Classicists did, i.e., he does not want to appoint one tone to be the dictator over all other tones of the chord. He attempts to create a community of tonal individuals that are influenced by one another in regard to to their effect and that do not give up their individuality, but stand in a free relationship to one another--a community that promotes the individual in the chordal society and, in this way, increases the total energy the society.

The tonal individuals do not give up their existence but
mutually serve one another to a stronger degree. With these statements, we are right in the center of sociology of tones in the truest sense of the word.* Every tone in the chordal society should, above all, be

*Every reader who cares about present-day life will easily be able to establish an artistic parallel between the sociological endeavors of present-day life and new music using my sociological conception of music.

   Everything that I have said about the individual tone and its function in the chord is also true for the active striving of modern man and of the new communal form of life that is slowly being formed.

   At one time, the Gothic syle was the symbol of collective feeling. Today, there is another feeling and another goal: the active function of every individual in the community of life rather than "self-subordination" in view of a fictitious higher purpose.

   In any case, from a truly artistic standpoint, it is impossible to want to renew an old musical style. A new style certainly arises out of modern man's idea of life; I have clearly expresses this idea. Art has become absolute again, without a program; however, on the basis of the idea of life, art, even in its most complicated tonal forms will be able to be understood. My musical forms have arisen from this conception.

responsible for itself, rely on itself and its own strengths, and volunteer his strengths for the mutual well-being of chords. The creative musician places the tonal individuals so that they can hold their own and operate well. This is the highest statesmanship in the empire of tonal individuals. Every tonal individual is in itself harmonic and resting; it moves only in the sense of ascending and descending pitches. The chord is neither horizontal nor vertical as a totality but consists of simultaneously sounding tonal individuals that are at different pitch levels, i.e., that arise from sound waves of different lengths.

   Every tonal individual possesses its own realm of pitches (in the overtones); however, since the overtones more distantly removed from the basic tone sound considerably weaker that the basic tone, several
simultaneously sounding tones at different pitch levels can hold their own
Musical practice also confirms our assertion that several tonal indivi-
duals (with their natural harmony of overtones) can win recognition and
need not be lost if sounded simultaneously with other tones. A chord
is harmony, i.e., the simultaneous presentation of several harmonic
tonal individuals.

Melody is a change in the pitch levels—the succession of tonal
individuals that are continuously connected invisibly through the will
of the composer.

Polyphony (from an aural standpoint) is the perception of the
simultaneous development of two or more melodies; from a creative stand-
point, it is the successive invention of two or more melodies that form
a harmonic and melodic community.

In the explanations of melody, harmony, and polyphony, we have
avoided the words "linear, vertical and horizontal," which, from an
aural standpoint, are irrelevant and unfortunately hackneyed at the
present time.

The use of these words is justified as long as the music "on
paper" is viewed as a picture of tones. On hearing the music, they
have no conceptual justification and are the cause of aural disorien-
tation. The picture of tones

Ex. 1.

\[\text{\textbf{Example 1}}\]

is horizontal as long as the paper is in a horizontal position. If the
paper is placed vertically, the picture of tones is also vertical. The
chord as a tonal community is neither horizontal nor vertical. Aurally, there is the impression of six simultaneously sounding tones. Whoever is trained acoustically know that the six tones are differentiated by their wavelengths.

The word "motion," which has "become popular" at the present time, is misused. The string vibrates, the tuning fork vibrates, and the reed vibrates; however, as vibrating objects, they are stable nevertheless. The chord is also stable—immovable. The pitch changes, i.e., the number of vibrations changes. Why is the word "motion" needed in music? A change in pitch levels is more intelligible from a musical standpoint. *

*Incidentally, Ernst Kurth has also caused a great deal of havoc and disorientation with his book Grundlagen des linearen Kontrapunkts: Bachs melodische Polyphonie.  

Music is better understood using the words, "melody," "polyphony," and "harmony" than using the words, "line," "horizontal structure," and "vertical structure." With these statements, we wanted to summarize once more what we already indicated sporadically in our discussion of the diatonic and the chromatic tonal systems and to clarify our attitudes towards the tone, its nature, and its relational possibilities.

Now, we want to deal with the theoretical foundations of the quarter-tone system.

We consider the 24-step, well-tempered quarter-tone scale to be the basis of all variations of the theoretical and practical relationships of tones of the quarter-tone system:

---

5 This treatise, which Hába incorrectly calls Der lineare Kontrapunkt, was first published in Bern by M. Dreichsei in 1917.
Ex. 2. Ascending scale.

Ex. 3. Descending scale.

Sharpening by a quarter tone is notated with $\flat$ or $\natural$, sharpening by a 3/4 tone with $\#$, flattening a quarter tone with $b$ or $b^\flat$, and flattening by a 3/4 tone with $b$. The regular signs, $b$, $b$, $b\flat$, $\#$, and $X$ are used in the traditional way.

The quarter-tone scale can also be notated with the help of only two of the new signs ($\flat$ and $\natural$):

Ex. 4.

Ex. 5.
The designation of the new tones by the supplementary words "high" and "low," proposed by Willi von Mollendorff, seems to be the simplest and the most appropriate way.

The supplementary word "high" is used in connection with the new sharp signs (♯ and ♯) and the supplementary word "low" is used in connection with the new flat signs (♭).

Therefore, the tones of the quarter-tone scale (Example 2) have the following names: c - high c - c♯ - high c♯ - d - high d, etc.

The scale (Example 3) is read: c - low c - b - low b - b♭ - low b♭, etc.

Example 4 shows that the 24-step quarter-tone scale can be divided into twelve old and twelve new half-tone scale degrees: c - c♯ - d - d♯ - e, etc., and high c - high c♯ - high d - high d♯ - high e, etc.

The twelve new half-tone scale degrees can be conceived as a 12-step half-tone scale transposed up a quarter tone. From this standpoint, the quarter-tone scale seems to be a combination of a normal half-tone scale with its transposition a quarter tone higher.

This conception makes possible the close connection of all quarter-tone scales and chords to the half-tone system. All half-tone scales and chords can be set up on the basic scale degree high c (instead of c) and transposed to each of the twelve new scale degrees.

Ex. 6.

\[
\begin{align*}
\text{C major scale} & \quad | \quad \text{High C major scale} \quad | \quad \text{C sharp major scale} \\
& \quad | \quad \text{Low D major scale} \quad | \quad \text{D major scale} \quad | \quad \text{etc.}
\end{align*}
\]
Example 7 shows the twelve new transpositions of the major triad.

Example 6 illustrates the successive quarter-tone transposition of the major scale.

The law of transposition also applies to other chords:

The reader should try to acquire a fluency in the transposition of all scales and all 2-note to 12-note chords to the new scale degrees of the quarter-tone system.

We will explain transposition later with more examples.

Before this can be done, we must establish which new intervals are possible in the quarter-tone system and how they are used in connection with intervals already known from the half-tone system.

Ex. 9. New intervals from the old basic tone.
Ex. 10. Transposition of the new intervals to scale degrees a quarter tone higher.

Ex. 11. Another spelling of the tones in Example 9.

Ex. 12. Another spelling of the tones in Example 10.

Ex. 13. Succession of all the intervals of the quarter-tone scale.
They are named in turn: quarter-tone second, minor second, 3/4-tone second, major second, 5/4-tone second, minor third, neutral third, major third, high major third, perfect fourth, high perfect fourth, augmented fourth, high augmented fourth, perfect fifth, high perfect fifth, minor sixth, neutral sixth, major sixth, high major sixth, minor seventh, neutral seventh, major seventh, and high major seventh.

We recommend that the reader transpose each of these intervals to all the scale degrees of the quarter-tone scale, i.e., that he combine all remaining scale degrees of the quarter-tone scale with every other scale degree. (Practice writing, playing, and eventually singing them.)

The axiom, "all tones of a certain scale can be combined with every other tone," is true, not only in the half-tone system, but also in the quarter-tone system.


In the quarter-tone system, there are the following complementary intervals within the range of an octave:

- quarter-tone second - high major seventh
- minor second - major seventh
- 3/4-tone second - neutral seventh
- major second - minor seventh
- 5/4-tone second - high major seventh
minor third - major sixth
neutral third - neutral sixth
major third - minor sixth
high major third - high perfect fifth
perfect fourth - perfect fifth
high perfect fourth - high augmented fourth
augmented fourth - augmented fourth

and vice versa:
high augmented fourth - high perfect fourth
perfect fifth - perfect fourth, etc.

Ex. 15.

The simultaneous ringing of both tones of an interval (a succession of two tones) is called a dyad.

As seen in Example 13, there are twenty-four intervals in the quarter-tone system. Therefore, there are twenty-four dyads.

Ex. 16.

In Example 16, all the tones of the quarter-tone scale are, in turn, combined with the first tone c.
It is possible to set up all twenty-four dyads on every tone of the 24-step scale.

Ex. 17.

(They can be written in the same way beginning on $c^\#$, low $d$, $d$, high $d$, $e^b$, etc. Practice the construction of all dyads by writing and by playing them.)

If one acknowledges the axiom that it is possible to combine every tone of the 24-step scale with every other tone of the scale, then it also follows that every dyad can be combined with each of its transpositions (Example 18) and that every dyad can be combined with each of the other 23 dyads of the quarter-tone system and with all 24 transpositions of each of the 23 remaining dyads (Examples 19 and 20):

Ex. 18.

Relationships of quarter-tone second dyads

Similarly: Relationships of other dyads to their transpositions:

$\frac{1}{2}$-tone dyads

$\frac{3}{4}$-tone dyads
Ex. 19.

Relationships of the quarter-tone dyad to all other dyads:

Similarly: Relationships of the half-tone dyad and the 3/4-tone dyad to other dyads:

Ex. 20.

Exercises according to Example 18:

Relationships of the whole-tone dyad

Relationships of the 5/4-tone dyad

Relationships of the minor third dyad

Relationships of the neutral third dyad

Relationships of the major third dyad

Relationships of the high major third dyad

Relationships of the perfect fourth dyad

Relationships of the high perfect fourth dyad

Relationships of the augmented fourth dyad

Relationships of the high augmented fourth dyad
Relationships of the perfect fifth dyad
Relationships of the high perfect fifth dyad
Relationships of the minor sixth dyad
Relationships of the neutral sixth dyad
Relationships of the major sixth dyad
Relationships of the high major sixth dyad
Relationships of the minor seventh dyad
Relationships of the neutral seventh dyad
Relationships of the major seventh dyad
Relationships of the high major seventh dyad

Exercises according to Example 19:
Relationships of the whole-tone dyad
Relationships of the 5/4-tone dyad
Relationships of the minor third dyad
Relationships of the neutral third dyad
Relationships of the major third dyad
Relationships of the high major third dyad
Relationships of the perfect fourth dyad
Relationships of the high perfect fourth dyad
Relationships of the augmented fourth dyad
Relationships of the high augmented fourth dyad
Relationships of perfect fifth dyad
Relationships of the high perfect fifth dyad
Relationships of the minor sixth dyad
Relationships of the neutral sixth dyad
Relationships of the major sixth dyad
Relationships of the high major sixth dyad

to each of the named dyads of the quarter-tone system
Relationships of the minor seventh dyad
Relationships of the neutral seventh dyad
Relationships of the major seventh dyad
Relationships of the high major seventh dyad
Relationships of the octave dyad

Exercises according to Example 20:

Relationships of the quarter-tone dyad:

to the half-tone dyad and its transpositions
to the 3/4-tone dyad and its transpositions
to the whole-tone dyad and its transpositions
to the 5/4-tone dyad and its transpositions
etc., until
to the high major seventh and its transpositions

Relationships of the half-tone dyad:

to the quarter-tone dyad and its transpositions
to the 3/4-tone dyad and its transpositions
to the whole-tone dyad and its transpositions
to the 5/4-tone dyad and its transpositions
etc., until
to the high major seventh dyad and its transpositions

Relationships of the 3/4-tone dyad:

to the quarter-tone dyad and its transpositions
to the half-tone dyad and its transpositions
to the whole-tone dyad and its transpositions
to the 5/4-tone dyad and its transpositions
e tc., until
to the major seventh dyad and its transpositions
To these three fundamental types of dyadic relationships is added the possibility of forming relationships between every dyad and all remaining dyads outside the octave range, therefore, in all other octaves of the total range, e.g.:

Ex. 21.

Although the dyads of the quarter-tone system and their interrelationships can be formed according to the same axioms used with dyads of the half-tone system (see our statements about dyads in the discussion about the half-tone system), there are some dyadic combinations that are fundamentally new in comparison to those of the half-tone system.

Just as we divided the quarter-tone scale into two half-tone scales, similarly, we can also divide the dyads:

Ex. 22. Dyads of the old half-tone scale.

Ex. 23. The same dyads using the tones of the new half-tone scale.
The dyads (Example 22) have the basic tone $c$, and the dyads (Example 23) have the basic tone high $c$. Combined, the dyads of Examples 22 and 23 contain the twenty-four scale degrees of the quarter-tone scale; Example 22 contains the tones $c \ c^\# \ d \ e^b \ f \ f^\# \ g \ g^\# \ a \ b^b \ b$ and Example 23 the tones high $c$ - low $d$ - high $d$ - low $e$ - high $e$ - high $f$ - high $f^\#$ - high $g$ - low $a$ - high $a$ - low $b$ - high $b$ - high $c$.

For the purpose of an easier understanding of the new accidentals, we want to briefly explain their use: $c - d$ is a whole tone; when we raise the $c$ by a quarter-tone and flatten the $d$ by a quarter-tone (Example 23, 1.), we have taken away two quarter tones (a half tone) from the whole tone $c - d$; consequently, the new interval (dyad) that arises is a half tone:

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High $c$ - high $d$ (Example 23, 2.) is a whole-tone dyad (similar to $c - d$).

Half-tone music can also be written with the dyads in Example 23 in the same way as it is written with the dyads given in Example 22. The difference between the two dyadic groups lies only in their pitch levels (a difference of a quarter tone):

Ex. 24.
Example 25 is the transposition up a quarter tone of the two-voice texture in Example 24.

Therefore, normal half-tone music can be composed using the twelve new scale degrees of the quarter-tone scale (Examples 25 and 27).

A new musical impression is obtained by a regular alternation between the dyads of the old and the new half-tone scales:

Ex. 26.

Ex. 27. Transposition of Example 26 up a quarter tone.

Ex. 28. Regular alternation of dyads of the old and the new half-tone scales.
Ex. 29. New intervals of the quarter-tone scale.

