IDEAS FOR A STUDY "ON THE IMAGINATION OF TONE"

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I.
Tones, Their Sensation and Conception

A guiding principle that extends throughout my music-theoretic and music-aesthetic work from the time of my dissertation (*Musikalische Logik,* Leipzig, C. F. Kahnt, 1873)[1] is that music listening is not merely a passive processing of sound effects in the ear but, on the contrary, a highly developed manifestation of the logical functions of the human intellect. Without being absolutely clear myself of that which I really sought and to which I aspired, I have gradually developed a kind of musical grammar in my new system of notation for harmony ("Skizze einer neuen Methode der Harmonielehre," [Leipzig] 1880) in its various stages of development up to the formulation of the "Lehre von den tonalen Funktionen der Harmonie" ("Vereinfachte Harmonielehre," 1893), and likewise in the labelling of rhythmic elements in music (phrase markings) from the very first articles to raise the question in "Musikalisches Wochenblatt" (1882)[2] up to the formulation of a "System der musikalischen Rhythmik und Metrik" (1904).[3] In the harmonic concepts tonic, dominant, subdominant, and the rhythmic concepts "heavy and light beats," "heavy and light measures," "antecedent, consequent," etc., this grammar points to the

elements over which musical logic governs, and teaches their manipulation in order to build musical phrases in the same way that a spoken grammar does with the concepts "subject," "predicate," etc. In retrospect, I do not consider it an error that I have not chosen the path "from bottom to top," the "inductive method," but rather the path from top to bottom, the "deductive method"—that is, that I have consciously placed myself in the position of contemporary artistic practice, taking full advantage of its resources, and have sought to find and to comprehend these elements from its point of view. The immense difficulties against which the opposing method strives have been set forth clearly enough in the work of Carl Stumpf, whose *Tonpsychologie* (Volume 1–2, 1883–1890 [Leipzig]) awakened the boldest hopes of a satisfactory solution to the problem of hearing music through surmounting the deficiencies in Helmholtz's "Lehre von den Tonempfindungen" ([Brunswick] 1863). All too soon, however, it brought disappointment, since the author himself abandoned the work's continuation and became bogged down in the detail-work of preliminary tone-psychological investigations of intervals. The hope that Stumpf would transport the foundation of music theory from a physiological to a psychological domain has not been fulfilled, and music listening still appears as a physical process in Stumpf, even more so than in Helmholtz. The "logical activity" of musical hearing, which I had postulated already in 1873, plays no role in his work.

I too have only very slowly reached an understanding of the reasons why the obstacles created by useless findings in physical and physiological investigations of sounding phenomena have been almost insurmountable in moving toward aesthetic observations on the structure of living music. Traces of budding knowledge can be found in my article "Spontane Phantasietätigkeit und verstandmässige Arbeit in der tonkünsterlischen Produktion" in the 1909 *Jahrbuch der Musikbibliothek Peters* [Leipzig, pp. 33–46] and in the third volume of my "Kompositionslehre" (1913).[4] To put it briefly and without digression: my intensive preoccupation with "late Beethoven" while revising Thayer's five-volume Beethoven biography[5] first opened my eyes completely and even allowed me to formulate a statement that the hearer of my lectures might have received at first with some astonishment: *the "Alpha and Omega" of musical artistry is not found in the actual, sounding music, but rather exists in the mental image of musical relationships that occurs in the creative artist's imagination—a mental image that lives before it is transformed into notation and re-emerges in the imagination of the hearer. The process of notating an artistic creation as well as the sounding performance of the work are merely expedients to transplant musical experiences from the composer's imagination into the imagination of the musical listener.* If one has

grasped these fundamental ideas, then it is clear that *the inductive method of tone-physiology and tone-psychology is headed in the wrong direction from the very beginning when it takes as its point of departure the investigation of the elements of sounding music, instead of the examination of the elements of music as it is imagined.* In other words: *neither acoustics, nor tone-physiology nor tone-psychology can give the key to the innermost essence of music, but rather only a "Theory of Tonal Imagination"—a theory which, to be sure, has yet to be postulated, much less developed and completed.*

In all fairness, I should not be expected to present a well-articulated structure for this new discipline all at once. For the time being, it is only a matter of the very first emphatic assertion of the postulate. It is clear, however, that it is truly a "theory of tonal imagination" to which Helmholtz aspired and that Stumpf seemed to achieve with his tone-psychology. That my own theoretical works up until now were nothing other than building blocks, contributions toward the creation of such a theory, is not doubtful to me in the least. Meanwhile, there is certainly much to be done in the new field, and the theory's completion will probably have to occupy musical scholarship for a long time. Even the definition of the concept and the question of its necessity await, for many, first proofs and interpretation. Therefore it must be my initial task to state, for the first time, *what a significant role the imagination of tones and of tonal motion plays—a role it has played, and will continue to play, in music-making for all time.*

Just as a painter, in advance, gazes inwardly upon a picture that he wishes to paint, so does a composer hear inwardly and in advance all that he notates afterwards. I refer to my article in the 1909 yearbook, which endeavors to elicit the correct understanding of Beethoven's "sketchbooks" and to bring to consciousness their sense and meaning, which is that a work may well have a latent existence for years in the imagination of the artist and can grow and evolve before it receives its definitive formulation and final version by being written down. Every musical composition that even the non-composing musician knows by heart and is capable of reproducing in his memory at any time has an analogous existence in his imagination. It must be admitted that these images can be of quite different intensity in [different] musical imaginations. This at least is certain, that in the case of *intensive musical temperaments, all the attributes of actually sounding music obtain,* including the most subtle distinctions of timbre and also the strongest dynamic effects. Best-known and familiar even to non-musicians are the agonies that any popular song can cause by persistent reappearance in the memory. It is not entirely superfluous to note that each singer or player who reproduces a musical composition from the

notated music, or from memory, imagines each tone first before bringing it forth, and that the distress over an error in intonation or wrong note is explained chiefly through the conflict of the sounding note against the expected (imagined) one. That we are able to recognize and find fault with incorrect intonation in a work heard for the first time, which until then has been unknown to us, demands a somewhat more involved explanation. Here it is a matter of progressions of notes that strike us as illogical, unnatural or impossible—that is, once again, contradictions between something expected and something offered in its place, between what is imagined and what is actually heard.

