

Conceptual Development and Interaction among Related Disciplines in Hugo Riemann's *Musik-Lexikon*: Focused on Theory of Harmony *

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Abstract: This study aimed to elucidate how articles related to music theory and acoustics in Hugo Riemann's (1849-1919) *Musik-Lexikon* changed during his lifetime from the first (1882) to the eighth edition (1916). In the recent development of Riemann studies (Rehding 2003, Holtmeier 2011), the significance of *Musik-Lexikon* has not been surveyed. This work includes many revised articles and various types of revisions. Specifically, the publications of his *Handbuch der Harmonielehre* (1887) and *Vereinfachte Harmonielehre* (1893) brought to the fourth edition (1894) a turning point in articles on harmony, whereas the new terminology and symbol notation permeated gradually only until the seventh edition (1909). Regarding articles on acoustic fields, the criticism of psychological and physiological methods led his "Ideen zu einer 'Lehre von den Tonvorstellungen'" in the eighth edition (1916), which could truly contribute to music theory. Regarding harmonic dualism, an ambivalence concerning the application of undertones was detected among the editions. Furthermore, the incremental historicization of his own theory and the evaluation of other theorists lost coherence in the text. Thus, the editions of *Musik-Lexikon* can be considered as the essence of Riemann's theoretical development, revealing fluctuation in his descriptions. It suggests that *Musik-Lexikon* encouraged Riemann to situate his functional theory within the broader history.

Keywords: Hugo Riemann, *Musik-Lexikon*, editions, music theory, acoustics

1. Introduction

1.1. Purpose

Recently, the neo-Riemannian theory has become popular in the field of music theory, particularly in the United States. This theory, based on Hugo Riemann's (1849–1919) theory of harmony, has developed multifariously and has been applied to late Romantic and film music. In addition, Riemann's own theory has been re-examined. For example, Rehding (2003) historicized his theory and aesthetics relating to the contemporary academic background, Nishida (2019) discussed the relationship between his and neo-Riemannian theories, and Holtmeier (2011) surveyed how his music theory had been received in German-speaking areas in the early twentieth century.

However, because Riemann covers a wide variety of writings, it is still difficult to grasp the entire picture and development. Therefore, this study focuses on *Musik-Lexikon* (1882–), where

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the development process was recorded, and elucidates how articles in music theory and acoustics have changed from the first to the eighth (1916) editions in his lifetime.

1.2. Object and Preceding Studies

First, let us look at the synopsis of *Musik-Lexikon*. What concepts did Riemann have when he published this lexicon? On the front cover of the first edition in 1882, the following is printed: “Theory and history of the music, the musicians of old and new periods, including information on their works, with a complete organology [Theorie und Geschichte der Musik, die Tonkünstler alter und neuer Zeit mit Angabe ihrer Werke, nebst einer vollständigen Instrumentalkunde]”¹. In its preface, Riemann noted that, because he assumed the “musicians and music lovers” were the reader, the lexicon would evoke the interest of “the highly educated musicians and the man in musicology,” while, theories of composition, such as the theory of harmony and counterpoint, were described only in the outline (Riemann 1882, V–VI). Furthermore, he appreciates the collaborators in Western countries for providing biographical information². Possibly, he intended to create a comprehensive lexicon of Western music theory and history.

Subsequently, *Musik-Lexikon* was expanded, revised many times, and translated into different languages. This study investigated eight German editions that Riemann himself engaged in editing (Table 1). From the seventh edition onward, the title became *Hugo Riemanns Musik-Lexikon*.

As shown in Table 1, *Musik-Lexikon* continued to be revised throughout Riemann’s lifetime. Thus, tracing this shift will also lead to an understanding of the development process of his musical thoughts. However, previous studies referred to some articles only in a specific edition, and the descriptions in each edition were not compared. Above all, although A. Rehding touched on several topics, such as tonality, undertones, and cadence (Rehding 2003, 48, 88, 103), he concentrated on only one edition. This might be because descriptions in the lexicon were viewed as supplementary data for understanding his main writings. Moreover, at the end of Rehding’s book, 13 articles were translated into English (Rehding 2003, 186–198) that were all based on the fifth edition. At this point, Rehding’s study did not detail the transition of each harmonic concept, the characteristics of Riemann’s historical description, his understanding of the related disciplines, and his later methodological discussions, although it examined his wide spectrum of musical thoughts from many perspectives. Additionally, Holtmeier’s reception study (2011) did not touch on *Musik-Lexikon*. In this way, despite the current popularity of Riemann studies, interest in *Musik-Lexikon* itself has not been high.

Therefore, as the first step in grasping this writing systematically, this study focused on articles on music theory and acoustics because Riemann left behind many related writings. Presumably, both fields are related closely to each other, and cross-disciplinary arguments are indispensable, especially in the theory of harmony.

¹ In the citation, the original German and translator’s (the present author’s) notes are provided within [], while the English translation is provided within “”. The spelling in German is modernized.

² Thus, *Musik-Lexikon* included complements and corrections by multiple persons. This study presupposes that Riemann, as the editor in the lexicon’s revisions, controlled and approved intentions and actions of others.