First of all, look at the first two dyads of Examples 26-29:

Example 26: Octave dyad, major seventh dyad; melodic steps:
\( c - b \) (a half tone), \( c - c^\# \) (a half tone).

Example 27: Octave dyad, major seventh dyad \((\text{high } c - \text{high } c, \text{high } c^\# - \text{high } b)\); melodic steps: \( \text{high } c - \text{high } c \) (a half tone), \( \text{high } c - \text{high } c^\# \) (a half tone).

Example 28: Octave dyad, major seventh dyad \((c - c, \text{high } c^\# - \text{high } b)\); melodic steps: \( c - \text{high } c \) (a quarter tone), \( c - \text{high } c^\# \) (a 3/4 tone).

Example 29: Octave dyad, major sixth dyad \((c - c, \text{high } c^\# - b)\); melodic steps: \( c - b \) (a half tone), \( c - \text{high } c^\# \) (a 3/4 tone).

It is seen in Example 28 that by using dyads that belong, in turn, to the old and to the new half-tone scales, the dyads themselves are perceived as harmonies from the half-tone system, but the melodic intervals that arise through this succession of dyads are perceived as new.

The dyads in Example 29 offer new sonorities, fully independent of the half-tone system. The dyads are new in comparison with the dyads of the half-tone system (Examples 26 and 27) and, in addition, the melodic impression of the two voices (Example 29) is also new.

Examples 27, 28, and 29 graphically show how one can harmonically and melodically move from half-tone music to quarter-tone music. Example 28 is a mixture of half-tone harmony and quarter-tone melody. Example
29 is a pure form of quarter-tone harmony and quarter-tone melody. Example 27 is a new transposition of half-tone harmony and half-tone melody.

The close connection between the sonorities of the half-tone and the quarter-tone systems has been shown and it has been theoretically established where the differences between the half-tone and the quarter-tone systems lie; *if the quarter-tone scale is considered as a single unit and it is used in this way, half-tone music is harmonically and melodically abandoned and new music (quarter-tone music) is obtained; however, if the quarter-tone scale is conceived as a combination of two half-tone scales, a mixture of half-tone and quarter-tone music results.*

Since we expect that the reader will encounter difficulties when trying to compare the dyads (in Examples 26, 27, 28, and 29), we will carry out this analysis ourselves:

Examples 26, 27, and 28 contain the identical succession of dyads: octave, minor seventh, augmented ninth, major sixth, major second, major seventh, minor second, minor sixth, major third, augmented fourth, major seventh, major third, minor seventh, minor seventh, octave.

Example 29 consists of the following new dyads: octave, high major sixth, high augmented ninth, neutral sixth, 5/4-tone second, neutral seventh, 3/4-tone second, high perfect fifth, high major third, high perfect fourth, high major seventh, neutral third, neutral seventh, high major sixth, octave.

The intervals in Example 26 are identical to those in Example 27.

The intervals of the melodic voices in Example 28 as well as in Example 29 are new.

Pure quarter-tone music inevitably arises in a free two-voice
texture of two independent melodies:

Ex. 30.

The harmonic-melodic mixed forms of half-tone harmonies with quarter-tone melody are also justified:

Ex. 31.

It is also possible to compose longer harmonic-melodic sections using the old and the new half-tone scales:

Ex. 32.

When a uniformity of conception is wanted, the transitions from the old into the new half-tone region, and vice versa, must be carried out cautiously.
In Example 32, the transitions from the old into the new half-tone region, and vice versa, have been carried out in the following way:

Ex. 33.

The combination of the perfect fourth $a^b - d^b$ moving in contrary motion to the augmented fourth $g^h - d^l$ constitutes the first transition in Example 32; $a^b$ and $g^h$ form a descending quarter tone while $d^b$ and $d^l$ form an ascending quarter tone. (See Example 33, 1.)

In the second transition in Example 32, the major sixth $g^h - e^h$ is followed by the minor seventh $g - f$; $d^l$ and $f$ form an ascending quarter tone and $g^h$ and $g$ is a descending quarter tone.

The combination of the minor sixth $f^h - d$ with the perfect fifth $g^h - c^h$ forms the third transition in Example 32; $d$ and $c^h$ form a descending quarter tone and $f^h$ and $g^h$ form an ascending quarter tone.

The fourth transition in Example 32 is made up of the minor third $g^h - b$ and the major third $g^h - b^h$; $g^h$ and $g$ forms a descending quarter tone and $b$ and $b^h$ forms an ascending quarter tone.

In the fifth transition of Example 32, the minor second $d^h - e$ is followed by the major second $d - e$. The tones $e - d$ form an ascending quarter tone and the tones $d^h - d$ form a descending quarter tone.

It is seen from Example 33, which shows all five transitions of Example 32, that the voices of the first, second, fourth, and fifth
sections of Example 32 are in contrary motion away from one another and the voices of the third section of Example 32 are in contrary motion towards one another.

Although all kinds of motion (parallel, similar, and contrary motion) are contained in the exercises given in connection with Examples 18, 19, and 20, it seems necessary to show a clearly arranged, theoretical summary of the kinds of motion, as well as the new possibilities for motion in the quarter-tone system.

In general, contrary motion is the combination of simultaneous ascending and descending melodic lines. Let us first carry out this principle in the half-tone system using tones within the range of an octave and examine the dyads that then arise:

Ex. 34.

Contrary motion towards one another

Contrary motion away from one another

Ex. 35. The same kind of motion utilizing the tones of the new half-tone scale.

The same kinds of motion in the new half-tone scale

In the half-tone system, dyads of the minor seventh, the minor sixth, the augmented fourth, the major third, and the major second arise through contrary motion. (See Example 34 and 35.) There are no dyads of the major seventh, the major sixth, the perfect fifth, the perfect fourth, the minor third, and the minor second. (See Examples 37 and 38.)

Example 34 and 35 contain ascending half tones starting with the
tone $c^1$ combined with descending quarter tones starting with the tone $c^2$. Now, we will show ascending quarter tones starting with the tone $c^1$ combined with descending quarter tones starting with the tone $c^2$:

Ex. 36.

Dyads of the major seventh (high $c$ - high $b$), the minor seventh ($c^\#$ - $b$), the major sixth (low $d$ - low $b$), the minor sixth ($d$ - $b$), the perfect fifth (high $d$ - high $a$), the augmented fourth ($e^b$ - $a$), the perfect fourth (low $e$ - low $a$), the major third ($e$ - $g^\#$), the minor third (high $e$ - high $g$), the major second ($f$ - $g$), and the minor second (high $f$ - low $g$) are found, in turn, in Example 36, a. The dyads that were contained in Examples 34 and 35, as well as the missing dyads that we mentioned before, are found in Example 36.

We can say: only half of the dyads of the half-tone system arise through contrary motion.

All the dyads belonging to the half-tone system arise through contrary motion in the quarter-tone system. (These dyads constitute half of the possible dyads of the quarter-tone system.)

In the half-tone system, if we move in contrary motion by half tones beginning with a major seventh, we obtain the remaining dyads of the half-tone system that were missing in Examples 34 and 35:
Ex. 37.

Contrary motion towards one another

Contrary motion away from one another

Ex. 38. The same kind of motion utilizing the tones of the new half-tone scale.

The same kinds of motion in the new half-tone scale

If we choose the high major seventh as the starting point for contrary motion in the quarter-tone system, we obtain the remaining twelve dyads of that system:

Ex. 39.

Contrary motion towards one another

Contrary motion away from one another

Dyads of the high major seventh (c - high b), the neutral seventh (high c - b), the high major sixth (c\# - low b), the neutral sixth (low d - b), the high perfect fifth (d - high a), the high augmented fourth (high d - a), the high perfect fourth (e\# - low a), the high major third (low e - a\#), the neutral third (e - high g), the 5/4-tone second (high e - g), the 3/4-tone second (f - low g), and the quarter-tone second (high f - f\#) are found, in turn, in Example 39.

Example 40 contains the same dyads as Example 39, transposed up a quarter tone.
Ex. 40.

The dyads of Examples 39 and 40 show the truly new dyads that are produced by the quarter-tone system. It is seen from the preceding examples that the quarter-tone system offers more combinational possibilities of contrary motion than does the half-tone system.

In the quarter-tone system, it is also possible utilizing contrary motion (and starting from the octave dyad) to arrive at those dyads that can only be attained by similar motion in the half-tone system:

Ex. 41.

Ex. 42.

We have given examples and exercises concerning the similar motion of dyads earlier. (See Examples 19 and 20 and the exercises belonging to them.)

Example 18 and the exercises connected with it illustrate the possibilities of parallel motion. In addition, we can see that it is possible to construct a passage with continuous parallel motion by
simultaneously using different scales derived from the 24-step basic scale:

Ex. 43.

Harmonically, Example 43, a. is a succession of 5/4-tone dyads. Melodically, it is a combination of the C major scale with the High D major scale; the lower melody consists of the tones c - d - e - f - g - a - b - d and the upper melody consists of the tones high d - high e - high f# - high g - high a - high b - high c# - high d.

Harmonically, Example 43, b. is a succession of minor third dyads. Melodically, it is two 3/4-tone scales:

\[
\begin{align*}
\text{c} & \rightarrow \text{high c}^\# & \text{e} & \rightarrow \text{high f}^\# & \text{g} & \rightarrow \text{a} & \text{b} & \rightarrow \text{low} & \text{c}, \text{ and} \\
\text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4}
\end{align*}
\]

\[
\begin{align*}
\text{e}^b & \rightarrow \text{high g}^b & \text{a} & \rightarrow \text{low} & \text{b} & \rightarrow \text{c} & \text{d} & \rightarrow \text{low} & \text{e}^b. \\
\text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4} & & \text{3/4}
\end{align*}
\]

Before going into more detail about the scales of the quarter-tone system, we can observe that both of the 3/4-tone scales are symmetrical (c \rightarrow f^# \rightarrow c, e^b \rightarrow a \rightarrow e^b) and that they have the same number of 3/4 tones in both their lower and
upper halves.

Example 43, c. is a succession of alternating high major third and neutral third dyads. Melodically, the lower voice is a 5/4-tone scale $c - \text{high} d - f - \text{high} g - b^b - \text{high} c - e^b - \text{high} f - a^b$.  


The upper voice forms the following scale:

$\quad \text{high} e - f^# - \text{high} a - b - \text{high} d - e - \text{low} g - a - \text{high} c$.  

3/4 neut 3/4 neut 3/4 neut 3/4 neut

tone 3rd tone 3rd tone 3rd tone 3rd

Example 43, d. is a succession of high perfect fourth dyads.

Melodically, it is two quarter-tone scales:

$c - \text{high} c - c^# - \text{low} d - d - \text{high} d - e^b - \text{low} e - e - \text{high} e - f - \text{high} f,$  

1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4

tone

and

$\quad \text{high} f - f^# - \text{high} f^# - g - \text{high} g - a^b - \text{low} a - a - \text{high} a - b^b - \text{low} b - b$.  

1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4

tone

Example 43, e. is a succession of high augmented fourth dyads.

Melodically, it consists of the scales

$c - c^# - \text{high} d - \text{high} e - f^# - \text{high} g - \text{high} a - b - c$, and

1/2 3/4 1/1 3/4 3/4 1/1 3/4 1/2

tone

$\quad \text{high} f^# - \text{high} g - a - b - \text{high} c - d - e - \text{high} f - \text{high} f^#$.  

1/2 3/4 1/1 3/4 3/4 1/1 3/4 1/2 3/4 1/2

tone

Both of these scales are symmetrical. One notices the symmetrical division of the scale degrees contained in the basic constructions of the scales:
It is clearly seen that the principle of double awareness (an awareness of both harmony and melody) plays a decisive role in the formation of quarter-tone music just as it does in the formation of half-tone music. We only need to point out to the reader the formation of diatonic 3-note to 7-note chords by the superimposition of the major or the minor scale and its inversions.

Certainly, in the quarter-tone system, it is a question of other harmonies and of other scales; however, the principle of harmonic and melodic connection as the foundation of the creative conception remains fully valid.

There is also no "reckless" voice-leading in the quarter-tone system. Because of the new qualities of tones, the application of these laws is partially different.

As Example 43, a. - e., theoretically proves, the principles of tonality and of polytonality are valid in the quarter-tone system. However, new scales are created as the foundations for tonality.

The principle of tone centrality is also valid, but in a wider sense; every tone of the 24-step scale can be combined with every other tone of that scale. In principle, there are no restrictions. The composer alone determines the type of restrictions that will be imposed from time to time.

On the basis of our compositional experiences, we maintain that the change of restrictions is also to be regarded in the composition of quarter-quarter-tone music as the only means of sonorous variety. (After all, the painter does not always paint with all colors and mixtures of colors.)
The four fundamental types of motion, (1) contrary motion, i.e., the relationship of melodic lines that simultaneously move in opposite directions, (2) parallel motion, i.e., the relationship of melodic lines that move in the same direction and maintain the same intervallic distance, (3) similar motion, i.e., the relationship of descending or ascending melodic lines that move in the same direction but do not maintain the same intervallic distance, (4) oblique motion, i.e., the relationship of melodic lines in which one line remains at the same pitch level while the other line descends or ascends, form the foundation of quarter-tone melody and harmony.

The four types of motion also form the foundation of quarter-tone polyphony.

The possibilities for variation of the four directions of motion are limited to the scale degrees of the quarter-tone system, however, not exclusively to quarter tones; all of the intervals of the quarter-tone system can be used melodically descending or ascending.

Ex. 44. Some possibilities of contrary motion.

\[\text{[Musical notation]}\]

Ex. 45. Some possibilities of similar motion.

\[\text{[Musical notation]}\]

Example 43 illustrates parallel motion, Example 19 oblique motion, and Example 20 similar motion.
In practice, all four directions of motion are usually combined (see Examples 24, 25, 30, and 32).

During our discussion of the half-tone system, in connection with Example 111, we spoke about the varying the scale degrees of a certain motive. This principle is also applicable in the quarter-tone even to a greater extent. The next example should clarify this assertion:

Ex. 46.

In the half-tone system, the interval c - e can be divided into two intervals in three ways (Example 46, a.). In the quarter-tone system, the same interval can be divided into two intervals in seven different ways (Example 46, a. and b.). Four new possibilities are added to the three possibilities that existed in the half-tone system. It is interesting to compare the possible divisions of the major second in the half-tone and the quarter-tone systems:

Ex. 47.

In the half-tone system, there is only one possibility (Example 47, a.); in the quarter-tone system, there are six additional possibili-
ties at our disposal.