Without a doubt, musical training, comprehensive knowledge of the literature, and practice are able to increase and develop considerably this capacity to hasten forward with the imagination, ahead of the actual sounding notes. The difficulty in understanding a more complexly worked-out modern composition on first hearing results, to be sure, from the fact that to a high degree it is necessary to grasp the entire course of the work through apperception of the individual sounding tones. The *reading along with the score of a work as it is heard for the first time,* which the unknowledgeable dismiss with a shrug of the shoulders, is not a mere crutch for the understanding. This activity enables the trained musician, at least, to bring the music that follows to life ahead of time in his imagination, from the notation, so that the individual apperception of the sounding notes is unnecessary; rather, the individual notes are grouped into living structures that are united with what has gone before. It is an open question, however, whether all of those who sit in concerts with the score really have the capacity to draw the anticipated benefit therefrom—that is, whether many do not feign a degree of classical education, one which they in no way actually possess.

Anyone who has ever turned pages for a performing artist knows that his eyes are always a long way ahead of the immediately sounding notes, so that he is continuously reading and imagining something different and beyond while performing that which came before. It is one of the great wonders of human capacity that this is at all possible. What is more, doing so will in no way encroach upon the performer's capability to control the immediately-sounding notes with regard to their correctness. Likewise, he who reads along with a score at a concert is always some distance ahead with his eyes, bringing to life musical structures that will only follow later those that are sounding at the time. The expression "*reading along*" is absolutely false; it is much more a matter of a continuous "*reading ahead.*"

That our *music pedagogy* will be capable of making a highly meaningful step forward through conscious inclusion of the *musical imagination in schooling* by means of rational, methodical *training of the*

tonal-imaginative faculties is a certainty. This training will result in an entirely new instruction, especially for the elementary teaching of singing, because relevant exercises are nothing other than training in the most precise imagining of the individual intonations. The first preliminary question for the establishment of the theory must therefore be: *What do we really imagine?* What are the discernible features that an imagined note has in common with an actual sounding one, if it is imagined correctly?

Of course, everything will depend upon our keeping firmly in mind the guiding principle that distinguishes the aspiring new theory—that is, that from the very start and from then on we investigate the *active imagination,* the *images of tone,* and that we seek to ascertain which *categories of thought* guide and determine the *living, working musical imagination,* and which categories impose rules upon it.

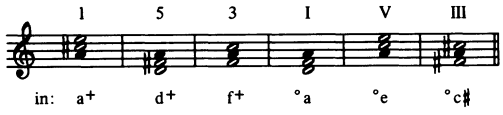
The first object for our consideration is obviously not the artistically uninteresting individual note of any single musical instrument, but rather the *note as a component of a musical work of art.* It is quickly discernible that the individual note's characteristics, in whatever musical context, are by no means exhausted by determination of the note's *absolute pitch height.* On the contrary, these features occasion an entire set of diverse categories for the individual note, each with its own specific definition.

At one time, I was opposed to Dr. Géza Révész*[6] (*Zeitschrift der International Musikgesellschaft* XIII, 8 and XIV, 5 and 6) when he proposed a double definition for the designation of pitch height and advanced the concept of "harmonic relatability" as something separate from absolute pitch height.[7] Today I see that I misunderstood Dr. Révész, although not entirely through my own fault since it did not emerge from his explanation that he was thinking of something other than actual sounding notes. But if one proceeds from the perspective of the mental image of sound, then Dr. Révész's hypothesis suddenly seems entirely different. To be sure, I do not need to take back anything from all that I have written against Révész; but I am pleased that, through a modification of the point of view, I believe I have come to an understanding of that which he posited—what Révész had in mind, even if it was not stated clearly enough. Révész's assertations are good and correct, as soon as one transfers them into the sphere of the musical imagination. Essentially, the *harmonic relatedness* (not

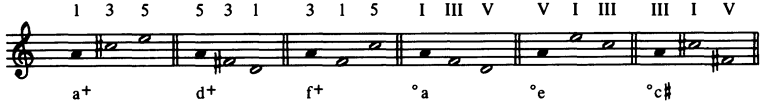
*G. Révész, "Nachweisung dass in der sogenannten Tonhöhe zwei von einander unabhängige Eigenschaften zu unterscheiden sind" ["Demonstration that two characteristics that are independent of one another are to be distinguished in the so-called pitch height"], (*Nachrichten der Göttinger Gesellschaft der Wissenschaften, mathematisch-physikalische Klasse* 1912).

"relatability")—the *representation of a tonal complex* [*Klang-vertretung*]—is a principal distinguishing feature of each *concrete, musically-heard* note. According to whether a note is imagined as 1, 3, or 5 of a major chord or as I, III or V of a minor chord, it is something essentially different and has an entirely different expressive value, character and content. For the expressive value, character, and content of the harmony that it represents associates it with an aesthetic value. If, for now, we ignore the meaning that a note can have as a dissonant addition to a harmony, which disturbs its consonance, the six-fold possibility for the representation of the tone "a" is as shown in Example 1.