Table 1.

Musik-Lexikon and its type of revisions (boldface) in Riemann's lifetime with his published writings referred to in this study

Edition	Year	Revision type or title of publications	Edition	Year	Revision type or title of publications
	1875	“Die objective Existenz der Untertöne in der Schallwelle [The Objective Existence of the Undertones in the Sound Wave]”		1898	<i>Geschichte der Musiktheorie im IX.- XIX. Jahrhundert [History of Music Theory in the IX–XIX Century]</i>
	1877	<i>Musikalisches Syntaxis [Musical Syntax]</i>	5th	1900	“vollständig umgearbeitete Auflage”
1st	1882			1903	<i>Anleitung zum Generalbass-Spielen [Instruction of the Thoroughbass Play]</i> (2nd edition)
2nd	1884	“vermehrte Ausgabe [Enlarged Edition]”	6th	1905	“vollständig umgearbeitete Auflage”
3rd	1887	“sorgfältig revidierte und mit den neuesten Ergebnissen der musikalischen Forschung und Kunstlehre in Einklang gebrachte Auflage [Carefully Revised and with the Newest Results of the Music Study and Theory of Art in Accord Brought Edition]”		1905	“Das Problem des harmonischen Dualismus [The Problem on the Harmonic Dualism]”
	1887	<i>Handbuch der Harmonielehre [Handbook of the Harmonic Theory]</i>	7th	1909	“vollständig umgearbeitete Auflage”
	1891	<i>Katechismus der Akustik [Catechism of the Acoustics]</i>		1912	“Tonhöhenbewusstsein und Intervallurteil [Consciousness of Pitch and Judgment of Interval]”
	1893	<i>Vereinfachte Harmonielehre [Simplified Harmony]</i>	8th	1916	“vollständig umgearbeitete Auflage”
4th	1894	“vollständig umgearbeitete Auflage [Completely Reworked Edition]”		1916	“Ideen zu einer ‘Lehre von den Tonvorstellungen’ [Ideas for a Study ‘On the Imagination of Tone’]”

1.3. Method

Next, the selection process for the articles is described.

(1) The articles on music theory and acoustics were extracted from eight editions. Among them, short articles, and those only with references to other articles were excluded. Articles with personal names were refined to include only famous music theorists. Consequently, 167 articles were extracted from the first edition. This included many terms specific to Riemann, such as *Klangschlüssel* [key of *Klang*]³ and *Klangvertretung* [representative of *Klang*].

(2) The differences among editions were listed. Additionally, added, altered, or deleted articles were identified.

(3) The list was narrowed to those that underwent major revisions (58 articles). Then, by comparing altered passages between the latest article and its previous editions, the reasons behind their alteration were examined.

³ Riemann used the term *Klang* with respect to sound, resonance, consonant triad, and others. The *Klangschlüssel* indicated figures and symbols for chord designation, along with abbreviation, such as T, D, S (tonic, dominant, and subdominant). Regarding *Klangschlüssel*, see Nishida and Yasukawa 2019, 100–102. In this paper, Riemann's terms and article names in German are provided with English translations within [] at the first appearance.

In the next section, the overall course of revision is explored by analyzing the tendency to add articles and delete articles, and new articles are scrutinized. In the third section, articles that have undergone a major change and the reasons behind their alteration are discussed.

2. Transition in Articles

2.1. New and Deleted Articles

First, the characteristics were explored using a new article set (Table 2) and deleted articles (Table 3) through editions.

There were 43 new articles, indicating that new articles were added continuously, while 8 articles had been deleted since the fifth edition.

Table 2. New articles (listed in alphabetical order)

Edition	Year	New articles
3 rd	1887	“Agogik [agogics],” “Agogischer Accent [agogic accent],” “Schluss [close],” “Stumpf, Carl”
4 th	1894	“Funktionen [functions],” “Parallelklänge [parallel <i>Klänge</i>],” “Plagalschluss [plagal close],” “Tanaka, Shohé,” “Tongeschlecht [kind of keys],” “Wechseldominante [dominant of the dominant]”
5 th	1900	“Accord [accord],” “arithmetische Teilung [arithmethic division],” “Basse fundamentale [fundamental bass],” “Common chords,” “Farbenvorstellungen [representation of colors],” “Leittonwechselklang [leading tone exchange],” “Scheinkonsonant [apparent consonance],” “Subdominante [subdominant],” “Tonverschmelzung [tonal fusion],” “Variante [parallel keys]”
6 th	1905	“Absolutes Ohr [absolute ear],” “Fundamental [fundamental],” “Gegenklang [counter <i>Klang</i>],” “Generalauftakt [general upbeat],” “Hören [hearing],” “Musikwissenschaft [musicology],” “Nonenakkord [ninth chord],” “Terznonenakkord [third ninth chord],” “Terzseptakkord [third seventh chord],” “Tonpsychologie [psychology of tone],” “Verminderter Dreiklang [diminished triad]”
7 th	1909	“Akzent [accent],” “Anschlussmotive [appendage motive],” “Chromatisches Tonsystem [chromatic system of tone],” “Klangstufen [degrees of <i>Klang</i>],” “Melodik [theory of melody],” “Verwandt [related],” “Zwischendominanten [secondary dominants]”
8 th	1916	“Regula dell’ottava [rule of the octave],” “Resonanz [resonance],” “Sprechmaschinen [speaking machines],” “Tongedächtnis [memory of tone],” “Überstülpung [covering]”