We must leave it to the reader to divide the other intervals of the quarter-tone system into smaller scale degrees if he wants to convince himself of the wealth of melodic possibilities the quarter-tone system offers. Within the limits of a discussion of the foundations of the quarter-tone system, we cannot enumerate all these possibilities. However, we have clearly shown how this can be done. (See Examples 46 and 47.)

For the sake of a uniform review, we would like to mention two principles that we discussed in detail in connection with the half-tone system (see Examples 86, 87, 195, 203, 204, and 279).

The principle of chordal polyphony (polyphonic harmony) and the principle of the polyphony of more than five single voices, which is conceived harmonically, form harmonies of the half-tone system with 5/12 tones. Since there are twenty-four tones in the quarter-tone system, it offers even more possibilities for the practical development of the these two principles. From the twenty-four tones of the quarter-tone system, a maximum of eight groups of three tones (triads) can be formed for polyphonic harmony, e.g., or a twenty-four-voice polyphonic texture in which each harmonic structure consists of the regrouping of the twenty-four tones (therefore, twenty-four different chords) can be constructed.

Naturally, considerably greater technical-compositional abilities are required by this system than by the half-tone system in which the maximum number of polyphonic voices is twelve.

Later, we will explain the possibilities now discussed generally with musical examples.
From the preceding statements, it is clear that the musical and theoretical formation of the quarter-tone system is based on the same principles as the music of the half-tone system and its theories. The connection between the old and the new music, as well as quarter-tone music, is complete and entirely unproblematic.

The reason why we have dealt with the theoretical foundations of the intervals and the dyads of the quarter-tone system in such detail lies in the fact that, according to our conception, the detailed knowledge of dyadic relationships forms the most important prerequisite for the formation of harmony and polyphony in every tonal system.

We already established this standpoint in the discussion of the half-tone system, in connection with Examples 195, 204, and 279 in the first chapter, by our psychological analysis of creative practice, but we would like to make some additional comments [about dyads] now.

The ability to form the relationships between intervals and between dyads is needed when writing two-voice music.

Harmonically, polyphonic music consists of the changing relationships of several simultaneous dyads. Using Example 279 in the first chapter as an example, we can see that a chord can be divided into dyads and additional relationships (to other dyads) are created from them which then again stipulate the subsequent chord.

Chordal relationships are usually created in this way. In polyphonic harmony, chords are divided into triadic and tetradic groups and one tries to form subsequently relationships of groups from these smaller groups that as a whole, form one chord.

Since we are not specifying an a priori relationship for every dyad or chord but only attempting to explain the maximum number of relational
possibilities, there are no preordained "combinations" of chords of two or more tones from our standpoint. It is always only a question of one well-known chord (and even this one must be invented) to which a joining chord is added, and [in polyphonic harmony], the work is made easier by the fact that the chord is divided into smaller chordal groups.

In the conception of "harmonic combinations" that was valid and was taught up to now, there were two goals: the beginning chord and the joining chord; on the basis of this conception, the primary task lie in "connecting" the two chords, keeping in mind certain rules for the progression of individual tones of the beginning chord to the joining chord:

Ex. 48.

```
\text{Dom 7th | Tonic chord | triad}
```

The seventh should be resolved down, the third up, and the basic tone (root) of the dominant chord to the basic tone (root) of the tonic chord. According to our conception (that is also documented by some modern music), only the beginning chord, in this case, the seventh chord, is "given"; the joining chord should be freely invented, for example:

Ex. 49.
One can decide to connect $c - c$ to $b - g^\#$, $c - e$ to $g^\# - d^\#$, and $e - b$ to $d^\# - c$. The new relationship is freely chosen from the many relational possibilities of dyads and of intervals.

We chose this simple example from the half-tone system in order to make our conception more understandable. This conception also holds true in the quarter-tone system:

Ex. 50.

The dyads $c - high d$, $high d - g$, $g - low b$, and $low b - low e$ are first created (Example 50, 1.) and, in this way, the first pentad in Example 50 arises. Then, the joining dyads are created: $c - high d$ to $high a - d^\#$, $high d - g$ to $d^\# - low g$, $g - low b$ to $low g - c^\#$, and $low b - low e$ to $c^\# - f$, and, in this way, the second joining pentad in Example 50 arises. The melodic intention is to lead some tones of the first pentad in Example 50 down and some tones up. The determination of the scale degrees that are going to be used in the second joining chord occurs only after this has been done.

To avoid misunderstandings, we consider it necessary to point out that our detailed explanations of the creative process may appear to be similar to the slow production of shooting a motion picture. In reality, the clear tonal idea of the first pentad in Example 50 as a harmonic unit emerged in a split second; the preparatory determination regarding the creation of a new relationship took approximately four seconds; then, the entire second pentad in Example 50 emerged.
It is a natural process, but many years of composing are required before the imagination of a gifted man works as quickly and clearly as we have intimated.

During creative work, however, there are moments where one is occupied for minutes with the choice of one possibility from several that have occurred simultaneously. The next time, the concentration on creative activity is disturbed by a remembrance or an emotion. As a rule, a man's changing feelings get in his way during creative activity, half-subconsciously.*

*Our rather detailed descriptions of the creative process are, as far as is known to us, the first attempts to give authentic and sincere information about the psychic feeling of composers. We are of the opinion that the compositionally gifted reader gains much more if he comes to know how a composer works psychologically than if he only comes to know the composer's works from several short examples; he cannot learn about a composer's compositional process from short excerpts alone. We wrote the Czech edition of the quarter-tone harmony book (1921) with this in mind.

It would be very interesting to know from as many composers as possible, how they work and when in their work do they concentrate on harmony and when on melody. Certainly, from a psychological standpoint, they differ a great deal.*

*Dr. Lotte Kallenbach-Greller probably represents the correct standpoint when she maintains that a musician must be his own creative scholar. (See her book, Grundriss einer Musikphilosophie: nebst kritischer Darstellung des des Buches von Paul Bekker, "Von den Naturreichen des Klanges" (Berlin: Breitkopf & Härtel, 1925).

6The actual date of publication is 1922.
Now, let us return to the quarter-tone system. Other theorists have devoted little attention to dyadic relationships in their books about the theory of harmony in the half-tone system. In earlier times, only contrapuntal instruction began with a study of them. Instruction in the theory of harmony customarily began with the study of the relationships of triads. Intervals and dyads were only mentioned as a preparation to the formation of triads. We are of the opinion, however, that it is more appropriate to have students create melodies first (after the theoretical explanation of the scale) and only then to discuss the nature of harmony and to explain the dyad, the relationships of dyads, and the formation of two-voice music. Thus, in the surest, easiest way, he becomes accustomed to noticing the harmonic and the melodic principles simultaneously.

Furthermore, the explanation of all harmonic and melodic principles in connection with dyads and their relationships that we gave in our discussion of the quarter-tone system allows the student to gain a clear view of the entire tonal system so that he can consider the construction of chords as the logical expansions of sonic possibilities.

In fact, other than theoretical explanations, basically we have nothing new to say about the formation of 3-note to 20-note chords. It is only a question of varying the application of those principles that were set up and discussed in connection with dyads. We will not follow the methods used in the discussion of the diatonic and the chromatic tonal systems by starting with 3-note, 4-note, and 5-note chords and then moving to 12-note and 24-note chords; instead, we will first discuss the formation of harmonies with the largest number of tones. We will theoretically deal with smaller groups of tones (triads, tetrads,
etc.) only after this.

We will continue to keep this standpoint in mind by first forming those scales of the quarter-tone system that contain fewer than twenty-four tones.

The twenty-four tones of the quarter-tone scale can be considered a harmony (a secundal construction that consists of twenty-four quarter-tone seconds) for the same reasons that the tones of the major scale are considered a harmony of seven tones (a secundal construction that consists of major and minor seconds) and the tones of the 12-step chromatic scale are considered a harmony of twelve tones (a secundal construction that consists of twelve minor seconds).

The quarter-tone secundal construction of the 24-note chord is the close position of that harmony.

Ex. 51.

The septad in Example 51 contains all seven tones of the major scale, the 12-note chord contains all twelve tones of the chromatic scale, and the 24-note chord contains all twenty-four tones of the quarter-tone scale.

Now, we want to determine the intervals that can be used for
the construction of equally-spaced 24-note constructions.\footnote{In other words, Hába is referring to constructions that make use of only one type of interval and utilize the twenty-four tones before repeating a tone.}

With half-tone scale degrees, only a 12-note chord can be obtained.

\[
\begin{array}{cccccccc}
\text{c} & \text{c}^\# & \text{d} & \text{d}^\# & \text{e} & \text{f} & \text{f}^\# & \text{g} & \text{g}^\# & \text{a} & \text{b}^\flat & \text{b} \\
\end{array}
\]

1/2 tone

\[
\begin{array}{cccccccc}
\text{high c} & \text{high c}^\# & \text{high d} & \text{high d}^\# & \text{high e} & \text{high f} & \text{high f}^\# \\
\end{array}
\]

1/2 tone

\[
\begin{array}{cccccccc}
\text{high g} & \text{high a} & \text{high b}^\flat & \text{high b} \\
\end{array}
\]

With 3/4-tone scale degrees, an 8-note chord is obtained:

\[
\begin{array}{cccccccc}
\text{c} & \text{low d} & \text{e}^\flat & \text{low f} & \text{g}^\flat & \text{low a} & \text{b}^\flat & \text{b}^\flat & \text{low c}^\flat \\
\end{array}
\]

(see the part of the 24-note chord of Example 51 labeled 1.).

This 8-note chord can be formed with the scale degrees of the 24-step scale twice more:

\[
\begin{array}{cccccccc}
\text{high c} & \text{d} & \text{low e} & \text{f} & \text{low g} & \text{a}^\flat & \text{b}^\flat & \text{c}^\flat \\
\end{array}
\]

(see the part of the 24-note chord of Example 51 labeled 2.).

\[
\begin{array}{cccccccc}
\text{c}^\flat & \text{high d} & \text{e} & \text{high f} & \text{g} & \text{low a} & \text{b}^\flat & \text{low c} \\
\end{array}
\]

(see the part of the 24-note chord of Example 51 labeled 3.).

In our twice-repeated transposition, each a quarter-tone higher, of the 8-note chord (labeled 1. in Example 51), we have utilized all twenty-four tones of the quarter-tone scale.

Furthermore, each of the three 3/4-tone 9-note chords can be divided into two diminished-seventh chords (tetrads). This can already
be clearly seen in the spelling of the 24-note chord in Example 51.

We have labeled the tones of the seventh chord in the letter notation of the 8-note chords given above by brackets.

Ex. 52. Four tones times times six = twenty-four tones of the quarter-tone scale.

\[ \text{\textit{\textbullet}} \]

It is seen that the 24-note chord, just like all other chords, can be divided into smaller harmonic groups similar to all other chords.

With whole-tone scales degrees, only a sextad can be obtained:

\[ c - d - e - f\# - g\# - a\# \]

We can transpose this formation to the three nearest quarter-tone scale degrees and, in this way, utilize all twenty-four scale degrees:

Ex. 53. Six tones times four = twenty-four tones of the quarter-tone scale.

\[ \text{\textit{\textbullet}} \]

It is possible to superimpose the six tetrads, as well as the four sextads, in open position in the following way:

Ex. 54.
The tetrads, as well as the sextads, can also be superimposed in different successions:

Tetrads:

\[ 1 + 3 + 2 + 5 + 4 + 6 \]
\[ 1 + 4 + 2 + 6 + 3 + 5 \]
\[ 1 + 5 + 2 + 4 + 6 + 3 \quad \text{etc.} \]
\[ 2 + 4 + 6 + 1 + 3 + 6 \]
\[ 3 + 6 + 2 + 4 + 5 + 1 \quad \text{etc.} \]

Sextads:

\[ 1 + 3 + 2 + 4 \]
\[ 1 + 4 + 3 + 2 \]
\[ 1 + 3 + 4 + 2 \quad \text{and others} \]
\[ 2 + 4 + 1 + 3 \]
\[ 3 + 1 + 4 + 2 \quad \text{and others} \]

In this way, many possibilities of open position chords and inversions of open position chords can be obtained from the closed position 24-note chord in Example 51.

The superimposition of 5/4-tone dyads produces an open position 24-note chord that consists of twenty-four 5/4-tone dyads:

Ex. 55.
Every perfect fourth, bracketed in Example 55, is divided into two symmetrical 5/4-tone dyads.

In the half-tone system, the perfect fourth can only be divided into two asymmetrical parts:

Ex. 56.

Minor third dyads cannot be used for the formation of a 24-note chord, however, they are well-suited for mixed constructions (see Example 54).

The same is true of major third dyads. It is seen that the tertian system, which has formed the theoretical foundation for the theories of the diatonic and the chromatic tonal systems for approximately two centuries, is of limited importance in the quarter-tone system.

Already, in the half-tone system, both types of thirds (minor and major) had to be used for the formation of 3-note to 7-note and 12-note chords. We refer to the fact that, in the equal-tempered system, the fourth minor third and the third major third coincide with the beginning tones, the "root" of the chord sounding an octave higher:

Ex. 57.
The situation is different with the neutral third; since only the twenty-fourth neutral third coincides with the beginning tone (c), it can be used for the formation of a 24-note chord:

Ex. 58.

It is seen that every perfect fifth, bracketed in Example 58, is divided into two symmetrical intervals (two neutral thirds). In the half-tone system, the perfect fifth can only be divided asymmetrically (into a major and a minor third or vice versa):

Ex. 59.

The progression of high major thirds leads only to an 8-note chord:

Ex. 60.
This 8-note chord consists of symmetrically divided major sixths. Each of the major sixths consists of two high major thirds.

By the use of two transpositions, each higher by a quarter tone, of the 8-note chord in Example 60, the remaining sixteen tones of the quarter-tone scale are utilized:

Ex. 61.

![MIDI music sheet]

Perfect fourths cannot be used for the formation of a 24-note chord. They can only form a 12-note quartal construction.

A 24-note chord, however, can be formed from high perfect fourth dyads. This chord has a range of eleven octaves. It can be divided into two chords (an 11-note and a 13-note chord) that differ from one another in pitch by a quarter tone: 

Ex. 62.

![MIDI music sheet]

This 24-note chord contains major sevenths that are divided

---

8As Hába mentions later in the text, he divides all chords that have the range of more than seven octaves into smaller chords in order to stay within what he considers the practical range.
into two high perfect fourths \((c \quad \text{high f} \quad \text{high b}, \text{etc.})\).

The augmented fourth cannot be used for the formation of a 24-note chord.