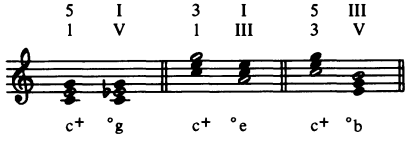
One of the first, most basic exercises of the faculties of musical imagination would have to be *to imagine specifically each individual note in its six possibilities for the representation of a tonal complex.* This exercise can be undertaken methodically such that from a given chord (major or minor) the student will extract and intone the 1, 3, 5 (I, III, V), or even (which is considerably more difficult) such that a single assigned note will be filled out into a triad by the student by adding the two other notes (see Example 2). If a certain fluency and sureness are achieved in this realization of a complete harmony, then, no doubt, this will also guarantee the capability of appreciating the individual note precisely in each of the six aesthetic meanings. The question whether an *isolated* tone, for example at the beginning of a composition, will be appreciated as a truly individual note (without harmonic meaning as representative of a tonal complex) cannot readily be answered with "yes" or "no" without more information. So long as the composition in question is completely unknown to the listener, some doubt as to how he is to interpret the tone must be admitted as a possibility. However, the key signature and knowledge of the key of the piece in general already remove this uncertainty to a great extent, and perhaps also the inclination to understand the note as root of a major chord, where all other clues are missing. Even a tone that occurs in the middle of a piece, if it is strongly foreign to the preceding harmony, can effect a kind of riddle, the solution to which is found only in the continuation (Ph.E. Bach, Haydn, Mozart and Beethoven have often achieved particularly fascinating results with such musical riddles). In such cases one is able, with good reason, to regard the multiple relatability of the individual note at the moment of its entrance as a complex formation related to dissonance, the striking impression of which, of course, decreases strongly on closer acquaintance with the work. Simultaneities of two tones (intervals) also have yet another, although more limited, polyvalence [*Mehrdeutbarkeit*]—first of all, as a (consonant) *dual-representation from the same harmony* (only two possibilities for each interval) as shown in Example 3,



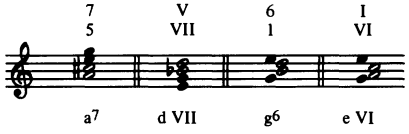
Example 1



Example 2



Example 3



Example 4

but furthermore also as shown in Example 4, and under certain circumstances, an essentially more complex [polyvalence] through conflict with the preceding harmony; for example, the interval e to g, after c♯ minor or E♭ major. Of this there is no doubt: each uncertainty over the meaning of an interval, in the sense of its representation of the tonal complex, appears to us as a *negative* characteristic of such a structure, which we struggle to overcome in order to gain complete clarity. In other words: today we hear individual notes and intervals always as representatives of triads (major or minor chords) according to the available possibilities; *the harmonic meaning* of the individual

note in concrete individual cases is, to us, positively one of its *most essential characteristics.* Let attention be drawn here to the definite inclination of the interpreting mind to find its way easily through the confusion of endless possibilities of tonal combinations (in melody and harmony) by means of *preferring simple relationships over more complicated ones.* This *Principle of the Greatest Possible Economy for the Musical Imagination* moves directly toward the rejection of more complicated structures, where other possible meanings suggest themselves that weigh less heavily on the powers of interpretation (even though this conflicts strongly with actual intonations).[8]

A truly blatant example, to begin with, may bring to light the extent to which this economy of imagination works. The same example places us at once in the midst of the conflicts with natural musical feeling to which pure tone-psychological investigations can lead. [Let us assume that] one were to play on a purely-tuned harmonium the following four-voiced composition in completely pure harmonies:* No

*The annotated functions analyze the harmonies here without the errors in intonation; that is, as though they were to be labelled in C Major throughout, without the fatal stumblings toward D♭ Major and B Major. The individual functional symbols are also correct for the false intonations; it is just that, for example, the S (Subdominant) of the third chord does not apply to C Major, but rather to D♭ Major. Unfortunately, the author must acknowledge that the possibility of accounting, with functional designation, for the relationships of even those harmonies that are remote from the tonic has seduced intelligent musicians, many times working according to the author's methods, into viewing whatever can be analyzed as understandable. Even the frightful eight-bar example above still would be analyzable in C Major, namely as:

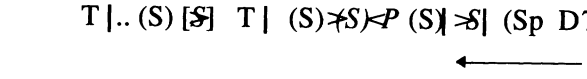
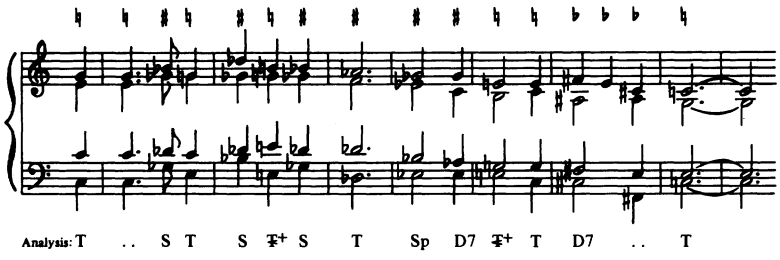


Figure 1

I certainly do not need to assert that it has never occurred to me to explain harmonic nonsense of that kind as possible in any way. A comparison of the two analyses reveals better how logic prevails here only so long as the same symbol is repeated in the superimposed sharp, flat, or natural. The functional symbols appearing in square brackets [S], [D] show clearly that an implied modulation has not been made by means of the preceding chord, and reveal the half-tone lurches of the tonality. The student of my *Harmonielehre* is no doubt aware that all of the preceding individual chord progressions are indeed possible without error. The absurdity lies only in the accumulation of these far-fetched imbroglios. Without the



Example 5

German listener will be in doubt for even a single moment as to what these eight measures should represent, because the rhythm and the linear direction of the melody in the upper voice is so familiar to him that he recognizes it in spite of the horrible dislocations through false intonations.[9] All chords with a sharp written above are a half step too high, [and] all with a flat marked are played a half step too low in relation to those marked with a natural, in whose sense the entire melody will be heard. Since all four voices make the same error at the same time, the individual chords are in themselves pure and it is therefore possible from the example to establish the *limits of the power of just intonation* over the musical imagination. On a 53-note harmonium, like those that have been constructed for the acoustical investigations of Bosanquet, Helmholtz, Tanaka, Öttingen and others,[10] it is easy to play these eight bars such that the chords with naturals written above them represent a pure C Major, those which are too high