Table 3. Deleted articles

Edition	Year	Articles
5 th	1900	“Stammakkord [principal chord]”
6 th	1905	“Oberdominante [upper dominant]”
7 th	1909	“Gegenklang [counter <i>Klang</i>],” “Klangfolge [succession of <i>Klang</i>],” “Tonverschmelzung,” “Wesentliche Dissonanzen [essential dissonances]”
8 th	1916	“Mittöne [co-occurrence tones],” “Telephon [telephone]”

2.2. General Characteristics

From these articles, the following three characteristics were highlighted.

(1) Especially from the fourth to the seventh editions, new concepts, terms, and denotation systems on the theory of harmony appeared in each edition.

(2) As the number of articles in foreign languages has increased since the fifth edition, the lexicon has become multi-lingual⁴.

(3) Since the third edition, new articles on the psychology of tone and physics of tone have increased.

Among these characteristics, the first and the third ones were scrutinized.

2.3. Shift of the Theory and Representation of Harmony and Moment of Historization

The crucial changes in the first characteristics were that the Riemannian term “Funktionen” was registered in the fourth edition (1894), and along with T, D, and S, the denotations, such as “Parallelklänge⁵” (added as an article in the same edition) and “Leittonwechselklang⁶” (added as an article in the next edition), were introduced. The concept of functions that appeared in *Vereinfachte Harmonielehre* in 1893 brought about this shift. Furthermore, the denotation of *Leittonwechselklang* was updated from the fourth to the fifth edition⁷.

Additionally, in the article “Funktionen” in the fifth edition, the doctrine that “modulation always appears as reinterpretation of a function into another [Modulation erscheint stets als Umdeutung einer Funktion zu einer anderen]” (Riemann 1900, 351⁸) was added, complemented by the passage, “as already Rameau [Jean-Philippe Rameau, 1683–1764] recognized clearly [wie bereits Rameau klar erkannte]” (Riemann 1905, 407*l*) in the sixth edition, where his intention to historicize concepts on the functions could be observed⁹. However, in the seventh edition, the description of the modulation and reference to Rameau were deleted from the same article. This correction emphasized that the new theory and denotation of harmony were Riemann's own invention. In the eighth edition, although there was a difference in wording, he attributed the theory's novelty to himself.

In some articles, the concepts were renewed. For instance, “Parallelklänge” was explained as “*Klänge* that stand in the relation of relative key with the tonic [Klänge, die im Verhältnis der Toniken von Paralleltonarten stehen]” (Riemann 1894, 787*r*) in the fourth edition, while it was described as “*Klänge* that have the third interval in common [Klänge, welche das

⁴ After the fourth edition, English and French translations were published. About the relationship between the translated editions and the German original, see Nishida and Yasukawa (2021). This study sights on the German edition and the relationship among related disciplines in it.

⁵ Tp, Sp, and Dp are the relative chords of tonic, subdominant, and dominant chords, respectively. Regarding *Parallelklänge*, see Figure 1.

⁶ *Leittonwechselklang* is the chord that changes major or minor nature of a chord, and the prime in minor triad is half a tone lower than that in major triad. In Riemann's theory, the prime in minor triad means the uppermost tone (e.g., in a minor triad A-C-E, the prime is E). In this paper, the pitch names are written in German.

⁷ The fourth edition showed “⁰S2>,” for instance, while the next edition used letters of functions and superimposed < or >, such as \mathfrak{S} .

⁸ The lexicon took two-column format; thus, the left and the right columns were distinguished as *l* and *r*.

⁹ Riemann published *Geschichte der Musiktheorie im IX.–XIX. Jahrhundert* in 1898 that seemed to promote his attempt to historicize.

Terzintervall gemeinsam haben]” (Riemann 1900, 835/) with an illustration (Figure 1) in the fifth edition. Correspondingly, it was grounded not at the key level but at the chord level.

Moreover, “Variante” and “Verwandt,” which were set up as an article each in the fifth and the seventh editions, were necessary concepts for “Verwandtschaftstabelle [table of tonal relationships]” (Riemann 1916, *Ideen*, 20¹⁰; Figure 2) shown in his treatise “Ideen zu einer ‘Lehre von den Tonvorstellungen.’” In other words, Riemann attempted to link later editions to his own evolving thoughts.