The 24-note chord can be formed from high augmented fourths; this chord has a range of thirteen octaves and can be divided into two chords, a 13-note and an 11-note chord, that differ from one another in pitch by a quarter tone:

Ex. 63.

This 24-note chord contains minor ninths that are divided into two high augmented fourths.

Perfect fifths, minor and major sixths, and minor and major sevenths cannot be used for the formation of 24-note chords.

We do not need to look at any other intervals of the quarter-tone system for the construction of 24-note chords because these constructions are the result of the double inversion of those chords that we have already set up: the double inversion of the 8-note chord that consists of 3/4 tones produces a construction that is composed of neutral sevenths:
Through the double inversion of the 24-note chord that is composed of 5/4 tones, a construction which consists of high major sixths arises:

Ex. 65.

We have divided the inversion of the 24-note chord that is composed of 5/4 tones into three 8-note groups (Example 65, 1., 2., 3.); each of the three 8-note chords consists of high major sixths. Together, these three 8-note chords contain the twenty-four tones of the quarter-tone scale.

Through the double inversion of the 24-note chord that consists of neutral thirds, we obtain a 24-note chord that is composed of neutral sixths:

Ex. 66.
Because of the large range of the chord, we have divided it into three 8-note chords that together contain all twenty-four tones (Example 66, 1., 2., 3.).

Through the double inversion of the 8-note chord that is composed of high major, an 8-note chord that consists of high perfect fifths is obtained:

Ex. 67.

Through double inversion, the 24-note chord composed of high perfect fourths (Example 62, 1., 2.) forms another 24-note chord that consists of high augmented fourths (Example 63, 1., 2.):

Ex. 68.

The 24-note chord and its inversion in Example 68 are divided into two groups (1., the inversion of 1., 2., the inversion of 2.).

The inversional relation indicated in Example 68 is already found in the mutual relation of the two chordal groups in Examples 62 and 63.
The regular constructions of 8-note and 24-note chords just described and their inversion, which are composed of equally-large superimposed intervals, are the only regular constructions\(^9\) of this type in the quarter-tone system. All other constructions are irregular (mixed) constructions that can be derived as inversions and changes of position of the indicated regular constructions; the regular constructions make possible a comparative analysis in regard to the irregular constructions.

In reality, every irregular chordal construction, e.g., a construction composed of unequal dyads, is just as independent as a regular chordal construction. We make use of the concept "derivation" only when comparing regular and irregular chordal constructions; we use regular chordal constructions as the measure of comparison because they are more clearly arranged.

Since we usually work with the range of seven octaves, those regular constructions of 24-note chords that do not exceed the range of seven octaves are best suited as measures of comparison.

Three constructions meet this requirement: the quarter-tone secundal construction of the 24-note chord, i.e., the 24-step quarter-tone scale as a 24-note chord in close position (one octave), the 24-note chord that is composed of 5/4-tone seconds that can be divided into two 12-note quartal chords and has the range of five octaves:

\(^9\) Hába uses the term "regular" construction in the sense of a construction of equally large intervals and the term "irregular" construction in the sense of a construction of unequally large intervals.
1. P4ths
2. c - high d - f - high g - b\textsuperscript{b} - high c - e\textsuperscript{b} - high f - a\textsuperscript{b} - high b\textsuperscript{b} - d\textsuperscript{b} -
3. 5.
6. 8.
9. 10.
and the 24-note chord that is composed of neutral thirds which can be divided into two 12-note quintal chords and has the range of seven octaves:

1. 2. 3. 4. 5. c - low e - g - low b - d - low f - a - high c - e - high g - b -
6. 8.
9. 10.
11. 12.
11.
12.
high c\textsuperscript{#} - e\textsuperscript{#} - high g\textsuperscript{#}.

All other regular constructions of the 24-note chord call for a range larger than seven octaves, and it is not possible to use them as 24-note chords. They have to be divided into smaller groups of tones. As is seen, the principle of scale degree regularity in regard
to the formation of chords and the use of all tones of a certain tonal system can also be applied to the quarter-tone system. Only the type of application is different.

Groups of tones that are composed of 5/4-tone or neutral-third dyads can be conceived in various ways:

Ex. 69.

Ex. 70.

Ex. 70a.

The regular chordal constructions in Examples 69 and 70 can be changed into irregular chordal constructions by the regrouping of tones:
Ex. 71.

Change of position | 1. 2. 3. 4. 5. 6. 7. 8. 

inversion

Ex. 72.

Change of position | 1. 2. 3. 4. 5. 6.

inversion

As can be seen in Examples 71 and 72, the principles of changes of position and of inversion remain the same in the quarter-tone system. Only some of the scale degrees and intervals are new. The formation of chords in the quarter-tone system will pose no difficulties for an individual who has practiced the changes of position and inversion of chords in the half-tone system.

Now, the reader will also understand why earlier we dealt in detail with the theoretical formation of chords in the quarter-tone system.

The following exercises are of great importance to the reader:

1. Construct 3-note, 4-note, 5-note, 6-note, 7-note, 8-note, 9-note, 10-note, 11-note, 12-note to 23-note chords from the chords given in Example 55-68 (especially from the 24-note chords in Examples 55 and 58).

2. Divide the 24-note chords into different, smaller groups of chords (from 3-note to 21-note chords).

3. Practice changes of position and inversion of 3-note to
24-note chords.

4. Transpose all 3-note to 24-note chords to each of the twenty-four scale degrees of the quarter-tone scale.

5. Form combinations of 3-note to 24-note chords on the basis of the working method described earlier.

6. Attempt the combination of inversions of individual chords.

7. Learn the combinations of individual inversions of a certain chord with different transpositions of all other inversions of that chord.

To someone who is interested in investigating the variety of constructions of the quarter-tone system with regard to the formation of different 3-note to 23-note chords, we recommend the method that we have used for the formation of 3-note to 11-note constructions in the half-tone system (Examples 206 to 261 [in the first chapter]).

Within the scope of our discussion of the quarter-tone system, we will only briefly discuss this operation.

The following scheme is valid for the formation of triads:
Combine the first and second tones of the quarter-tone scale with all remaining tones of the scale:


The following musical examples show this plan:

Ex. 73.

Ex. 74.

Ex. 75.

Ex. 76.
We have obtained 253 triads in this way. Among these triads are also found the fifty-five triads that belong to the half-tone system (compare with Examples 206-15 [in the first chapter]). Therefore, from the total number of triads in the quarter-tone system shown, 198 of them are new.

After examining the triadic constructions of the half-tone system already mentioned, an organic disintegration is noticed in the quarter-tone system under a uniform law of construction.

Each of the 253 triads can be inverted twice:
Ex. 95.

Each triad can also be transposed to each of the twenty-four scale degrees of the quarter-tone scale:

Ex. 96.

Melodically, the triadic progression Example 96 can be conceived as a combination of three quarter-tone scales (with the basic tones c, high c, and high b). As is seen, the melodic construction of harmonic progressions that we have already discussed in regard to the half-tone system also is possible in the quarter-tone system (see Examples 92-100 in the first chapter).

For the formation of tetrads in the quarter-tone system, the same axiom as used in the half-tone system is valid:

Combine each of the remaining tones of the quarter-tone scale with each of the 253 triads.

Ex. 97.
Examples 97-117 are expansions of the twenty-two triads in Example 73 into tetrads. Two hundred and thirty-one new tetrads arise through this process.

In a similar way as earlier, we will now expand all triads that are contained in Examples 74-94 into tetrads.
Ex. 118.  Expansion of the twenty-tone triads in Example 74 into tetrads.

Ex. 119.  Expansion of the twenty triads in Example 75 into tetrads.
Ex. 120. Expansion of the nineteen triads in Example 76 into tetrads.
Ex. 121. Expansion of the eighteen triads in Example 77 into tetrads.

Ex. 122. Expansion of the seventeen triads in Example 78 into tetrads.
Ex. 123. Expansion of the sixteen triads in Example 79 into tetrads.

Ex. 124. Expansion of the fifteen triads in Example 80 into tetrads.

Ex. 125. Expansion of the fourteen triads in Example 81 into tetrads.
Ex. 126. Expansion of the thirteen triads in Example 82 into tetrads.

Ex. 127. Expansion of the twelve triads in Example 83 into tetrads.

Ex. 128. Expansion of the eleven triads in Example 84 into tetrads.
Ex. 129. Expansion of the ten triads in Example 85 into tetrads.

Ex. 130. Expansion of the nine triads in Example 86 into tetrads.

Ex. 131. Expansion of the eight triads in Example 87 into tetrads.

Ex. 132. Expansion of the seven triads in Example 88 into tetrads.

Ex. 133. Expansion of the six triads in Example 89 into tetrads.

Ex. 134. The triads in Example 90 expanded into tetrads.
Ex. 135. The triads in Example 91 expanded into tetrads.

Ex. 136, 137.

Examples 118–37 contain 1,540 tetrads. Every tetrad can be varied by means of three inversions and several open positions.

Ex. 138.

Also, every tetrad can be transposed to the twenty-four scale degrees of the quarter-tone scale:

Ex. 139.

Melodically, the succession of tetrads can be considered a combination of four quarter-tone scales (with the basic tones c#, high b, low d, and c).

We have taken pains to write out all the tetrads so that the reader would roughly get an idea of the wealth of chords that can be constructed from the 24-step quarter-tone scale.
Furthermore, we wanted to prove that it is possible to get along without the concepts of "alteration," "suspension," and "passing tones" and to regard every tetrad as a theoretically independent group of tones.

The construction of pentads on the basis of the tetrads should also be mentioned. Each remaining tone of the quarter-tone scale can be combined with each of the 1,540 tetrads:

Ex. 140.

Each tetrad in Examples 97-137 can successively be combined with each remaining tone of the quarter-tone scale, and in this way, pentads can be formed.

The number of pentads is significantly greater than the number of tetrads.

Even if we have not worked out the other irregular constructions of 5-note to 23-note chords, we have stimulated detailed work and, above all, have sought to prevent a stiffening of the formations of the quarter-tone system to certain formulas, in other words, to an ex post facto theory.

We are conscious of the fact that by showing all the possible formations of the quarter-tone system, we are far ahead of present (even our own) musical practice. Up to now, however, a wide view of the com-
binational possibilities has not hurt any composer. The less one has
to struggle for the tonal material, the more intensively one can devote
oneself to one's own ideas and dedicate one's creative energy to the
construction of musical forms.

In our case, we do not feel it is detrimental that theory pre-
ceeds practice. From the psychological standpoint, we even maintain
that our own compositional activity could not have been so varied if we
had not thought about the combinational foundations and the diversity of
the quarter-tone system. The most comprehensive theoretical skills
protect us from the limiting ourselves to a few harmonic or melodic
details and spur us on to more active compositional work.

Through our activity, we refute the generally adopted opinion
that practice consistently hurries ahead of theory. In art, theory
always preceded practice, at least, with creative men. These men always
had certain ideas first that they then tried to realize. Only scienti-
fic theory is an ex post facto consideration. Creative theory was, at
all times, the beginning of every creative deed—in all forms of human
life. We are not embarrassed to admit that only an intimate familiarity
with the combinations of tones and a well worked-out conception of tones
makes it possible for a composer to be able musically to enjoy life to
the fullest, correctly, and without restraint. Only with complete con-
trol of the combination of tones are musical ideas lively and free,
unencumbered by the toilsome gathering of chords and melodies at the
piano. The true composer can do so much that it is not at all noticeable
in his works if they are played correctly. He never boasts of his
ability in musical works; he does not write "spectacular" music.

A magician must be watched very attentively if his skill is to
be discovered and understood.

A musical work must be listened even more attentively if the artistic skill of a composer is to be understood.

I would still like to mention several things in regard to the relation between my music and the theories of the quarter-tone system that I set up: I discovered the theoretical foundations early, before the composition of the first quarter-tone string quartet. I carried on regular theoretical exercises because it was necessary for me to thoroughly know which new intervals arise when one deviates from the old intervals by one or more quarter tones (in contrary, oblique, parallel, and similar motion).

On my own, I learned to set up new chords, to transpose them, and to form inversions and other relationships.

I wrote the first quarter-tone string quartet only after I felt sure of myself theoretically. Although at that time (in 1919) I worked as a proof-reader in the publishing house of Universal-Edition for six hours daily and, in addition, performed several other functions in order to be able to live, this work was finished in fourteen days.

Only because I had prepared myself theoretically in advance was it possible for me to create music without toilsome reflections and "constructing." I learned and practiced "construction" earlier, i.e., the formation of chords in the quarter-tone system. In creating, I only needed to "choose" from the possibilities that I first made clear to myself theoretically, i.e., I could consciously form my ideas from a theoretical basis. Psychologically, there are three conceivable possibilities: to make use creatively of the theoretical foundations already acquired by others; to create from a standpoint opposed to the
old foundations without possessing one's own exact theoretical conception in regard to the formation of the tonal material; or to shape new
tonal forms from one's own theoretical conception but without opposing
tendencies.

In accordance with my development, I could have followed the
last possibility. [In the beginning], I did not theoretically know all
the divisions of tones in the quarter-tone system, e.g., the regular
constructions of 8-note and 24-note chords occurred to me only in 1921;
however, the foundations of the irregular chordal constructions in the
quarter-tone system were already clear to me in 1917.

I became conscious of the foundations for the formation of
different scales in the quarter-tone system only in 1921. Before I
wrote the first quarter-tone string quartet, I theoretically mastered,
as well as I could, the 24-step quarter-tone scale and the 8-step
3/4-tone scale (both scales are symmetrical).

The use of these scales can be seen in the first quarter-tone
string quartet. An analysis of this work will convince the reader
that I have made authentic declarations.

On the other hand, the second quarter-tone string quartet
(written in 1922), e.g., can harmonically be interpreted only on the
basis of the 1,540 tetrads, their transpositions, inversions, and open
positions.

Different 5-note to 23-note chords are to be found in the fan-
tasies and the suites for quarter-tone piano.

Therefore, in my works, the variety in the number of chordal
combinations is not accidental. It is the result of an organic
connection between the fundamental laws governing the formation of
combinations of tones and their expansion as a result of numerous experiments and my own creative organization of chords and joy in working with sounds. I can only speak of chance in the sense that my choice of chords does not depend on an a priori decision but always on an inspiration that appears on its own. I cannot answer the question why, one time, the simplest dyads and triads of the quarter-tone system attract me in the conception of formation and why, the next time, I have no interest in them and find pleasure in the most complicated chords. These last things are bound up far too much with the organic liveliness and activity of man; it is difficult to comprehend them even through self-analysis.