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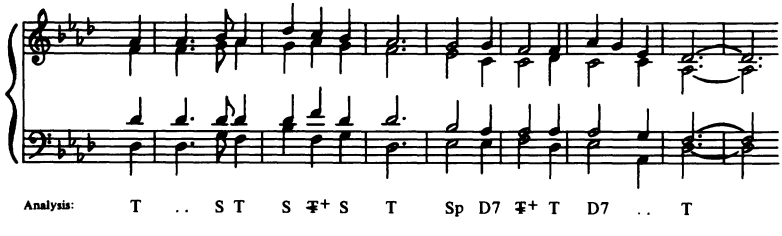
shifts, the example would appear entirely in D♭ Major (in agreement with the functional analysis) as:

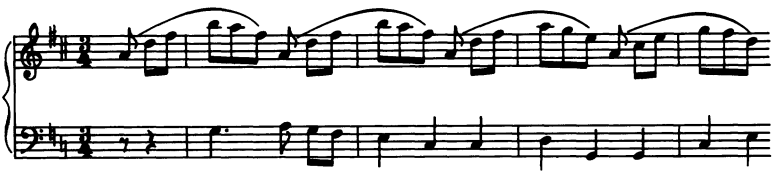


Example 6

(with sharps) a pure D♭ Major, and those too low (with flats) a pure B Major. But no power on earth can force the healthy musician to hear something other than a repeated *shifting of the pitch* (wherever a superimposed sharp, flat or natural occurs), and thus a series of bothersome intonational errors. He who does not know the folk tune will understandably not recognize it, but even for him the entire piece remains a senseless hodge-podge of chords that sound beautiful individually. Even an a cappella choir with the most solid sense of pitch will prove themselves unable to perform the intonations that the mechanical instrument produces here. And yet the movements of the individual voice parts that result [from these chordal successions] do not transcend that which one can demand of a musical singer today. The impossibility of the performance lies purely and simply in the fact that the [correct] consequences are not drawn from the complicated voice motions, consequences which alone can motivate these motions and make them intelligible.

A second illustrative example is the contrapuntal pairing of the Freischütz Waltz in D Major with the song "Lieber Augustin" in C Major. I remember with great amusement that, as a young student, Max Reger was able to play glibly through this combination at the piano without stopping (see Example 7). The wit in this case lies in this: the musician recognizes immediately that with the selection of the same key for both melodies, the combination is to a certain extent possible because of the conformity of the [harmonic] functions. Thus, the single, grotesque error is the playing of one of the two voices continually a whole tone too high or too low vis-à-vis the other. In the case of both examples, an energetic protest of the perceiving tonal imagination results—a protest against the individual intonations, which it rejects without hesitation. Other cases that will occupy us later differ from these two in that the error is so small that the imagination essentially ignores it. But the two examples will not be without use, for they show us that our musical imagination does not allow itself to be thrown around aimlessly through superficial tonal attractions but, on the contrary, has its own will, which it enforces continually and everywhere in the sense of a *centralization, a simplification of tonal relations.*

Therefore, we can now connect our further investigations with the question: how far does our tonal imagination allow itself to travel, through sounding music or through notation, away from the central regions of the simplest mental images of music, the fundamental scales of C Major and A minor? Is it a deficiency or an arbitrary limitation when our notation stops with the doubly sharped and doubly flattened notes of the fundamental scale? And what is the status, then, of such matters as the Pythagorean comma, the syntonic comma and other



Example 7

similar [and] important phenomena of acoustic theory? What does our musical imagination know of these? In short, what do we actually imagine?

It is certain that we do not imagine likenesses of notes, piano keys, fingerings, motions of the larynx, or even numerical designations; nor do we combine these and compare them. These are all things that play a role in musical pedagogy or the scholarly discussion of musical relations, but they do not reveal the essence of the mental conception of music, even though they must be recognized as attempts to come closer to it. They are merely the results of investigations into those things that mediate between the productive and reproductive mental states of music. While constantly taking care that I have not underestimated the aesthetic value of real, existing sound, I point out nevertheless that an effective melody or an exceptional harmonic effect will be altered in its essence neither through transposition to an entirely different key, nor through its performance on an entirely different instrument. One need think only of the common, standard orchestra- and quartet-arrangements of piano pieces, or of the transformation of harmonically-rich instrumental works into vocal pieces, and the countless piano arrangements (earlier, in particular, the lute- and organ-arrangements) of vocal works of all types (motets, madrigals, chansons). Undoubtedly, all such disguises (evincing, to an extent, a very strong alteration of sound) originate in the conviction that the essential core, the main point, remains preserved in them—namely, the essential musicality, the harmonic, rhythmic, and melodic events. The high aesthetic value of string quartet music rests, in undisputed measure, on the renunciation of the course dynamic effects and the contrasting timbres of the orchestra in favor of the refinement of design and the enrichment of melodic and harmonic details. Conversely, the threat to our good taste that lies in military music and also in music of the modern opera orchestra rests on the diversion of interest from the inward and intimate to the superficial and voluptuous.