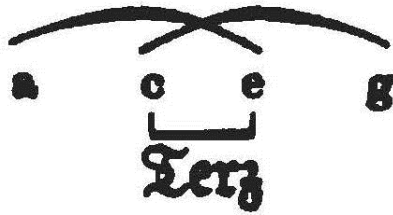


Figure 1. Illustration of *Paralleklänge*
(Terz means the third; Riemann 1900, 835/)

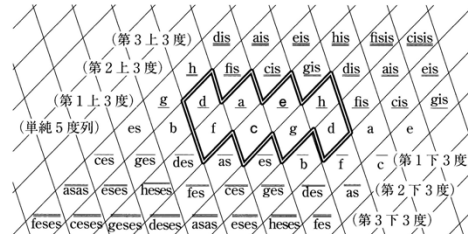


Figure 2. *Verwandtschaftstabelle*
(Nishida and Yasukawa 2019, 97)

2.4. Toward a Cooperation with Psychology and Physics of Tone

Riemann continued to absorb the latest studies in the psychology and physics of tone. An increase in his interest can be observed in the third edition (1887). Stumpf (1848–1936) was set up as an article where his *Tonpsychologie*, Vol.1 (1883), which discussed human perception and judgment of tones, was introduced as a development of Hermann von Helmholtz’s (1821–94) *Die Lehre von den Tonempfindungen [On the Sensations of Tone]* (1863). In the fifth edition, an article on “Tonverschmelzung¹¹” was added but deleted in the seventh edition. This deletion was related to the fact that an article on “Tonpsychologie” as a new field was added in the sixth edition. In other words, a comprehensive view of the academic field was preferred to the article on an individual. In relevant articles, a need for the future interaction between this field and music theory has been commented upon: “the benefit that now comes out from their research for the foundation of music theory is a very smaller one [der Nutzen, der bis jetzt aus ihren Untersuchungen für die Grundlagen der Musiktheorie herauspringen, ein sehr kleiner ist]” (Riemann 1905, 1348/).

In addition, the emerging terms in the psychology of tone in the sixth edition were discussions from cognitive science, such as “Hören” and “Absolutes Ohr.” In his “Ideen zu einer ‘Lehre von den Tonvorstellungen’” in 1916, Riemann devoted pages to the arguments on the absolute ear. In the eighth edition published in the same year, Riemann’s own treatise “Tonhöhenbewusstsein und Intervallurteil” (1912) was listed in the article on “absolute ear,” and a new article on “Tongedächtnis” was set up. To put these facts together, from the 1900s, Riemann became more concerned with the topics of sensation and psychology in listening to music.

¹⁰ To distinguish from the eighth edition of *Musik-Lexikon* published in the same year, references to the “Ideen zu einer ‘Lehre von den Tonvorstellungen’” was provided as “Riemann, 1916, *Ideen*.”

¹¹ It is the concept to distinguish consonance and dissonance not as physical phenomena but psychologically.

Moreover, along with the article “Farbenvorstellungen,” the article “Scheinkonsonant,” which was a concept based on the difference between physical and psychological consonances¹², was created. Subsequently, one can see that the results from related disciplines were assimilated into music theory.

However, “Tanaka, Shohé,” a new article on the physics of tone, was in the fourth edition, where the instrument harmonium based on just intonation was introduced.

Thus far, we have examined the characteristics of both the new and deleted articles. What characteristics can be found in the existing articles?

3. Transition in Descriptions

3.1. Articles that Underwent a Major Change

Along with new and deleted articles, the procedure indicated in Section 1.3, 58 existing articles were excluded. Approximately 45 articles were scrutinized based on the characteristics described in Section 2.2.

3.2. Gradually Prevailing Theory and Representation of Harmony and Revised Historization

The theory and representation of harmony reached a tipping point in the fourth edition (1894), following the publication of *Vereinfachte Harmonielehre* (1893). However, as presumed in the previous section, these changes did not occur simultaneously. The denotation based on harmonic dualism, such as c^+ and 0c ¹³, the representation using functional symbols, such as T, D, and S, and new terms were gradually identified to have a close connection (Table 4).

Table 4. Articles that showed a change in theory and representation of harmony

Article	Alteration
Auflösung [resolution]	Functional symbols were added in the 6th edition.
Chroma [chroma]	Functional symbols were added in the 5th edition, and the name of the article was altered to “Chromatik” in the 7th edition.
Dissonanz [dissonance]	Chord symbols, such as $g7$ in the 4th edition, were replaced with functional symbols in the 5th edition.
Dominante [dominant]	“Oberquintklang [<i>Klang</i> of upper fifth]” and “Unterquintklang [<i>Klang</i> of lower fifth]” were, respectively, replaced with “Dominante” and “Subdominante” in the 5th edition. Riemann insisted his novelty differed from his predecessors, such as Rameau, in that “he takes the initial letter of the three functions (T, D, and S) as sole basis [er die Anfangsbuchstaben der drei Funktionen (T, D, and S) als alleinige Grundlage durchführt]” (Riemann 1916, 254r) in the 8th edition.
Dreiklang [triad]	Chord symbols by Arthur von Oettingen and Riemann., such as c^+ and 0g , had introduced in the 4th edition.
Durtonart [major keys]	T, D, S, Tp, Sp, and Dp were elucidated in the 4th edition. In describing <i>Parallelklänge</i> , the passage, “either as parallel <i>Klänge</i> or as leading tone exchange [entweder als

¹² For example, the transposed C–E–A of a triad A–C–E consists of physically consonant intervals, but it was considered as a dissonant chord.