As a conclusion to the discussion of the quarter-tone system, it is necessary to explain the foundations for the formation of scales.

We already clarified the concept of symmetrical and asymmetrical scales in the chapter on the half-tone system.

It is possible to form 5-step to 24-step asymmetrical scales from the tones of the 24-step basic scale and to use these scales harmonically and melodically in root position and in inversion (according to the number of scale degrees).

No doubt, the asymmetrical basic division of the octave is used for the formation of asymmetrical scales, for example:

1. \[\text{c} \quad \text{--- high f --- c} \]
   \[\text{high P4th} \quad \text{high A4th}\]

2. \[\text{c} \quad \text{--- high f\# --- c} \]
   \[\text{high A4th} \quad \text{high P4th}\]
3.  c --------- high f ---- g --------- c
   high P4th   middle P4th
   3/4 tone
4.  c --------- high f --- a悪い--- c
   high P4th   5/4 tone M3rd

Ex. 141. Asymmetrical basic division of the octave.

Every asymmetrical basic division of the octave can be filled in by smaller scale degrees and, in this way, be expanded to a large number of 5-step to 23-step scales:

Ex. 142. Some asymmetrical scales.

5-step scale  6-step scale  7-step scale

8-step scale  9-step scale

10-step scale 11-step scale

12-step scale 13-step scale

14-step scale

15-step scale

16-step scale

17-step scale

18-step scale

19-step scale
It is seen that, in the 18-step to 21-step asymmetrical quarter-tone scales, the half tone occupies a similar exceptional position among the quarter tones as among the whole tones in the diatonic tonal system, or as the whole tone occupies among the half tones of the half-tone system (see the scales of the half-tone system).

The 5-step to 17-step symmetrical scales can be varied by inserting new tones and eliminating other tones, and thereby, a great number of new scales can be obtained.

The tetrachordal scales act as mediators between the asymmetrical and the symmetrical scales. They are based on a symmetrical basic division of the octave; however, the detailed division of both symmetrical halves of the octave is carried out so that the scale degrees in the second half are a transposition of those in the first half.

A third possibility for the basic division of the octave in the quarter-tone system \( (c \quad \text{------} \quad \text{high } f \quad \text{------} \quad \text{high } f^\# \quad \text{------} \quad c) \)

\[
\begin{array}{c}
\text{high P4th} & \text{half tone} & \text{high P4th} \\
\text{middle} & & \\
\end{array}
\]

can be used in addition to the two symmetrical basic division already used in the half-tone system \( (c \quad \text{------} \quad f^\# \quad \text{-----} \quad c, \quad c \quad \text{------} \quad f \quad \text{-----} \quad g \quad \text{-----} \quad c) \).

\[
\begin{array}{c}
\text{A4th mid A4th} & \text{P4th whole P4th} \\
\text{tone} & \text{middle} \\
\end{array}
\]
Ex. 143. Symmetrical basic divisions of the octave.

The basic division in Example 143 can be used to form a variety of 6-step to 24-step tetrachordal scales.*

*We also use the word "tetrachord" to describe a group with any number of tones that fills in half of the symmetrical basic division of the octave.

Ex. 144. Tetrachordal scales.
Ex. 145. Symmetrical scales.
The symmetrical scales in the quarter-tone system use the same basic division of the octave as the tetrachordal scales in the half-tone system (look at Example 145).

Ex. 146.  
Symmetrical basic division of the octave.

The difference in the kind of division used in the symmetrical scales and in the tetrachordal scales lies in the fact that, in symmetrical scales, the intervals in the second half of the scale are a mirror of the intervals in the first half. This is completely different than the transposition found in the tetrachordal scales. The results are also different, as can be seen in the following example:

Ex. 147.

The first half of both scales (Example 147, a., b.) is the same. The mirroring of the first half in the second half in Example 147, a., however, produces a different progression of tones than the transposition of the first half to the second half of the basic division

---

10 Example 146 is identical to Example 143.
of the octave in Example 147, b. The difference can best be established by a comparison of the scale degrees of both scales.

It has already been mentioned in the discussion of the half-tone system that every scale can be inverted several times:

Ex. 148.

\[
\begin{align*}
\text{Basic scale} & & \text{Inversions of the symmetrical scale}, \\
1. & & 1. \\
2. & & 2. \\
3. & & 3. \\
4. & & 4. \\
5. & & 5. \\
6. & & 6. \\
7. & & 7.
\end{align*}
\]

The inversion of a symmetrical scale that begins with the middle tones of that scale is also symmetrical; however, the progression of tones is altered (see the fourth inversion in Example 148). All other inversions are asymmetrical.

Ex. 149.

\[
\begin{align*}
\text{Basic scale} & & \text{Inversions of the tetrachordal scale}, \\
1. & & 1. \\
2. & & 2. \\
3. & & 3. \\
4. & & 4. \\
5. & & 5. \\
\end{align*}
\]
The inversion of a tetrachordal scale that begins with the middle tone of that scale (in Example 149, with the tone $f^\#$) produces a tetrachordal scale that consists of the same succession of intervals as the basic scale (compare Example 149, 1. with Example 149, 4.).

The first, second, third, fifth, and sixth inversions in Example 149 are also tetrachordal scales. In the seventh inversion, the second half of the symmetrical basic division of the octave (low b - high e - low b) is also a transposition of the first half.

All inversions of a basic scale can be transposed to the basic scale degree of that scale (similar to the inversions of the major scale):

Ex. 150.

Every scale and its transpositions can also be transposed to every scale degree, therefore, to the twenty-four scale degrees of the quarter-tone scale:

Ex. 151.

In connection with the formation of 24-note chords, we said that it is possible to arrive at the beginning tone (basic tone) through the succession of twenty-four high augmented fourths:
277

c - high f\# - c\# - high g - d - high g\# - d\# - high a - e - high b\#

- f - high b - f\# - high c - g - high c\# - g\# - high d - a - high d\#

- b\# - high e - b - high f - c.

This succession can be considered a circle of basic tones from which it is possible to set up different scales. For the transposition of scales, not only the succession of quarter tones, but any row of basic tones can be used; therefore, a circle of high augmented fourths (similar to the circle of perfect fifths that is used for the transposition of major and minor scales in the half-tone system) can also be used. The basic division of the octave, c - g - c, is only suited for the circle of perfect fifths; the tetrachord c d e f can be transposed up a perfect fifth to g a b c, and then up another perfect fifth to d e f# g, etc. This process can be repeated twenty-four times in the quarter-tone system. The transposition of high perfect-fourth tetrachords to the twenty-four successive high augmented fourths, however, makes use of another basic division of the octave, which we already used in Example 144:

\[(c \quad --- \quad \text{high f} \quad --- \quad \text{high f\#} \quad --- \quad \text{c})\]

<table>
<thead>
<tr>
<th>high P4th</th>
<th>half tone</th>
<th>high P4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>middle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The chain of twenty-four tetrachords is formed in the following way:
Ex. 152.

Every tetrachord can be filled in with 2-10 scale degrees, i.e., 7-step to 23-step scales can be formed using the twenty-four quarter tones of the 24-step basic scale (see Example 144).

The succession of transpositions (according to Example 152) forms the following circle:
The law already known from the half-tone system—the second tetrachord of a certain scale becomes the first tetrachord of the succeeding scale—is also true in the quarter-tone system in the new form that we have already shown.

Ex. 153.

We do not maintain that this succession of transpositions in the quarter-tone system must be used under all circumstances. In our opinion, it is only one possibility among many. It should not be conceived dogmatically as the one stable "relationship of scales." We have also said before that different successions of the twenty-four basic scale degrees of the basic scale can be chosen for the transposition of scales, e.g., the succession of twenty-four 5/4-tone seconds, the succession of twenty-four neutral thirds, and others.

Whoever is interested in what aspects of the theoretical foundations have been used by me and my students (Karel Hába, Rudolf Kubín, Miroslav Ponc, etc.) should look at our works.

In my Suite No. 3, Op. 16, for piano (published by Universal-Edition), I composed the fifth movement consistently with the scale

\[
\begin{align*}
d & \text{ high e } & f^\# & \text{ high g } & g^\# & \text{ high a } & \text{ high b } & c & d \\
5/4 & 3/4 & 3/4 & 1/4 & 3/4 & 1/1 & 1/4 & 1/1 \\
\end{align*}
\]

and all its inversions:
The harmony of this movement is also built using only the eight tones of this scale.

In the Fantasy No. 1, Op. 17, for piano, there is a section using the 10-step scale $c^# - high c^# - high d - d^# - high e - e^# - high f^# - high g - g^# - high a^# - c^#$.

This scale (as is that of Example 154) is asymmetrical.

In the section marked "Meno" on pages 18 and 19 of the Fantasy No. 2, Op. 19, for piano (published by Universal-Edition), the reader will find several scales used melodically in sixteenth notes as accompaniment to a melody written in half notes. A total of twenty-five different

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\[11\] Hába is referring to the page numbers of the Universal-Edition of Fantasy No. 2, Op. 19, for piano, published in 1925.
scales are to be found there.

As a rule, sections of my works, varying from short to long, are composed of groups of tones that consist of fewer than twenty-four tones. Because of this, a chordal alternation arises. I do not memorize exactly where I use this or that chordal group or scale since, with me, such choices come about spontaneously while I am composing, without long reflection, and I have no time to control them analytically and to memorize them during work. Usually, when I have finished a composition, I know very little about what I have written in detail. Only the consciousness of the entire form and its division remains in my mind. My creative attention is again focused on something new that is in the process of formation. For that reason, I cannot make consistently systematic analytical statements about my works. Whatever I have mentioned analytically are merely suggestions to the reader about where he might search in order to discover different details in my works.

I certainly know the principles that I have laid down theoretically and out of which of them my compositions develop. How and when I use them in a work always depends on the momentary idea that is organically combined with the basic conception of the entire work. Furthermore, I never know in advance how the details of a work will turn out. I possess a secure formal instinct, however, that dictates the arising of the form. I do not strive to hinder it with a priori intentions.

The ideas about chords occur irregularly and transiently, similar to sparks in the darkness; usually, one must really hurry in order to be able to write them down in succession. Often, however, there is also time to smoke a cigarette between the arising of ideas concerning the continuation of the melody or the harmony. There is
also fatigue. The next time, there is hesitation before jotting-down an idea and one feels like circulating it around in his imagination. The conditions of creation are very different; it is impossible to mention all of them.

The final reason why we have devoted exclusive attention to the theoretical representation of the foundations of the quarter-tone system and not to analyses of my own musical works lies in our conviction that it is more important to explain the foundations to the reader rather than their application.

It would be impossible even for the most gifted musicologist to extract, through analysis of musical works, the foundations of the quarter-tone system that we have shown. Alone, he would also not deduce that this composer, who was the first person to write [extended] quarter-tone compositions, had mastered all the combinational possibilities of the quarter-tone system. He could even come up with the hypothesis that this composer knew nothing more about the tonal material than that which he had used in his works.

Our discussion of the quarter-tone system and its basic laws of combination proves that it is possible to know more than what has been used. We have probably rendered a greater service to creatively gifted youth by communicating our knowledge to them and by remaining silent, for the most part, about what we ourselves have used. Of course, we are every anxious concerning the way in which young people will make use of our knowledge (of our theories). In no way do we want to force our personal kind of formation on them. We can judge our own kind of creation as artistically of great value, however, and, at least, expect
from the younger generations that, with youthful arrogance, they not attack a man who has given them the most important things.
III. MELODIC AND HARMONIC FOUNDATIONS
OF THE THIRD-TONE, THE SIXTH-TONE,
AND THE TWELFTH-TONE SYSTEMS

After having studied the general foundations of three different
tonal systems, the diatonic, the chromatic, and the quarter-tone systems,
the reader realizes that the third-tone and the sixth-tone systems are
only two more variations of the basic theoretical laws established for
those other tonal systems. The basic laws, which were drawn up in the
discussion of the diatonic and the chromatic tonal systems and discussed
in detail at the beginning of the discussion of the quarter-tone system
are changeable in their nature but, as such, are capable of transformation.

Therefore, we can immediately begin with the theoretical forma-
tion of the third-tone and the sixth-tone systems.

The basic scale of the third-tone system contains eighteen tones
within the range of an octave, and the basic scale of the sixth-tone
system consists of thirty-six tones within the range of an octave.
Consequently, in the tempered third-tone and sixth-tone systems, a whole
tone consists of three third tones or six sixth tones, a half tone of a
third tone and a sixth tone or of two three sixth tones, a third tone
of two sixth tones, and a quarter tone of a sixth tone and a twelfth
tone or of three twelfth tones. The twelfth-tone system consists of
seventy-two tones within the range of an octave. We will use the follow-
ing accidentals in the discussion of the third-tone, the sixth-tone, and
eventually the twelfth-tone systems:
Sharping by a twelfth tone
Sharping by a sixth tone (two twelfth tones)
Sharping by a quarter tone (three twelfth tones)
Sharping by a third tone (four twelfth tones)
Sharping by a 5/12 tone
Sharping by a half tone
Sharping by a 7/12 tone
Sharping by a 2/3 tone
Sharping by a 3/4 tone
Sharping by a 5/6 tone
Sharping by a 11/12 tone
Flatting by a twelfth tone
Flatting by a sixth tone
Flatting by a quarter tone
Flatting by a third tone
Flatting by a 5/12 tone
Flatting by a half tone

Consequently, the three basic scales (the 18-step third-tone scale, the 36-step sixth-tone scale, and the 72-step twelfth-tone scale) can be notated in the following way:

Ex. 1.

Ex. 2.
Ex. 3.

With the theoretical discussion of these three tonal systems, we will proceed according to the same methods that were used in the discussions of the diatonic, the chromatic, and the quarter-tone systems, i.e., we will clarify a) which established theoretical elements of the tonal systems already mentioned are found in the third-tone, the sixth-tone, and the twelfth-tone systems, b) which new combinational possibilities the three new tonal systems offer, and c) in which relation the three new tonal systems stand and which combinational possibilities they have in common.

The whole-tone scale $c - d - e - f^\# - g^\# - a^\#$ forms the basis of the third-tone system (Example 1). This basic division of the octave into six whole tones shows the close relationship between the third-tone system and the diatonic, the chromatic, and the quarter-tone systems. The third-tone scale can be divided into three whole-tone scales that differ in absolute pitch by a third tone:
Ex. 4.

Basic scale | Transposition | Transposition
-------------|---------------|---------------
1. (Whole-tone) | 2. a third tone higher | 3. third tones higher

The tones of the second whole-tone scale in Example are named:

third c - third d - third e - third f# - third g# - third a# - third c.