II.
Pitch Level and Absolute Hearing

The ultimate elements of the tonal imagination are single tones—not only single tones of varying frequency (melodic), but also those of varying volume (dynamic), varying duration (rhythmic) and varying weight (metric). For the mental image of tones, the conscious realization of the distinctions of single tones in each of these areas implies the emergence of more complicated formations. Here, in place of single tones, tonal successions enter, and notions of *tonal motion* come into being. From a chain of isolated single facts, the tones become a connected *musical event* and the understanding [of that event], as a consequence of the expressive values that are tied to tone qualities, becomes a *psychic experience.* Every musical work of art is such a psychic experience—not only in its origin in the productive imagination of the composer, but likewise in the receiving and reproductive imagination of the hearer. The high ethical worth of music lies therein, that it enables the receiving hearer to experience again what the heaven-inspired artist experienced before. Of course, the degree of strength of this "experiencing again" depends on the capacity to follow the artist's succession of ideas—a capacity that assumes talent, but that can be developed considerably through serious study. Thus it is true that the ear may be educated and that music may be taught and learned. However, with regard to the most expedient and effective directions that musical pedagogy must pursue, varying opinions are possible; indeed, the present work is intended to point out a new direction that differs from those previously-known and available, less in its ancillary doctrines than in its total aim, its point of departure and final goal. One would be inclined, not without justification, to assign this direction to the literature of musical aesthetics.* However, its strong contact with the musical practice of composition as well as performance (reproduction) classifies it as music theory in the narrower sense—indeed, as a new branch of the *speculative theory of music,* which one also calls *philosophy of music.* If perhaps this [approach] is most strongly in opposition to the new field of *tone psychology,* the explanation is to be sought in its close relationship to that discipline [and] in the prevalence of materials common to these investigations, which naturally tends to bring all divergences in detail immediately to the

*Perhaps [it is] precisely musical aesthetics [that] will receive a powerful impulse through the setting up of the new nomenclature and the new manner of observation of musical events. An effect on the aesthetic theory of other arts is certainly not excluded, since in all cases the origin and final judgment is doubtlessly in the imagination.

fore. If, more than any other formulation of speculative music theory, the theory of tonal imagination undertakes to explain just how listening to music can represent a psychic experience, then the way in which the theory must proceed is prescribed: that is, it is a question first of all of *where the roots of the psychic values of the elements of music* (melody, harmony, rhythm, meter) *may be found.*

Here we encounter first of all the diversity of *aesthetic valuation of pitch level.* Aesthetics has long known that "high" and "low" are actually transferals of the designation of spatial perceptions to a completely heterogenous domain; however, the dissemination of this transferal among all people of the earth certainly demonstrates a justification for its use. Besides high and low, *light* and *dark,* pointed (sharp) and broad (dull, heavy) are in use for the same qualitative distinction (*oxys—barys,*[11] *aigu—grave, fein—grob*). All of these designations are certainly understandable when one considers that the vibrating body, which emits the various tones, presents smaller dimensions the higher the tones it produces [become], and larger dimensions the lower the corresponding tones are. The old German name *grob* [literally, crude or uncouth] for low brings this out very beautifully (for example, in "*grobgedakt,*" which is retained to the present day in organ study). The heavy mass of the vibrating body's lower tones is drawn to the ground, [while] the diminutive dimensions of the vibrating body's higher tones appear light as a feather, floating weightlessly above.

At this point it becomes understandable why tonal motion is valued as an *upward and downward motion* in space and, at the same time, as an *alteration in strength of light.* Higher is at once brighter, lower at once darker. In this fashion, the hearing of changes in pitch level is transformed into a vision of changes in location, and we already have a presentiment of the *ultimate identification of the essence of visual and aural imagination.* However, we still lack a complete explanation because tonal motions also have a definite *value for our well-being and suffering* and because we experience them like happiness and grief, joy and pain. But here again, the key lies near enough in that musical instrument given to us by nature, the human voice. If at first we ignore its artistic use in songs, it is easy to observe in the speaking voice that rising pitch motion is connected to more lively excitement, and descending pitch motion is a sign of calming. Thus one can even say that as a consequence of a single tone's position in tonal space, a particular aesthetic value is already appropriate to it—a value of pleasant or unpleasant sensation, of joy or suffering, which is determined by its distance from the limits of rising and falling tension. Our notation yields the possibility of a clear determination of this aesthetic value through the position on the staff that it assigns to the particular pitch-level.

The notational symbol for the single tone is so familiar to the musician that it calls forth in the imagination with greater or lesser exactness the idea of the tone in question. For musicians with a pronounced so-called "*absolute pitch*" or "*absolute hearing,*" the single note is bound directly with the very definite and exact idea of the particular pitch level. We can add that the *imagination of pitch level* can also be associated with the *imagination of tone color,* for example, in the reading of a score that indicates the disposition of the individual instruments. Even loudness and other details of special production (harmonics, pizzicato of string instruments, staccato, etc.) go directly from notational indication to the musical imagination and form integrated components of the mental image, just as they were components of the mental image of the composer before the writing-down of the notational symbols.

However, we shall consider first the imagination of pitch level itself and attempt to understand clearly what meaning it has for the degree of strength of the experience of tonal motion, whether the listener is gifted with "absolute pitch" or not.

A large number of specialized studies by excellent researchers have dealt with the problem of absolute pitch, of which those by Otto Abraham *(Sammelb. d. Internat. Musikgesellschaft III and VIII),* Felix Auerbach (same, VIII) and Hugo Leichtentritt (*Voss. Zeitung* 4. April 1915) may be singled out in particular.[12] These works are based first of all on the important fact that *the possession of absolute hearing in no way* offers a guarantee of substantial musical talent. Although a pronounced sense of pitch level must be considered an auspicious precondition for a musician (just as a pronounced sense of color is for the painter), there are nevertheless not a few known cases of extraordinary musicians (Schumann, Wagner) who did not possess absolute hearing, and, on the other hand, musicians who enjoyed its possession in most pronounced fashion, but who have proved themselves to be nothing short of impervious to higher musical culture.