¹³ c^+ means the major triad C–E–G, while 0c means the minor triad A–C–E.

	Parallelklänge oder als Leittonwechselklänge]” (Riemann 1900, 281l), was added in the 5th edition. The symbol of “Mollsubdominate (⁰ S) [subdominant in minor keys]” (Riemann 1905, 327l) in major keys was added in the 6th edition.
Fétis, François-Joseph [1784–1871]	The passage, “Der moderne Begriff der Tonalität [the modern concept of tonality]” (Riemann 1900, 318l), included until the 5th edition was deleted, and Fétis was evaluated as “in diesem Gebiete [...] nicht eigentlich produktiv [not really productive in the theory of harmony]” (Riemann 1905, 369r) in the 6th edition.
Fundamentalbass [fundamental bass]	The explanation about Rameau was deleted in the 4th edition. Rameau’s fault was pointed out in the 5th edition. It was corrected and replaced with the description that functional symbols were “a further formation useful for the practice of Rameaus’s fundamental bass [eine für die Praxis brauchbare Weiterbildung von Rameaus F.]” (Riemann 1916, 337r) in the 8th edition.
Fünfstufige Tonleitern [five-degree scale]	Functional symbols appeared in the 5th edition and “(pentatonisch) [pentatonic]” was added to the article name in the 6th edition.
Generalbass [thorough bass]	Riemann’s <i>Anleitung zum Generalbass-Spielen</i> (second edition, 1903) was explained as a book equipped with both thorough bass figures and functional symbols in the 7th edition.
Harmonielehre [theory of harmony]	The criticism against Rameau’s fundamental bass was deleted and replaced with the passage in which he proposed the theory leading to <i>Klang</i> and tonality in the 5th edition. The description “that there are only three functions in harmony, [...] and that modulation is nothing more than an exchange of these functions [dass es nur drei Funktionen der Harmonie gibt, [...] und dass Modulation nichts anderes ist als ein Wechsel dieser Funktionen]” (Riemann 1909, 568r) was added in the 7th edition.
Hauptmann, Moritz [1792–1868]	The negative evaluation was reduced in the 3rd edition. The description about the connection between Hauptmann and Oettingen as well as Riemann was deleted, and Hauptmann’s fault was bespoken in the 5th edition. The positive evaluation was added in the 7th edition.
Kadenz [cadence]	Six-four chord was denoted by functional signs in the 4th edition. Progressions of T-D-T, T-S-D-T, and T-S-T were elucidated in the 7th edition.
Klangschlüssel	An explanation of functions was added in the 4th edition.
Modulation [modulation]	The reinterpretation of functions was added in the 5th edition.
Mollakkord [minor chord]	It was insisted that the symbol of minor chords that Oettingen introduced be first used consistently by Riemann in the 3rd edition. The symbols, such as ⁰ e, were supplemented in the 5th edition.
Molltonart [minor key]	Functional symbols were used in the 4th edition.
Neapolitanische Sexte [neapolitan sixth]	It was explained as “the leading tone exchange of the subdominant [Der Leittonwechselklang der Subdominante]” (Riemann 1900, 778r) in the 5th edition.
Nebendreiklänge [secondary triads]	Functional symbols were added in the 4th edition.
Nebenseptimenakkorde [secondary seventh chords]	Functional symbols were added in the 4th edition.
Nebentonarten [secondary keys]	Along with relative and dominant keys, relative keys of dominant and parallel keys of the main key were included in the 7th edition.
Phrygische Tonart [phrygian key]	Functional symbols were added in the 6th edition.
Schlüssel [clef]	Functional symbols were added in the 5th edition.
Septimenakkord [seventh chord]	Riemann’s own definition as “only the seventh chords that attach the upper seventh (of the fundamental tone) to the major chord or attach the lower seventh (of the highest tone) to the minor

	chord [nur die Akkorde S., welche dem Durakkorde die Oberseptime (des Grundtones) oder dem Mollakkord die Unterseptime (des höchsten Tons) beifügen]" (Riemann 1900, 1046r) was added in the 5th edition. Seventh chords on every degree in C major were represented in the 6th edition, which contradicts the definition in the 5th edition. Another definition was provided in the 7th edition.
Stimmführung [voice leading]	<i>Klangschlüssel</i> , such as < and >, were explained in the 5th edition.
Stufe [degree]	Riemann described the following, "since Gottfried Weber [...], the numbers of degrees also form the basis of an analytic denotation of the chord, from which H. Riemann has developed his denotation of function [seit Gottfried Weber [...] bilden auch die Stufenzahlen die Grundlagen einer analytischen Akkordbezeichnung, aus welcher H. Riemann seine Funktionsbezeichnung entwickelt hat]" (Riemann 1909, 1374f), in the 7th edition.
System [system]	Functions were explained in the 4th edition. The explanation that this concept dated back to Rameau was added in the 5th edition. "Oberdominante [upper dominant]" and "Unterdominante [lower dominant]" were, respectively, replaced with "Dominante" and "Subdominante" in the 6th edition.
Tonalität [tonality]	It was defined as "the modern concept of the key extended by Fétis [der moderne durch Fétis erweiterte Begriff der Tonart]" (Riemann 1894, 1080f) in the 4th edition. This was deleted and corrected as a concept proposed by Rameau and named by Fétis in the 5th edition. Additionally, the French "Tonalité" was attached to the article name and the functional concept was explained as a recent theory.