The tones of the third whole-tone scale in Example 4 have the following names: sixth c# - sixth d# - sixth f - sixth g - sixth a - sixth b - sixth c#.

The tones of the third-tone scale in Example 1 are labeled in the following way: c - third c - sixth c# - d - third d - sixth d# - e - third e - sixth f - f# - third f# - sixth g - g# - third g# - sixth a - a# - third a# - sixth b - c.

The designations, "third," and "sixth," signify the raising of the normal tones by a third tone and by a sixth tone respectively.

Harmonically, we consider the third-tone scale an 18-note chord in close position.

Now, let us attempt to create a succession of 2/3 tones:

Ex. 5.

9-step 2/3-tone | Transposition of the 9-step scale
-------------|---------------
1. scale | a third tone higher

The transposition of the this scale up two third tones is identical to the first inversion of this scale, which begins with the second tone of the first scale in Example 5:
The first and second scales in Example 5 divide the 18-step third-tone scale into two groups of nine tones; the first, second, and third scales in Example 4 form three groups of six tones that also use all eighteen tones of the third-tone scale.

The succession of $4/3$ tones also forms a structure of nine tones, however, it has a range of two octaves:

The two scales in Example 7 also divide the eighteen tones of the third-tone scale into two groups of nine tones.

The succession of $5/3$ tones produces a uniform chord\(^1\) that uses all eighteen tones of the third-tone system; it is an open position chord with the range of five octaves:

\(^1\)The term "uniform" chord (or construction) has the same meaning as the term "regular" construction utilized in the second chapter (see footnote 9, p. 222); the term refers to a chord that consists of equally large intervals.
The succession of eighteen $7/3$ tones produces an 18-note structure with the range of seven octaves:

A 9-note structure that can be transposed up a third tone arises through the succession of $8/3$ tones. In this way, the remaining nine tones of the 18-step third-tone scale are utilized.
The succession of 10/3 tones forms the following 9-note groups:

Ex. 11.

The second section of Example 11 is a transposition of the 9-note chord in the first section:

An 18-note structure arises through the succession of 11/3 tones:

Ex. 12.

Because it exceeds the range of seven octaves, however, it must also be divided into two 9-note groups (Example 12, a. and b.).

The succession of 13/3 tones also makes use of all eighteen tones of the third-tone scale; because of its large range, it must be divided into three groups (two 7-note groups and one 4-note group):
Ex. 13.

The septad in the second section of Example 13 is a transposition, up a third tone, of the septad in the first section of Example 13. The tetrad in the third section of Example 13 is a transposition, up a 2/3 tone, of the first four tones of the septad in the first section of Example 13.

The succession of 14/3 tones produces a 9-note group. This group can be transposed up a third tone and, in this way, makes use of the remaining new tones of the 18-step scale (the second section of Example 14):

Ex. 14.

A 9-note group arises through the succession of 16/3 tones.

This group can be transposed up a third tone and, in this way, makes use of the remaining nine tones of the 18-step scale:
Ex. 15.

9-note chord of 16/3 tones

Transposition a third tone higher

The succession of 17/3 tones forms an 18-note structure that utilizes all the tones of the third-tone scale. Because of its large range, this succession must be divided into three 6-note groups:

Ex. 16.

Sextads of 17/3 tones

In our discussion of the diatonic and the chromatic tonal systems, we gave the open position of the whole-tone sextad $c - d - e - f^\# - g^\# - a^\# - (c)$, which is the basic division of the octave in the 18-step scale:
Ex. 17.

Division of the 18 third tones into 6 augmented triads

Whole-tone sextad with Transp Transp
2 triadic triadic a third tone a 2/3 tone higher higher
groups

In Examples 4-17, we have shown the melodic and harmonic foundations of the third-tone system. From these examples, the reader also sees the fundamental difference between the harmonic principle (the simultaneous ringing of several tones) and the melodic principle (the succession of tones).

The construction of uniform structures, however, forms the basis of both principles. Every succession of tones can also be used as a chord (simultaneous ringing). Every chord (simultaneous ringing of several tones) can also be used as a succession of the same tones.

The chordal constructions that we have indicated in Examples 4-17 are regular, i.e., each of them consists of the same intervals (third tones, 2/3 tones, 4/3 tones, etc.). Furthermore, they are considered as open positions of regular chords in the third-tone system.

By the regrouping of tones, many irregular constructions can be obtained from each regular construction. Irregular constructions can be obtained by taking certain tones out of their original octave and by placing them in a different octave; because a seven-octave range is being used, every tone can be varied seven times, i.e., it can be used in seven different octaves.
The highest tone c of the first 18-note chord in Example 18, e.g., can also be used in all seven octaves. What we have said about the tone c is also true for all tones. Several tones are usually simultaneously moved to different octaves (see the second chord in Example 18).

Every tone of a chord can be used as the basic tone, i.e., the lowest tone (the principle of chordal inversion).

We feel that it is not necessary to work out all inversions and variations of position within the scope of this discussion. The reader will be able to do this himself on the basis of the examples that we have given in the discussion of the half-tone and the quarter-tone systems. Although the procedures used in the third-tone system are the same, the scale degrees of the third-tone system are new and the reader must acquaint himself with them.

It is self-evident that every chord can be set up on every scale degree of the 18-step third-tone scale (the principle of transposition).

Every chord can be divided into smaller groups of tones (e.g., the 18-note chord from Example 8):

\[
c - \text{sixth} \quad d^\# - \text{third} \quad f^\# - a^\# - \text{sixth} \quad c - \text{third} \quad e - g^\# - \text{sixth} \quad b - \text{third} \\
d - f^\# - \text{sixth} \quad a - \text{third} \quad c - e - \text{sixth} \quad g - \text{third} \quad a^\# - \text{sixth} \quad f - \text{third} \quad g^\#
\]
Ex. 19.

The succession of tones of a regular chordal construction does not always have to be maintained in the formation of smaller groups of tones. It is also possible to create groups of tones from the eighteen tones of the third-tone system according to free choice (see Example 19, 2.).

The axiom that states that every tone can be connected with every other tone of a certain system is also true for the third-tone system. This principle holds true in general: every tone can be connected with every other tone—successively and harmonically.

Now, we want to devote our attention to the dyads of the third-tone system and to establish in what respect they are new.

Since the 6-step whole-tone scale forms the framework of the third-tone system, this tonal system contains five dyads that can be set up using the tones of the whole-tone scale:

Ex. 20.

There are twelve new dyads in the third-tone system these dyads:
Ex. 21.

Therefore, the third-tone system contains predominately new tonal material. In the quarter-tone system, only half of the dyads were new.

Because the reader has very few opportunities to demonstrate for himself the dyads on the third-tone harmonium or other (as yet unbuilt) instruments in the third-tone system, we consider it necessary to help him by at least giving him a detailed description of the intervals so that he can play them on the violin (or on his harmonica).

The first dyad is a sixth tone smaller than the half tone $c - c^\#$;
the second dyad is a sixth tone larger than the half tone $c - c^\#$;
the third dyad is a sixth tone smaller than the minor third $c - e_b$;
the fourth dyad is a sixth tone larger than the minor third $c - e_b$;
the fifth dyad is a sixth tone smaller than the perfect fourth $c - f$;
the sixth dyad is a sixth tone larger than the perfect fourth $c - f$;
the seventh dyad is a sixth tone smaller than the perfect fifth $c - g$;
the eighth dyad is a sixth tone larger than the perfect fifth $c - g$;
the ninth dyad is a sixth tone smaller than the major sixth $c - a$;
the tenth dyad is a sixth tone larger than the major sixth $c - a$;
the eleventh dyad is a sixth tone smaller than the major seventh $c - b$;
the twelfth dyad is a sixth tone larger than the major seventh $c - b$. 
Ex. 22.

We want to attempt to make their sonorous individuality clear to the reader by a comparision of the new dyads with those of the half-tone system:

Ex. 23.

The tone $b^\sharp$ (in Example 23, 1.) is a sixth tone higher than the tone $b$ (in Example 23, 2.).

The tone $c^\#$ (in Example 23, 1.) is a sixth tone lower than the tone $c^\sharp$ (Example 23, 2.).

We recommend that the reader also compare the third, fourth, fifth, sixth, seventh, eighth, ninth, and tenth dyads in this way so that he can roughly get an idea how the new dyads sound.

It is also necessary for him to set up the seventeen dyads in Examples 20 and 21 on all scale degrees of the 18-step third-tone scale (using the principle of transposition). A two-voice texture in the third-tone system is subject to the same laws of motion that were already mentioned (similar, parallel, oblique, and contrary motion):
The concept of oblique motion is related to the principle of tone centrality; several tones are connected with a certain tone.

The concept of parallel motion is related to the principle of transposition; several transpositions of a certain chord of two or more tones are connected with one another.

The concepts of similar motion and contrary motion are contingent on the law, "every chord of two or more tones can be connected with every other chord of two or more tones."

Example 26 shows some possibilities of parallel motion:

Ex. 26.

Parallel M3rds in a new succession (scale)

Parallel 5/3 tones in a new succession (scale)

Parallel 14/3 tones in an old succession (whole-tone scale)
A general law can be derived from the first, second, and third sections of Example 26:

*It is possible to use the old dyads in successions of predominantly new dyads or to use new dyads in successions of predominantly old dyads. This law also holds true with chordal successions.*

There are more melodic possibilities in the third-tone system than in the half-tone system but fewer possibilities than in the quarter-tone system; the different number of scale degrees in these three tonal systems is the reason for this statement; the third-tone system has more scale degrees than the half-tone system and fewer scale degrees than the quarter-tone system.

In the half-tone system, the whole tone can be filled in with only two half tones (*C–C♯–D*). In the third-tone system, there are no half tones; instead, the whole tone is filled in in the following way:

Ex. 27.

![Diagram of music notation]

The same axiom that applies to the other tonal systems already mentioned holds true for the formation of triads in the third-tone system: every dyad can be combined with every remaining tone of the 18-step scale. The reader already knows the scheme used in the half-tone and the quarter-tone systems:
Ex. 28.

The following principle holds true for the formation of tetradis:
successively combine every triad with every remaining tone of the third-
tone scale:

Ex. 29.
There are 136 triads and 680 tetrads in the third-tone system.
The inversions of the changes of position of these triads and tetrads are formed in the same way as in the half-tone and the quarter-tone systems:

Ex. 30.

We must still establish and explain the axioms for the formation of scales in the third-tone system.

Asymmetrical, symmetrical, and tetrachordal scales can also be set up in the third-tone system. The one asymmetrical basic division of the octave is as follows:

Ex. 31.

There are three symmetrical basic divisions of the octave for the formation of tetrachordal scales and of symmetrical scales:

Ex. 32.
Ex. 33. Some tetrachordal scales constructed from the first basic division in Example 32.

Ex. 34. Some tetrachordal scales constructed from the second basic division in Example 32.

Ex. 35. Some tetrachordal scales using the third basic division.

Ex. 36. Some symmetrical scales using the first basic division.
Ex. 37. Some symmetrical scales using the second basic division.

Ex. 38. Some symmetrical scales using the third basic division.

The reader should compare the scales in Example 33 and 36, Example 34 and 37, and Example 35 and 38. The first halves of the scales in Examples 33 and 36, in Examples 34 and 37, and in Examples 35 and 38 are identical. The second halves of the symmetrical scales are different than those of the tetrachordal scales.

Using the basic division of the octave, the tetrachordal scales in Examples 34 and 35 can be used for the formation of a succession of transpositions in a way similar to the circle of perfect fifths:

Ex. 39.
According to the rule, "the second tetrachord of the basic scale can become the first tetrachord of its transposition," a circle of basic tones arises in the third-tone system (for the transposition of the basic scale). When the basic division of the octave shown in Example 39 is used (see Example 32, 2.), a succession of nine 10/3 tones is produced.

When the third basic division in Example 32 is used, a circle of eighteen successive 11/3 tones is obtained. The tones in this circle can be used as basic tones for the transposition of every tetrachordal scale (using the third octave division in Example 32):

Ex. 40.

1. middle 2. middle 3. 
1. tetr 2. tetr 1. tetr etc.

5. 6. 7. 8. 9.


15. 16. 17. 18. 1. tetr 2.
"Third" signifies the raising of a tone by a third tone. "Sixth" signifies the raising of a tone by a sixth tone.

Naturally, the symmetrical scales can be transposed in the succession given in the circles. The difference between the transposition of tetrachordal scales and the transposition of symmetrical scales is that with the transposition of symmetrical scales, the second half must always be a mirror of the first half, whereas, with the transpositions of the tetrachordal scales, the first half can merely be
transposed to a new step in order to form the second half:

Ex. 41.

By transposing a symmetrical scale in the order of the succession of the circle, a new, inverted\(^2\) construction of a symmetrical scale is obtained first. The second transposition forms the inversion of the inversion, i.e., the construction of the basic scale again; the next transposition is then an inversion of the construction of the basic scale, etc. There is a mirroring of intervals extending from the middle (see Example 41).

This transposition of the symmetrical scales is carried out in a way similar to the half-tone and the quarter-tone systems; in the half-tone system, the circle of perfect fifths came into consideration, while in the quarter-tone system, the circle of twenty-four high augmented fourths came into consideration.

It is still necessary to point out the complementary intervals of the third-tone system:

\(^2\)The construction is "inverted" in the sense that the order of the first and the second halves of the scale are reversed.
As shown in Example 42, the intervals in the third-tone system are complemented in the following way:

1. third tone, 17/3 tone,

2. 2/3 tone, 16/3 tone,

3. 3/3 tone (whole tone), 15/3 tone (major seventh),

4. 4/3 tone, 14/3 tone,

5. 5/3 tone, 13/3 tone,

6. 6/3 tone (major third), 12/3 tone (minor sixth),

7. 7/3 tone, 11/3 tone,

8. 8/3 tone, 10/3 tone,

9. 9/3 tone (augmented fourth), 9/3 tone (augmented fourth).

Inverted:

17. 17/3 tone, 1/3 tone,

16. 16/3 tone, 2/3 tone,

15. 15/3 tone, 3/3 tone,

14. 14/3 tone, 4/3 tone,

13. 13/3 tone, 5/3 tone,

12. 12/3 tone, 6/3 tone,

11. 11/3 tone, 7/3 tone,

10. 10/3 tone, 8/3 tone.

These complementary relationships of intervals form the
foundation of so-called "inversion" in the third-tone system. Inversion involves the comparison of each of the eighteen scale degrees of the third-tone system with the upper and the lower octave tones of each of the other degrees of the 18-step scale.