Now, in what consists the essence of absolute hearing? Generally, it is said that with the sounding of a particular tone those who possess this quality declare without reflection which tone it is; that is, they know its note name—for example, F2. To this the objection may first be made that F2 does not have an inevitable and fixed absolute pitch level—that at the time of Bach and Händel, for example, the standard of tuning was a whole tone higher than today, and therefore, our F2 was called E♭2.[13] Consequently, one who is gifted with absolute hearing will always give his judgments and designations according to a level of tuning to which he is used. I remember, at the entrance test for the Wiesbaden Conservatory, a gifted eight-year-old child from Biebrich, who declared abruptly, as he was played a tone from an old

Erard grand piano that was tuned considerably sharp: "There is no such tone!" For this deviant intonation, he had no pigeonhole into which to place this tone, despite his otherwise amazing tonal memory.

Certainly, absolute hearing is not circumscribed completely and correctly when one says that it is a strong bond between pitch level and notation. More correctly, it would have to be said that for one gifted with absolute hearing the value of expression that is appropriate to a tone on account of its height is extremely definite qualitatively. The note name and notational sign represent only a conventional symbol, which in no way has to coincide completely with this value. The absolute frequency number or the designation of wavelength[14] would be able to indicate the single tone and at the same time formulate the value which the tone possesses for absolute pitch-level consciousness more exactly than the note, whose sense and meaning changes according to the standard of tuning. A tone of 430 vibrations per second is, with respect to its tonal effect, as definite as is possible in notation; whether it is to be written or named as A or A♭ depends on habituation to a particular standard of tuning. This, however, does not change the tone's essence. Most important to absolute hearing—what it recognizes—is merely the consciousness of the quality of a tone that we could call its "size" or "mass," which is dependent on its frequency or wavelength. The note or name by which it is designated is, on the other hand, not fixed and varies according to place and time.

It is even possible that the possession of "absolute hearing" may lead to the most embarrassing conflicts in practical musical performance—for example, in places where it is necessary to perform a piece transposed. All of the wonderful methods for making transposition easier are useless when "absolute hearing" stands in the way. A musician who possesses absolute pitch in a pronounced fashion endures tortures when he continually has to produce tones other than those that he reads and therefore imagines and expects from the notation.

Profound skepticism is in order when the possessor of absolute hearing maintains that he can definitely distinguish enharmonically-coincident tones, like F♯ and G♭. For the differences in naming tones as flats or sharps have nothing to do with absolute pitch level but merely result from the internal construction of our tonal system and notation. Consequently, in all cases of such alleged refined designations, an introduction of the theoretical concepts of harmony into the area of absolute hearing takes place—a mixture of ideas that is certainly understandable and difficult to avoid but that, instead of simplifying recognition of the essence of absolute hearing, rather makes it more difficult. To qualify an F♯ or a G♭ chord—which are identical in our tempered system—as the one or the other is purely a matter of

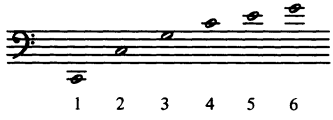
mental interpretation and not dependent on varying intonation. Certainly, F♯ major and G♭ major are two different mental images that differ essentially from one another and that with no further information, may not be confused or equated. However, only notation and harmonic logic (which leads to one or the other notation in the most various ways) guarantee their difference.

Thus, the aesthetic value of absolute pitch level and simple pitch-level motion (melody) rests merely on the rising and falling of pitch level and their exciting and calming effect. It may be indicated further that the realization of ascents and descents in concrete cases leads, for every melodic formation, to the recognition of a middle *level,* which forms the point of "indifference" for ascents and descents. This middle level may mark the beginning of a piece, although it does not have to; rather, it is also possible that a strong rising motion over this level or a marked downward motion under it forms the beginning, and the level only becomes prominent in the further course of the development. I also point out the important distinction of whether a soprano, alto, tenor or bass sings a melody, or whether a flute or a bassoon, a violin or a contrabass plays it. Since the given middle level already has an absolute high or low value, the notion of pitch level is split into two partial notions: that of *absolute* and that of *relative pitch level.* Fresh evidence of expressive values for our psychic sensation is unnecessary in this regard. We can only establish generally that the up and down of tonal motion can play itself out in strongly different *regions of tonal activity*—in the light upper reaches, in the darker depths, or in the middle level. For larger sections of more extended works one can therefore speak also of the raising or lowering of the middle level, which, as such, alters the total state of our musical experience.

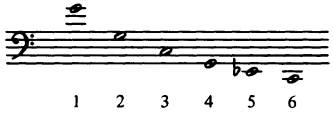
Thus, as a result of the valuation of pitch-level motion as alternating rising and falling, striving and renunciation, will and resignation, a psychic experience emerges comparable to an ascent into the lighter regions and a descent into the darker, like the flight of the bird in the air or the swimming of the fish in water—not as something viewed, but as something actually experienced. The imagining of these motions is a true participation with the Will; the soul, the living human spirit, carries out these motions itself and through them rejoices in its existence and its efficacy. If the tonal domain, within which tonal motions are completed, appears to us as a wonderland in which the restless wandering of the soul is an inexhaustible source of aesthetic joy, this will be the case to a much greater extent when we become aware of the infinite possibilities for harmonic relationships of single tones, an awareness that makes the inner articulation of the tonal domain comprehensible to the mind that marvels at it.