As shown in Table 4, all functional symbols were introduced in the fourth edition. Some symbols first appeared in the fifth and later editions. In the fifth and sixth editions, in place of preceding dualistic terms ("Ober-" and "Unter-"), functional terms, such as "Dominante" and "Subdominante," came to be used.

How about other terms? In the article "Durtonart" in the fourth edition, the functions including *Parallelklänge* were elucidated, while *Leittonwechselklang* was first explained in the fifth edition. "Neapolitanische Sexte" was also reinterpreted by *Leittonwechselklang* in the sixth edition. Given that *Leittonwechselklang* appeared as an article, it has been demonstrably recognized as an authoritative term since the turn of the century. In the prevailing terminology process, cases existed in which a gap in definition was found among editions, such as in "Septimenakkord."

In later editions, in the article "Nebentonarten," its range was extended to the "Variante." This concept became one of the bases of the abovementioned "Verwandtschaftstabelle."

As further characteristics in later years, there was an attempt to historicize the functional concepts, as in "Dominante" in the eighth edition, "Stufe" in the seventh edition, and "System" and "Tonalität" in the fifth edition¹⁴. Especially in the article "Tonalität" in the fifth edition, by placing functional concepts as recently invented, it was suggested that they had never been influenced by Fétis who died in 1871. This revision, when the novelty of Riemann's concepts was emphasized in the article "Funktionen" in the seventh and eighth editions (see Section 2.3) and "Dominante" in the eighth edition, reinforced such novelty. Moreover, since the fifth edition,

¹⁴ Riemann's evaluation on Fétis and Rameau was partly discussed in Section 3.3 in Nishida and Yasukawa (2021); thus, what was not mentioned there is examined here.

the criticism against Rameau was deleted in the article “Harmonielehre”; instead, the linkage to him had been stated. Thus, contradictions arose among editions when Riemann related himself to Rameau in the history of the theory of harmony and simultaneously emphasized the novelty of his own functional concepts.

Various factors underlie the oscillations in his descriptions: He might have been influenced by research trends on Fétis and Rameau within France in the 1900s (Nishida and Yasukawa 2021). By contrast, Riemann had already criticized Fétis and amplified Rameau’s theory of harmony in *Geschichte der Musiktheorie im IX.–XIX. Jahrhundert* in 1898. He argued that “it is probably finally only the *word* [of tonality] that we owe to FÉTIS and *maybe* an extension of the meaning of the concept (including the modulations); however, even this is doubtful [Im Grunde ist es wohl schliesslich nur das *Wort*, was wir FÉTIS verdanken und *vielleicht* eine Erweiterung der Bedeutung des Begriffes (einschliesslich der Modulationen); selbst dies ist aber fraglich]” (Riemann 1899, 451, 456f.). This means that the historicizing descriptions observed in *Musik-Lexikon* since the 1900s became summaries that disseminated the output of studies on the history of theory that Riemann conducted before the turn of the century beyond a country (see also note 9).

3.3. Conjunction with the Fields in Acoustics

Next, the conjunction with the field of acoustics is to be examined. The articles where the descriptions related to psychology and physiology of tone were found were “Hauptmann” and “Klang.” In the former, it had been insisted until the second edition to take not Helmholtz’s physiological method, but the psychological method based on “eine logische Aktivität des Geistes [a logical activity of mind]” (Riemann 1884, 384l). However, this description was deleted in the third edition (1887). In the fifth edition, Stumpf was introduced as a person who showed ideas contrasting Helmholtz’s theory.

Coincidentally, in the article “Klang” in the fifth edition, Stumpf’s *Tonverschmelzung* was explained, although the name Stumpf disappeared in the seventh edition. The reason was discussed in Section 2.4. Additionally, Riemann was skeptical of Stumpf’s method, which presumably influenced this deletion. In fact, in the seventh edition, the term physiology was preferred to psychology, evident in the rewritten title of the article “Tonpsychologie” to “Tonphysiologie (Physiologie der Tonempfindungen) [physiology of tone (physiology of sensations of tone)]” and he stated that “all efforts to give a physiological or psychological foundation to music theory have fallen into water [alle Anstrengungen, eine physiologische oder psychologische Fundamentierung der Musiktheorie zu geben, sind ins Wasser gefallen]” (Riemann 1909, 1433l). Furthermore, Stumpf was criticized in Riemann’s “Ideen zu einer ‘Lehre von den Tonvorstellungen’” (Riemann 1916, *Ideen*, 1–2).