We have already written about complementary intervals in our discussion of the quarter-tone system. The concept of "inversion" involves the pairing of intervals that, within the range of an octave, are complements of one another.

The concept of "inversion" also has another sense in musico-theoretical usage: it is said, e.g., that every basic scale and every chord can be inverted several times. Therefore, we want to state the following axiom: every tone row (basic scale) can be initiated on every tone of that row; every tone of a chord can be considered the basic tone to which all other tones of certain chord are connected.

The word "inversion" is also used to whenever there is an inverted succession of tones or a group of tones set up in an inverted succession:

Ex. 43.3

\[ \text{Inversion} \]

---

3An inverted succession of tones such as that shown in Example 43 is normally called a "retrograde."
After having established the harmonic and the melodic foundation of the third-tone system, we can now theoretically explore the nature of the sixth-tone system.

The sixth-tone scale in Example 2 shows us that the sixth-tone system represents a synthesis of the half-tone and the third-tone systems and, furthermore, contains its share of new possibilities.

The 36-step sixth-tone scale can be divided into two 18-step third-tone scales, three 12-step half-tone scales, four 9-step 4/3 tone scales, or six 6-step whole-tone scales:
Ex. 48. Two 18-step scales.

Ex. 49. Three 12-step scales.

Ex. 50. Four 9-step scales.

Ex. 51. Six 6-step scales.
Because of the new tones in the sixth-tone system, it is possible to produce the 18-step third-tone scale twice, the 12-step half-tone scale three times, the 9-step 4/3-tone scale four times, and the 6-step whole-tone scale six times. This fact is of great importance in compositional practice.

A true change of chords (6-note to 8-note chords) in the modulatory sense can occur because of the possibility of using chords with no common tones. We will show what we mean by giving some examples. In the half-tone system, triads and tetrads could be produced with new tones only a few times:

Ex. 52.

In the sixth-tone system, a sextai, e.g., can be produced with new tones six times:

Ex. 53.

A 9-note chord can be produced with new tones four times, a 12-note chord three times, and a 18-note chord twice (Example 54, 1., 2., 3.):
In the half-tone system, the transposition of the 12-note chord (Example 54, 4.) consists of the same twelve tones as the basic chord, only the succession of the twelve tones has been changed. In the sixth-tone system, new tones always come into play when working with 9-note, 12-note, and 18-note chords (Example 54, 1., 2., 3.).

Strictly speaking, the 12-note chord labeled b. in Example 54, 4. is only an inversion with another bass tone and a regrouping (a change of position) of the twelve tones of the half-tone system, and, therefore, not a true transposition.

The chords in the first, second, and third sections of Example 54, however, can be called transpositions.

Therefore, twelve-tone music in the half-tone system sounds somewhat monotonous because consistent transposition (the use of new tones) is not possible since, when more than six tones of the half-tone system are used simultaneously, some tones must be retained from one chord to another.

On the other hand, in the sixth-tone system, not only triads and tetrads, but also 6-note to 8-note chords, can be produced several times
with new tones, and transposition can be used even in 6-voice to
18-voice textures. Examples 48-51 also prove this melodically.

The facts that we have already discussed should sufficiently
establish the usefulness and the logic of the sixth-tone system.
The elegance of the melodic and the harmonic progressions is already
seen in the use of triads:

EX. 55.

The section in Example 55 from 0 to \( \frac{1}{x} \) contains tetrads of the
half-tone system (C major, C-sharp major, and B major triads combined
with a single melodic voice). The chords at \( \frac{1}{x} \) and \( \frac{2}{x} \) are also tetrads
from the half-tone system. Two transpositions of the B major triad, each
successively higher by a sixth tone, appear between them. Two tetrads
of the sixth-tone system also appear between the tetrad at \( \frac{2}{x} \) \( (a\# - c - e - g) \) and the tetrad at \( \frac{3}{x} \) \( (a - c\# - e\# - g\#) \). The C major triad at
\( \frac{2}{x} \) moves to the C-sharp major triad at \( \frac{3}{x} \) by two transpositions of the
major triad, each successively higher by a sixth tone. The lower tone
\( a\# \) is superceded by the tone \( a \) only after two sixth-tone steps.

Between the tetrads at \( \frac{3}{x} \) and \( \frac{4}{x} \), a succession of sixth tones \( (g\# - sixth
\ g\# - third \ g\# - a \ and \ a - third \ g\# - sixth \ g\# - g\#) \) is also seen in two
voices. The tetrad at \( \frac{5}{x} \) is the tetrad \( g - c\# - f\# - a\# \) raised by a
third tone; therefore, it is spelled third \( g - third \ c\# - third \ f\# - third \ a\#. \)
Twelve-note chords can also be fashioned in the same way as triads and tetrads:

Ex. 56.

The first, second, third, and fourth chords of Example 56 are tertian 12-note chords. The fifth chord of Example 56 is a quartal 12-note chord; it sounds a third tone higher than the quartal 12-note chord c - f - a# - d# - g# - c# - f# - b - e - a - d - g.

It would be an error, however, to assume that only the chords of three or more tones of the half-tone system have to be used with the new scale degrees of the sixth-tone system or that only sixth tones must be used in melodic successions. Completely new triads, e.g., those built from the tones of the sixth-tone system, can also be constructed, and larger scale degrees can be used in melodic successions:

Ex. 57.

The short phrase with twelve triads in Example 57 contains all thirty-six tones of the sixth-tone system. The first, fifth, and ninth
triads contain the tones of 9-note chord la. in Example 54, the second, sixth, and tenth triads the tones of 9-note chord lb., the third, seventh, and eleventh triads the tones of 9-note chord lc., and the fourth, eighth, and twelfth triads the tones of 9-note chord ld.

The individual voices of the three-voice texture in Example 57 contain the following intervals:

Ex. 58.

It is also possible to work freely with the chords (e.g., 9-note chords):

Ex. 59.

The first, second, third, fifth, and tenth 9-note chords are identical to the 9-note chord la. in Example 54; the fourth 9-note chord is a changed position of 9-note chord lb., the sixth chord is an exact inversion of the first 9-note chord. One can make sure of this by inverting the first 9-note chord or by reading it from bottom to top.

The seventh and eighth 9-note chords correspond to 9-note chords lc. and ld. in Example 54; the ninth 9-note chord is an exact inversion of the seventh 9-note chord (read this from bottom to top). The progression of Example 59 can be roughly indicated in the half-tone system in the following way:
Ex. 60.

It is interesting to compare which dyads arise when a succession of whole tones and half tones beginning a whole tone apart are combined and when a succession of third tones and sixth tones beginning a whole tone apart are combined:

Ex. 61.

The dyads produced in Example 61, 1. are as follows: \(c - e\), four half tones; \(d - f\), three half tones; \(e - f^\#\), two half tones; \(f^\# - g\), one half tone.

The dyads produced in Example 61, 2. are as follows: 4 half tones = 12 sixth tones, 11 sixth tones, 10 sixth tones, 9 sixth tones = 3 half tones, 8 sixth tones, 7 sixth tones, 6 sixth tones = 2 half tones, 5 sixth tones, 4 sixth tones, and 3 sixth tones = 1 half tone. The four dyads of the half-tone system are labeled by * in Example 61, 2. The motion of the major third to the minor third, for example, is delayed in the sixth-tone system by the use of two new dyads in between these intervals, but it occurs immediately in the half-tone system. This difference in motion can also be observed in a passage utilizing oblique motion:
Ex. 62.

Example 62 contains all thirty-five dyads of the sixth-tone system; the eleven dyads of the half-tone system are found among these.

The same law, which we have already indicated in the half-tone, the quarter-tone, and the third-tone systems, holds true for the formation of triads and tetrads (and also other chords), namely, combine every dyad with all remaining tones of the tonal system, every triad with all remaining tones of the tonal system, etc.

The method utilized earlier can be used for the realization of this axiom in the sixth-tone system:

Ex. 63. Triads:

Ex. 64. Triads:
Ex. 65. Tetrads:

\[\text{Score Image} \]

The relation of the third-tone and the sixth-tone systems to the half-tone system is different from the relation of the quarter-tone system to the half-tone system in one essential detail.

In the quarter-tone system, the half tone is divided into two equal parts—two quarter tones.

*In the sixth-tone system, the half tone can also be divided into equal parts (into three sixth tones), and furthermore, it can be divided into two unequal parts, into a third tone and a sixth tone or vice versa:*

Ex. 66.

\[\text{Score Image} \]

This condition gives a new charm to the melodic successions.

An essential difference is also found in contrary motion using quarter tones and contrary motion using sixth tones; in contrary motion using sixth tones, the difference from one dyad to the following dyad amounts to two sixth tones (a third tone), not a half tone. A third tone is an asymmetrical part of a half tone and also of a whole tone:
The dyads of the half-tone system are labeled with "x." It is also seen in Examples 47 and 48 how the half-tone system and its inherent laws are logically connected with the sixth-tone system. The dyads of the third-tone system are labeled with "o." Some dyads of the half-tone system are also found in the third-tone system (see the designation "o_x").

From our explanations, the reader can understand why we have not presented the new tonal systems as something revolutionary in relation to the half-tone system. This would be completely impossible on the basis of a strict theoretical analysis we have carried out. The most important task was to clarify the definite, logical relationships between all tonal systems and to put an end to the confusion about theoretical conceptions in regard to musical development. Theoretical narrow-mindedness was always the greatest hindrance to the normal development of music.

Just as we have established in the half-tone, the quarter-tone, and the third-tone systems, we want to establish which new structures of

4 These example numbers are incorrect. Presumably, Hába is referring to Examples 67 and 68.
equally-large scale degrees are possible in the sixth-tone system. The sixth-tone scale has already been mentioned (Example 2). An 18-step structure arises through the succession of third tones (Example 1). This structure can be produced once again in the sixth-tone system with eighteen new scale degrees (by transposing the third-tone scale up a sixth tone, see Example 48).

A 12-note structure arises through the succession of half tones (3/6 tones). The 12-step half-tone scale can be produced twice more with new scale degrees (see Example 49).

A 9-step structure arises through the succession of 2/3 tones (4/6 tones); this scale can be produced with new tones three more times in the sixth-tone system:

Ex. 69.

The succession of 5/6 tones produces one continuous structure of thirty-six scale degrees of the twelve successive perfect fourths that form the basis of this structure, each can be evenly divided into three 5/6 tones:

---

5 Throughout this chapter, Hába uses the terms, "scale," "succession," "connection," "chord," and "structure" interchangable to mean a group of tones combined horizontally or vertically. The term "structure" will be used in this translation.
The twelve tones of the half-tone system, following one another at the interval of a perfect fourth, are labeled with "x."

The structure of perfect fourths in Example 70 appears in the sixth-tone system twice more with new scale degrees (see Example 71):

Ex. 71.

\[ \text{\%\% tone; transposition} \]

We have shown the succession of whole tones (6/6 tones) in Example 50.

The succession of 7/6 tones is new:

Ex. 72.

The twelve perfect fifths of the half-tone system form the basis of the structure in Example 72 (designated by "x"). In addition, structures of twelve perfect fifths are produced twice more with new
tones in regard to the thirty-six 7/6-tone scale degrees:

Ex. 73.

\[
\begin{array}{c}
\text{\% tone} \\
\text{interval; transposition}
\end{array}
\]

Every perfect fifth in Example 72 contains three 7/6 tones.

See Example 50 for the succession of 4/3 tones (8/6 tones).

Each of the four 9-step scales in Example 50 can be divided into three open-position augmented triads:

Ex. 74.

The augmented triad can be produced twelve times with new scale degrees in the sixth-tone system. The triads marked with "x" belong to the half-tone system. Moreover, it is seen in Example 50 that the first tone of the first scale, the second tone of the second scale, the third tone of the third scale, and the fourth tone of the fourth scale form the diminished-seventh chord $c - d^\# - f^\# - a$. This tetrad can be produced nine times with new tones in the sixth-tone system:
Ex. 75.

Example 75 shows a succession of minor thirds (9/6 tones) in the diminished-seventh chords.

An 18-tone structure arises through the succession of 10/6 tones (5/3 tones) (see Example 8). This structure can be produced once more with new tones in the sixth-tone system:

Ex. 76.

New 36-tone structures arise through the succession of 11/6 tones, 13/6 tones, 17/6 tones, 19/6 tones, 23/6 tones, 25/6 tones, 29/6 tones, 31/6 tones, and 35/6 tones.

A 36-note structure arises through the succession of 11/6 tones; because of its large range, we have divided it into two 18-step groups:
The twelve tones of the half-tone system form major sevenths (see "x"). Each major seventh is divided into three equal scale degrees. Major sevenths are also formed by the second, fifth, eighth, eleventh, etc., scale degrees and the third, sixth, ninth, twelfth, etc., scale degrees.

The succession of major thirds (12/6 tones) lead to the augmented triad. This 3-note structure can be produced twelve times with new scale degrees in the sixth-tone system:

Ex. 78.

Successive 13/6 tones form a 36-note structure; because of its large range, it is divided into two groups of eighteen scale degrees:
The twelve tones of the half-tone system form minor ninths. Each minor ninth is divided into three equal scale degrees. The second, fifth, eighth, eleventh, etc., scale degrees and the third, sixth, ninth, twelfth, etc., scale degrees also form minor ninths.

We have shown the succession of \( 7/3 \) tones (\( 14/3 \) tones) in Example 9. The 18-note chord can be produced once more with new scale degrees in the sixth-tone system:

Ex. 80.
The twelve tones of the half-tone system form two rows of whole tones (major ninths).

Each major ninth is divided into three equal scale degrees. The second, fifth, eighth, eleventh, etc., scale degrees and the third, sixth, ninth, twelfth, etc., scale degrees also form major ninths.

A 12-note structure arises through the succession of 15/6 tones (perfect fourths). This structure can be produced twice more with new scale degrees in the sixth-tone system (see Example 71).

The structure of 16/6 tones (8/3 tones) has been shown in Example 10. This 9-note structure can be produced three more times with new tones in the sixth-tone system:

Ex. 81.

An augmented triad of the half-tone system in open position forms the basis of each of the 9-tone groups in Example 81 (see "x").

The second, fifth, and eighth tones and the third, sixth, and ninth tones of each 9-note group also form augmented triads.

The succession of 17/6 tones forms a 36-note structure; because of its large range, it is divided into three 12-note groups:
The tones of the half-tone system labeled with "x" form a succession of perfect fourths. The second, fifth, eighth, eleventh, etc., tones and the third, sixth, ninth, twelfth, etc., tones also form successions of perfect fourths.