III.
The Representation of Tonal Complexes

If the distinctions of pitch level were only one-dimensional, [and] if they were exhausted with the establishment of greater or lesser height—that is, greater or lesser speed of frequency, or greater or lesser wavelength—then from the lowest point rising to the highest point, or the highest point falling to the lowest point, the tones would appear ever more foreign to one another the farther apart they were, or ever more similar the closer they were. But that is certainly not the case. The theoretical view of tonal relationships has long ago led to the knowledge that besides the *differences in frequency and wavelength,* which can yield only a very large number of single intonations lying next to one another, the *commensurability of these same designations* collapses single tones into groups and brings closer together single tones that lie far apart with respect to pitch height. In a similar manner, the starry heaven with its countless single worlds arranges itself for the astronomer into a number of systems, of which one of many is our solar system. While it is beyond me to carry this comparison further, it is important to remember nevertheless that the ancient Greeks, and before them the Egyptians, compared the construction of the scale to the solar system in all earnestness. It is to them that we owe the knowledge that the essence of consonance and of the fusability of two tones to a higher unity rests on the commensurability of their designations [*Verlaufsbedingungen*]—that is, on the simplest numerical relationships that correspond to their wavelengths or frequencies. The late Middle Ages had already progressed from the notion of intervallic consonance to chordal consonance, and our age has found in the concept *representation of tonal complexes* the magic word that gives the key to the solution of the final riddle of tonal relations. Scotus Erigena (died, 880)[15] already progressed from the *Quaternarius numerus* of the Pythagoreans to the *Senarius numerus,* and saw in the numbers 1–6 the solution to the riddle of the nature of harmony (*De divisione naturae,* ed. Schlüter, p. 533).[16] Gioseffo Zarlino (1558) finally discovered the wonder of the contrast between major and minor harmony through the opposition of two forms of the senarius as Divisio arithmetica and Divisio harmonica: 1:2:3:4:5:6 and $\frac{1}{1:2:3:4:5:6}$. Thus he learned that the simplest numerical relations 1–6, with regard to frequency, describe the essence of consonance of the major triad, and that the same relations, with regard to wavelength, describe the essence of the minor consonance.[17] To the numerical relationships 1:2, 2:3, 3:4, 4:5, and 5:6 correspond the intervals of the octave, fifth, fourth, major third and minor third; that is, in ascent (frequency),



Example 8



Example 9

the components of the major triad (see Example 8) and in descent (wavelength) those of the minor harmony (see Example 9). The *Messeltheorie* of the Arabs in the fourteenth century extended the series of numbers to twelve in order to prove the consonance of the sixth (compare my *Studien zur Geschichte der Notenschrift* [Leipzig, 1878], p. 77–85).[18]

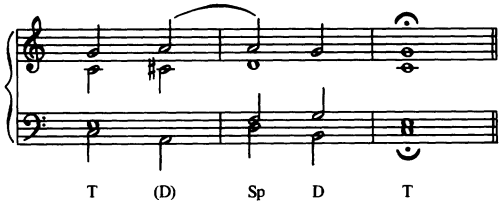
Through this discovery of the alliance of tones and harmonies, as whose *representatives* the tones are understood and perceived, the definition of the single tones is made much richer. However, the system as a whole is not made more complicated thereby, but simpler and more lucid. Through the equivalence, or at least the more intimate relationship, of *tones* that *stand in octave relation,* the number of tones belonging to a single harmony is reduced to three altogether: the *prime* (and its octaves = 1:2:4:8:16, etc.), the *fifth* (and its octaves = 3:6:12, etc.), and the *third* (and its octaves = 5:10:20, etc.), above as well as below.

The single tones of our notational system acquire manifold meanings, each according to the extent to which they may be understood as arising from a central tone (prime or tonic) through motions by fifth, third, or a combination of both. For example, E [may be understood] as the fourth fifth of C (C:G:D:A:E) or directly as third of C; the first is $\frac{1}{10}$ of a whole-tone higher than the last, at least according to acoustical numerical designations.[19] Here we confront the question of how the various acoustical values of single tones are imagined. It has long been understood and established that we definitely notice the difference in tuning between the fifth E and the third E. But it is likewise

established that we can be satisfied with an average of the two, as equal-tempered, 12-tone tuning offers (compare the table s.v. "*Tonbestimmung*" in my Musik-Lexikon):

Third E	= 0.32192	
12-tone tempered E ($= \frac{1}{3}$)	= 0.33333	Logarithms in base 2
Fifth E	= 0.33984	
(Pythagorean third)		

Those who advocate the introduction of school instruments in pure intonation are of the opinion that the surrogate intervals of temperament blunt the ear's ability to distinguish exact intonation—that is, that they damage that organ. With the introduction of pure intervals, [this faction] expects an increased desire for their performance, without exception, and thereby a heightened tonal sense. Circumstances are such, however, that these hopes must prove illusory. On the one hand, the implementation of pure tuning would complicate significantly the instruments and methods of practical music making, and render their use a near impossibility. On the other hand, *our organ of hearing fortunately is so disposed that absolutely pure intonation is definitely not a matter of necessity for it.* Certainly, it perceives purely tuned harmonies with pleasure and enjoys their sensual euphony with heightened consciousness; yet, this gain would be bought at too high a price if it were only possible through the renunciation of the free motion of harmony and through limitation of modulation. However, the primary question is and remains: What do we imagine? Do we think in tempered or pure intervals? Since the creation of a truly exact equal temperament is scarcely possible anyway (even the tuner can only begin to reach it through artificial deviations from the clear demands of the ear), it appears at first glance, to be sure, that temperament is a white lie—that the absolutely purely intoned fifths (2:3) and the thirds intoned 4:5 are what our natural tonal sense requires. A small practical example may oblige us to take a position on this fundamental question. The cadence as shown in Example 10 contains the *Parallelklang* of the subdominant (D F A) announced by its dominant; [the *Parallelklang*] then goes to the dominant and returns to the tonic. Hauptmann raised the contention that this D F A (in Hauptmann's notation, D || F a) is not a pure harmony, since its fifth is a syntonic comma ($= \frac{1}{10}$ of a whole tone) too small ($= 27:40$). The intonation of this little example is (in Helmholtz's improved notation instead of Hauptmann's)[20] as shown in Figure 2. Thus, the alto must transform itself from $\underline{d}$ to d in the second measure ($\underline{d}$ is the lower fifth of the third of the subdominant; d is fifth of the dominant). Our musical practice