In his “Ideen zu einer ‘Lehre von den Tonvorstellungen’” in 1916, Riemann achieved a turnaround from logical thinking, as seen in his *Handbuch der Harmonielehre* (1887) and *Vereinfachte Harmonielehre* (1893), where he attempted to thoroughly apply musical logic, to harmonic theory, which emphasized psychological thinking (Nishida 2019). However, this psychological thinking in his later days should not be equated entirely with his interest in psychological methods expressed until the second edition. Considering a series of his

abovementioned criticisms against Stumpf in the 1900s¹⁵, one can interpret that Riemann came to express “Ideen zu einer ‘Lehre von den Tonvorstellungen’” as a new method that overcame Stumpf's psychology of tone.

The articles related to the physics of tone are listed in Table 5.

Table 5. Articles that showed a change in physics of tone

Article	Alteration
Akustik [acoustics]	Recent works of literature were added in the 5th edition. Reference to the <i>Tonpsychologie</i> was added in the 6th edition. Works of literature on room acoustics were introduced in the 7th edition. The field was provided as a subsection within the article in the 8th edition.
Chroma [chroma]	In the 3rd edition, it was explained that the difference of comma (interval difference) in just intonation was unnecessary in practice, and the enharmonic interpretation depended on the context. Jankó clavier by Paul von Jankó was introduced in the 4th edition.
Enharmonik [theory of enharmonic]	The description that reinterpretation was impossible in just intonation in the 6th edition. Works by quarter-tones were introduced in the 7th edition.
Harmonium [harmonium]	Works of literature by Shohei Tanaka and Riemann were added, and music on just intonation was evaluated as aesthetically unacceptable in the 4th edition.
Klirröne [clank tones]	In the 2nd edition, the following was added: “still, the editor of this lexicon succeeded in producing even lower undertones [doch gelang es dem Herausgeber dieses Lexikons, die Untertöne noch weiter hinab hervorzubringen]” (Riemann 1884, 467r). The subject in this sentence has been deleted and replaced with “it is certainly successful [es gelingt auch wohl]” (Riemann 1905, 679r) since the 6th edition.
Komma [comma]	The symbol of syntonic comma by Oettingen and others was added in the 7th edition.
Konsonanz [consonance]	The definition by physicists in the 5th edition was introduced. The word “Physiker” was replaced with “physicists and psychologists of tone [Physiker und Tonpsychologen],” and references to <i>Tonpsychologie</i> were given in the 6th edition (Riemann 1905, 697l). It was insisted in the 8th edition that Helmholtz's “Lehre von den Tonempfindungen” should be developed into the “Lehre von den Tonvorstellungen.”
Oettingen	It was added that Oettingen advocated introducing just intonation into practice in the 7th edition.
Reine Stimmung [just intonation]	The attempts to increase the number of keys by temperaments other than equal temperament were referred to, and the same kind of attempts in the 17th century were supplemented in the 7th edition.
Schwebungen [beats]	In the 5th edition, Rameau and Helmholtz explained that dissonance was based on beats, which, however, was proven uncertain.
Temperatur [temperament]	The skepticism against the practicality of the harmonium was shown in the 4th edition.
Tonbestimmung [tone designation]	A table and algebraic denotation by Q (fifth) and T (third) were added in the 4th edition. Additionally, the frequency of vibration was elucidated in the 6th edition.
Untertöne [undertones]	The existence and the audibility of undertones were preached until the 3rd edition. In the 4th edition, it was explained that as the output in <i>Katechismus der Akustik</i> , undertones were inaudible because of the interference of overtones.

Thus, his arguments on the physics of tone are divided into articles on just intonations and new instruments based on them and those on physical phenomena such as beats and temperament.

¹⁵ About Riemann's other criticism against, see Rehding 2003, 52–54, 108–109.

In the first type of articles, such as “Harmonium” and “Temperatur,” his personal view was that he could not accept music based on just intonation aesthetically, and he was skeptical of its practical utility.

Subsequently, it could be assumed that Riemann strongly recognized the distance between physical studies of just intonation and music-theoretical studies on the “interpretation” of tones and harmony. This is clearly seen in the article “Konsonanz” in the eighth edition. Here, the necessity of “Ideen zu einer ‘Lehre von den Tonvorstellungen’” was insisted, though with the provision that “if the acoustics should keep full contact with the theory of music [wenn die Akustik vollen Kontakt mit der Musiklehre erhalten soll]” (Riemann 1916, 576*r*). To paraphrase, Riemann confirmed that acoustics could scarcely contribute to music theory if it remained in physiology and physics.

The second argument relates to harmonic dualism, which is one of the important conjunctures between music theory and the physics of tone, will be discussed in the next section.

3.4. Shift of the Relationship between Harmonic Dualism and Undertones

Riemann published “Die objektive Existenz der Untertöne in der Schallwelle” in 1875 and continued to insist that the undertones be audible in *Musikalische Syntaxis* in 1877. However, in *Katechismus der Akustik* in 1891, he acknowledged that the undertones were not audible and rejected his attempts to derive a minor triad from the undertones in “Das Problem des harmonischen Dualismus” in 1905. How the undertones were described in *Musik-Lexikon* would become an even greater concern in Riemann’s studies because his claim on their audibility aroused criticism¹⁶.