The succession of augmented fourths (18/6 tones) divide the octave into two symmetrical halves \( c - f^\# - c \); this group can be produced eighteen times with new scale degrees in the sixth-tone system:

Ex. 83.

Through the succession of 19/6 tones, a 36-note structure arises that, because of its large range, is divided into three groups of twelve
tones:

Ex. 84.

The intervals of a perfect fifth, produced by the twelve tones of the half-tone system, are labeled with "x." The second, fifth, eighth, eleventh, etc., tones and the third, sixth, ninth, twelfth, etc., tones also form perfect fifths.

A 9-note structure arises through the succession of 20/6 tones (10/3 tones) (see Example 11). This structure can be produced three more times with new tones in the sixth-tone system:
Ex. 85.

The succession of 21/6 tones, i.e., perfect fifths, is well-known. The structure of twelve perfect fifths can be produced twice more with new tones in the sixth-tone system:

Ex. 86.

We have shown the 18-note structure of 22/6 tones (11/3 tones) in Example 12. It can be produced once more with new scale degrees in the sixth-tone system. We divide the 18-note structure into two 9-note groups:
Ex. 87.

The succession of 23/6 tones forms a 36-note structure. Because of its large range, this structure is divided into four groups of nine tones:

Ex. 88.

The twelve tones of the half-tone system labeled with "x" form major sevenths. The second, fifth, eighth, eleventh, etc., tones and the third, sixth, ninth, twelfth, etc., tones also form major sevenths.

The structure consisting of 24/6 tones (minor sixths) is known from the half-tone system as an augmented triad in open position:
This 3-note structure can be produced eleven times with new tones in the sixth-tone system (Example 99).

A 36-note structure arises from the succession of 25/6 tones. Because of its large range, it is divided into four 9-note groups:

The twelve tones of the half-tone system labeled with "x" form a succession of chromatic scale degrees (minor seconds) in open position.

The second, fifth, eighth, eleventh, etc., tones and the third, sixth, ninth, twelfth, etc., tones also form the same succession of intervals.

The basic tones of the four 9-note groups in Example 90 form a diminished seventh chord $c - d^\# - f^\# - a$. 
We have shown the succession of 26/6 tones (13/6 tones) in Example 13. The 18-note structure, divided into two 9-note groups, can be produced once more with new tones in the sixth-tone system:

Ex. 91.

The tones of the half-tone system labeled with "x" form two successions of whole tones (in Example 91, a., b.). The second, fifth, eighth, eleventh, fourteenth, and seventeenth tones in Example 91, a. and the third, sixth, ninth, twelfth, fifteenth, and eighteenth tones in Example 91, b. also form successions of whole tones in open position.

The structure consisting of 27/6 tones (major sixths) is known from the half-tone system as an inversion of a diminished-seventh chord. The 4-note groups can be produced eight times more with new tones in the sixth-tone system:

Ex. 92.
A 9-note structure arises through the succession of 28/6 tones (14/3 tones) (see Example 14). It can be produced three more times with new tones in the sixth-tone system:

Ex. 93.

The tones of the half-tone system labeled with "x" form augmented triads. The second, fifth, and eighth tones and the third, sixth, and ninth tones of every 9-note group also form augmented triads (Example 93).

A 36-note structure arises through the succession of 29/6 tones. We have divided this structure into four 7-note groups and one 8-note group:
The twelve tones of the half-tone system (see "x") form twelve perfect fourths in open position.⁶ The second, fifth, eighth, eleventh, etc., tones and the third, sixth ninth, twelfth, etc., tones also form twelve perfect fourths in open position.

A 6-note structure arises through the succession of 30/6 tones (minor sevenths); this can be produced five more times with new tones in the sixth-tone system:

⁶Hába used the expression "in open position" in the sense that the intervals in the succession (in this case, the minor seconds) are two octaves and a minor second apart rather than just a minor second apart. Hába also used this expression in connection with successions of perfect fourths, augmented fourths, and perfect fifths.
The succession of $31/6$ tones forms a $36$-note structure.

Because of its large range, we have divided it into four $7$-note groups and one $8$-note group:

The twelve tones of the half-tone system labeled with "x" form twelve perfect fifths in open position. The second, fifth, eighth, eleventh, etc., tones and the third, sixth, ninth, twelfth, etc., tones also form twelve perfect fifths in open position.

We have shown the structure consisting of $32/6$ tones ($16/3$ tones) in Example 15. This $9$-note group can be produced three more times with new tones in the sixth-tone system.
Ex. 97.

The twelve tones of the half-tone system labeled with "x" form four augmented triads in open position. The second, fifth, and eighth tones and the third, sixth, and ninth tones of every 9-note groups form augmented triads (Example 97).

A 12-note structure arises through successive 33/6 tones (major sevenths). Because of its large range, it is divided into two 6-note groups. This 12-note groups can be produced twice more with new tones in the sixth-tone system.
We have shown the succession of 34/6 tones (17/3 tones) in Example 16; this 18-note structure, divided into three 6-note groups, can be produced one more with new tones in the sixth-tone system:

A 36-note structure arises through the succession of 35/6 tones; because of its large range, we have divided it into two 6-note groups,
three 7-note groups, and one 3-note group:

Ex. 100.

In Examples 48-100, we have furnished proof that the sixth-tone system represents a synthesis of the half-tone and the third-tone systems, and that, furthermore, it offers new possibilities for combinations of tones. Besides the equally-spaced chordal structures that were established in the half-tone and the third-tone systems, there are twelve new equally-spaced 36-note structures in the sixth-tone system (Examples 2, 70, 72, 77, 79, 82, 84, 88, 90, 94, 98, 100).

In the half-tone system, there are four equally-spaced chordal structures that contain all twelve tones. These are structures that consist of half tones, of 5/2 tones (perfect fourths), of 7/2 tones (perfect fifths), and of 11/2 tones (major sevenths). Furthermore, the perfect fourth and the perfect fifth, the minor second and the major seventh, stand in complementary relation to one another:
In the third-tone system, there are six equally-spaced 18-note structures.

As was already mentioned, in the sixth-tone system, there are twelve equally-spaced 36-note structures.

We have consistently shown every chord of the sixth-tone system in the two basic forms, i.e., as a succession (melodically) and as a chord (harmonically) in order to stress that every tone of every tonal system can be used not only melodically but also harmonically.

For the formation of successions of tones within the range of an octave, some new basic divisions can be used in addition to those asymmetrical and symmetrical basic divisions of the octave that we showed in our discussion of the third-tone system (Examples 31 and 32):

Ex. 102. Asymmetrical basic division of the octave for the formation of asymmetrical scales.

Every construction in Example 102 can be used for the formation of 6-step to 33-step asymmetrical scales in the sixth-tone system.

The following new symmetrical basic divisions of the octave are suited for the formation of 7-step to 35-step symmetrical and tetra-chordal scales:
The first basic division in Example 103 can be used for the formation of a succession of symmetrical scales and of tetrachordal scales in the sense of a 36-step circle:

We leave the division of the basic constructions into smaller scale degrees to the reader. We have shown clearly enough in our discussion of the half-tone, the quarter-tone, and the third-tone systems how they are constructed.
A "third" is raised by a third tone.  
A "sixth" is raised by a sixth tone.

In the sixth-tone system, the following intervals are complements of one another:

<table>
<thead>
<tr>
<th>1/6 tone and 33/6 tone</th>
<th>13/6 tone and 23/6 tone</th>
<th>23/6 tone and 11/6 tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/6 n n 24/6 n</td>
<td>14/6 n n 23/6 n</td>
<td>26/6 n n 10/6 n</td>
</tr>
<tr>
<td>3/6 n n 32/6 n</td>
<td>12/6 n n 21/6 n</td>
<td>27/6 n n 9/6 n</td>
</tr>
<tr>
<td>4/6 n n 33/6 n</td>
<td>16/6 n n 20/6 n</td>
<td>28/6 n n 8/6 n</td>
</tr>
<tr>
<td>5/6 n n 81/6 n</td>
<td>17/6 n n 19/6 n</td>
<td>29/6 n n 7/6 n</td>
</tr>
<tr>
<td>6/6 n n 30/6 n</td>
<td>18/6 n n 18/6 n</td>
<td>30/6 n n 6/6 n</td>
</tr>
<tr>
<td>7/6 n n 29/6 n</td>
<td>19/6 n n 17/6 n</td>
<td>31/6 n n 5/6 n</td>
</tr>
<tr>
<td>8/6 n n 27/6 n</td>
<td>20/6 n n 16/6 n</td>
<td>32/6 n n 4/6 n</td>
</tr>
<tr>
<td>9/6 n n 24/6 n</td>
<td>21/6 n n 15/6 n</td>
<td>23/6 n n 3/6 n</td>
</tr>
<tr>
<td>10/6 n n 22/6 n</td>
<td>23/6 n n 14/6 n</td>
<td>24/6 n n 2/6 n</td>
</tr>
<tr>
<td>11/6 n n 25/6 n</td>
<td>24/6 n n 13/6 n</td>
<td>25/6 n n 1/6 n</td>
</tr>
<tr>
<td>12/6 n n 26/6 n</td>
<td>24/6 n n 12/6 n</td>
<td></td>
</tr>
</tbody>
</table>
Ex. 105. Complementary intervals within the range of an octave.

In our discussions of the half-tone, the quarter-tone, and the third-tone systems, we clarified how chords can be divided into smaller groups of tones (into triads, tetrads, pentads, etc.), how irregular chordal constructions are formed from regular chordal constructions, and how inversions and open positions of chords are obtained.

The formation of relationship of one chord to another also occurs in a way similar to the one we indicated earlier.

Now, it is necessary for use to say something about the twelfth-tone system.

The twelfth-tone scale (Example 3), with its division into half tones, third tones, quarter tones, sixth tones, and twelfth tones, proves that the twelfth-tone system includes, in itself, all four tonal systems that we have theoretically shown earlier.

This matter has practical sense in that, by using the twelfth-tone system, all combinations of tones of the half-tone, the quarter-tone, the third-tone, and the sixth-tone systems can be formed, not to mention the fact that the twelfth-tone system also brings with it many new possibilities for the combination of tones.

Because we are justified in believing that, on the basis of our earlier explanations, the reader can undertake the detailed work himself for the purpose of his own training, we will confine ourselves in the
the musical examples to the most important things that should make our assertions clear.

Basically, the following statements can be made: in the twelfth-tone scale, the half-tone scale can be produced with new tones six times, the quarter-tone scale three times, the third-tone scale four times, and the sixth-tone scale twice:

Ex. 106.

```
Ex. 106.

Basic scale (Half-tone scale)
```

```
by 1/12 tone higher
```

```
by 1/6 tone higher
```

```
by 1/4 tone higher
```

```
by 1/3 tone higher
```

```
by 5/12 tone higher
```

Ex. 107.

```
Third-tone scale
```

```
by 1/12 tone higher
```

```
by 1/6 tone higher
```

```
by 1/4 tone higher
```
Ex. 108.

Quarter-tone scale

by 1/12 tone higher

by 1/6 tone higher

Ex. 109.

Sixth-tone scale

by 1/12 tone higher

The following points should also be made:

1. Every structure using tones of the half-tone system can be produced five more times with new tones in the twelfth-tone system. Every structure using tones of the half-tone system can be combined with each of its five transpositions:

Ex. 110.

½2 tone | ⅔ tone | ⅔ tone | ⅔ tone | ⅔ tone | ⅔ tone | ⅔ tone higher

M M etc.
Ex. 111.

In the twelfth-tone system

The upper five tones (2., 3., 4., 5., 6.) of sextad a. in Example 111 are each successively transposed up by a twelfth tone.

The first tone of sextad a. in Example 111 is followed by descending twelfth-tone scale degrees that form a contrary motion to the upper five voices. The first and second tones of sextad a. form a perfect fourth that becomes larger in successive sextads, the second voice moving up by twelfth tones and the first voice down by twelfth tones (in contrary motion), until in sextad g., the perfect fourth is transformed into the perfect fifth $g^\# - d^\#$:

Ex. 112.

In Example 111, we dealt with the already well-known intervals of the half-tone system and the new intervals of the twelfth-tone system.

2. In the twelfth-tone system, every structure using tones of the third-tone system can be produced with new tones three more times. Every structure using tones of the third-tone system can be combined with each of its three transpositions:
3. In the twelfth-tone system, every structure using tones of the quarter-tone system can be produced with new tones two more times. Every structure using tones of the quarter-tone system can be combined with each of its two transpositions:

Ex. 114.

4. In the twelfth-tone system, every structure using tones of the sixth-tone system can be produced with new tones once more. Each structure using tones of the sixth-tone system can be combined with its transposition:
Ex. 115.

There are some new dyads (intervals) in the twelfth-tone system in addition to those mentioned in our discussion of the half-tone, the quarter-tone, and the third-tone systems:

Ex. 116.

Equally-spaced chordal structures can also be formed in the twelfth-tone system in a way similar to the half-tone, the quarter-tone, the third-tone, and the sixth-tone systems. These structures are composed of twelfth tones, 5/12 tones, 7/12 tones, etc., to 72/12 tones (see Example 116). Because of their large range, many of the equally-spaced chordal structures must be divided into smaller groups of tones.

Dyads of the twelfth-tone system, produced by contrary motion, are as follows:
The following is an example of polytonality that occurs by the use of tones from the twelfth-tone, the sixth-tone, the quarter-tone, the third-tone, the half-tone, and the whole-tone systems:

Ex. 118.

The first voice consists of twelfth-tone scale degrees, the second voice consists of sixth-tone scale degrees, the third voice consists of quarter-tone scale degrees, the fourth voice consists of third-tone scale degrees, the fifth voice consists of half-tone scale degrees, the sixth voice consists of whole-tone scale degrees.

At the same time, Example 118 consists of an open position sextad, slowly expanding in similar motion upwards. The scale degrees of the melodic succession as well as the dyads contained in every sextad can be determined and analyzed. Therefore, also in the twelfth-tone system, there is a double control of the arising of chord and of the succession of tones, i.e., harmonic and melodic control.
The new symmetrical basic division of the octave for the formation of symmetrical and tetrachordal scales is as follows:

Ex. 119.

New asymmetrical basic divisions of the octave for the formation of asymmetrical scales in the twelfth-tone system are as follows:

Ex. 120.

We have explained the essential aspects and fundamental principles of the twelfth-tone system and, in this way, have brought our theoretical discussion to a close.
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