He conceptually discussed harmonic dualism in the articles “arithmetische Teilung,” “Dualismus, harmonischer [dualism, harmonic],” “Moll,” and “Oettingen.”

In the article “arithmetische Teilung,” in the seventh edition, the description was added that Gioseffo Zarlino (1517–90) constructed a “dual foundation of the theory of harmony [duale Fundamentierung der Harmonielehre]” (Riemann 1909, 50*l*) from the contrast between arithmetic and harmonic divisions. This is an attempt to trace the concept of harmonic dualism back to Zarlino.

About “Dualismus, harmonischer,” although only references were provided until the third edition, a specific explanation was added in the fourth edition. However, this description is a general description without individual names. Only since the sixth edition, the advocators have been listed, such as Zarlino, Rameau, Hauptmann, Oettingen, Riemann, and so on, and the terms “Obertöne [overtones]” and “Untertöne” appeared (Riemann 1905, 318*r*). However, in the eighth edition, the terms of overtones and undertones disappeared, and they were replaced with the problem of interpretation: “Dursinn [sense of major]” and “Mollsinn [sense of minor]” (Riemann 1916, 264*r*). Riemann abandoned the derivation of the minor triad from undertones in 1905. Therefore, he could have deleted the relevant terms earlier (sixth edition). In contrast, in the article “Untertöne” in Table 5, the description was altered already in the fourth edition just after the publication of *Catechism of the Acoustics* (Riemann 1894, 1111*l*). Here, the evolution of

¹⁶ For example, see criticism in Ellis (1877) and Schafhäütl (1878). Cf. Hui 2012, Chap.2.

Riemann's own studies is immediately reflected. While, as seen in the article "Klirrtöne," he withdrew his insistence not until the sixth edition. Thus, his attitude toward the undertones was not consistent. Riemann presumably maintained harmonic dualism as a framework for his thinking and interpretation, even if he could not verify the existence of undertones by acoustic experiments.

In the article "Moll" in the seventh edition, it is explained that the major and minor triads are the *Klänge* that consist of tones in the simplest relationships in frequency and sound wave, respectively (Riemann 1909, 933r). This would be a new foundation for dualism, instead of a contrast between overtones and undertones. In the article "Oettingen" in the same edition, the explanation of harmonic dualism was added, where the history of harmonic dualism from Zarlino to Riemann was traced.

4. Conclusion

4.1. *Musik-Lexikon* in Riemann Studies

From the abovementioned investigation, it became clear that Riemann, feeling the gap between constantly advancing studies on temperament and hearing and music-theoretical studies, gradually constructed and reinforced the theory of functional harmony and the history of dualistic harmony. Thus, one can read the minute alterations in the eight editions of *Musik-Lexikon* as an essence of the development of thought in his enormous oeuvre.

On the one hand, discrepancies were observed between the descriptions in his other writings and those in *Musik-Lexikon* (as discussed in Sections 3.2 and 3.4). Even if his concepts were seemingly renewed, one can grasp the process by which his theory advanced and became established with oscillations. On the other hand, before the concepts were proposed in his books and treatises, *Musik-Lexikon* sometimes prepared the necessary concepts and updated their definitions, which could not be read in his main products (as seen in Section 2.3). Furthermore, differences in psychological thinking between the early and later editions were suggested, which could be traced to the descriptions in *Musik-Lexikon* (as seen in Section 3.3).

Such fluctuating shifts represent knowledge that can only be found in lexicons with multiple editions. At this point, *Musik-Lexikon* can become one of the systematic materials to survey the intellectual connections between music theory and other related disciplines.

4.2. Self-historicization of Riemann

Inconsistencies in his attempts to criticize others and historicize himself emerged as his descriptions of Fétis and Rameau concerned twisting the history of the harmonic theory. This inconsistency came to a head not in the description of facts but in their "historicization." These changes may be considered inevitable results reflecting the research outputs in each phase. However, alongside it, considering that this lexicon had already been disseminated outside Germany through multi-language editions during his lifetime (see note 4), one should feature the role of *Musik-Lexikon* as the "essential tool of Riemann's 'propaganda'" (Holtmeier 2011, 4). This nature of *Musik-Lexikon* would partly encourage Riemann to correct the history through later editions to position his theory of functional harmony, which systematized the logic of

harmony into a bigger history over countries (see Section 3.2).

Finally, Riemann seems to arrive at the more fundamental, methodological skepticism that a music theory could not be grounded by the contemporary physiological, psychological, and physical methods through his explanations and criticisms of concepts in related disciplines, such as “Tonverschmelzung” and “Reine Stimmung.” Notably, from them, the new method of “Ideen zu einer ‘Lehre von den Tonvorstellungen’” was proposed in the eighth edition (as shown in Section 3.3) as an action to self-historicize Riemann. To shift one’s perspective, Riemann’s ability to develop methodological arguments with related disciplines could be attributed to his environment, in which he was continuously engaged in editing the multi-disciplinary lexicon. Considering everything, constructing the history of the harmonic theory and editing articles in the lexicon formed the background of the new methodology in his later period, as if they were interconnected.

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