Example 10

c e g — a cis e — d f a — g h d — c e g

(c+ — a+ — °a — g+ — c+)

Figure 2

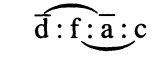


Figure 3

Figure 4

knows nothing of these two Ds in C major, and our tonal consciousness is even less aware that d:f:a would not be a pure minor chord, but rather a type of diminished triad (with the fifth 27:40 instead of 2:3). Certainly we imagine the D-minor chord as *Parallelklang* as shown in Figure 3, and not as a composite mixture of subdominant and dominant as Hauptmann wants (Figure 4). Were it not a pure triad, we would not be able to imagine its dominant (is there a dominant of b d f [Hauptmann's b || D F]? Certainly not!) In other words, our imagination knows nothing of the tuning difference d and d, but rather equates both, and imagines d as lower fifth of ā and at the same time also as upper fifth of g. This *enharmonic identification* of acoustical values that differ by a syntonic comma is simply indispensable to our musical hearing. According to the opinion of the defender of pure tuning, the *Parallelklang* of the subdominant of C major: d:f:a is completely different and has no tones in common with the double dominant: d:f♯:a, to the extent that one does not cling to the fifth (d:a; 27:40) that binds the two chords through the D. We want to transcend

this single case and give a general view of how and where—that is, *at what points in general we imagine the various keys in relationship to the basic scale.* I assume that my essay will serve to stimulate responses of other musicians to the new question; if as a consequence, differences and oppositions do not fail to appear, these nevertheless will certainly help to clarify the question and thereby contribute to laying the foundations for the theory of tonal imagination.

IV.
Establishing the Residence of Chords and Keys

Through the concepts of the dominants (upper dominant and subdominant), the relative keys [*Parallele*] and the [modal] variants, close relationships are clearly established and [become] common property for a large number of keys. That is, we can assume as established that all musicians imagine C major as fifth-related to G major and F major, and that A minor, through the commonality of all tones (parallelism) likewise stands very near [to C]. However, C minor must also be recognized as closely related to C major. This will not appear as self-evident on account of the three flats, which can easily mislead [one] to search for and imagine C minor in the area of E♭ major, which is to be found three descending fifths from C. The well-known table of tonal relationships[21] (see Figure 5) which may be carried further optionally in all horizontal rows (through further fifth successions), displays synoptically a large number of varying tone designations through ascending fifths (right), descending fifths (left), ascending thirds (up), and descending thirds (down). All major chords are in the area △, all minor chords in the area ▽ (root and fifth are in the same row; over-third is in the next higher row, under-third in the next lower one). The vertical columns show successions of chromatic seconds, which are distinguished from one another by two comma strokes ($\overset{\equiv}{F}$♭, $\overset{-}{F}$, $\underset{-}{F}$♯, $\underset{\equiv}{F}$x), since each [component of a vertical column] leaps over a horizontal row. The diagonals running upward from left to right show successions of major thirds ($\overset{\equiv}{D}$♭♭, $\overset{=}{F}$♭, $\overset{-}{A}$♭, C, $\underset{-}{E}$, $\underset{=}{G}$♯, $\underset{\equiv}{B}$♯); those running downward from left to right show successions of minor thirds ($\underset{=}{B}$, $\underset{-}{D}$, F, $\overset{-}{A}$♭, $\overset{=}{C}$♭, $_{E}$♭♭, etc.). The framed middle part shows the fundamental scale of C major, or respectively, A minor, both with the double value, $\underline{d}$ and d. The table shows directly the determination of every interval according to fifth or third successions and discloses for every multiply-determined interval the simplest and closest derivation [from C]: for example, for F^{x} as F 3 T (fifth of the 3rd third, or 3rd third of the fifth). If we inquire, by use of this table, as to the *location—that is, the fixed relationship of the usual transposed keys*—we see immediately that we may understand only G major, D major, F major, and B♭ major as

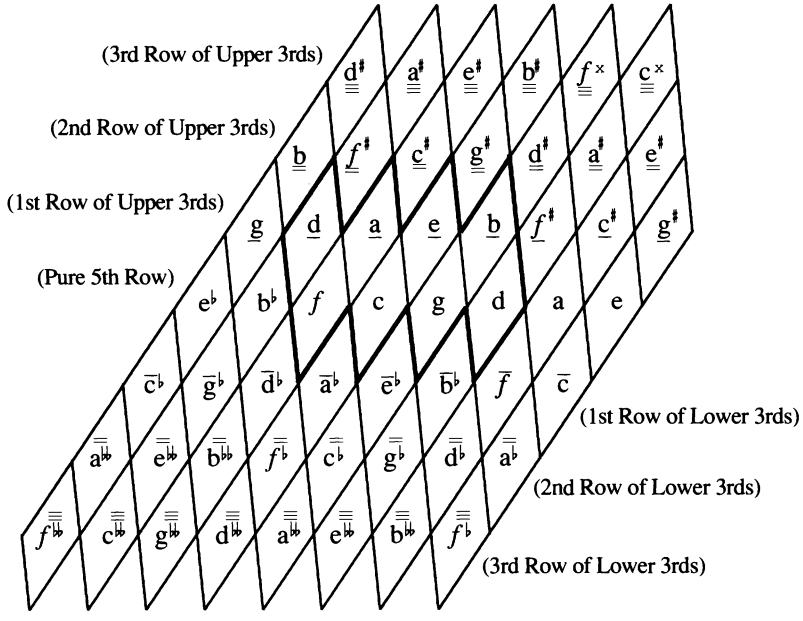


Figure 5

purely fifth-related to C; that is, we imagine the tonic primes (I) of only these four keys as reachable by fifth progression from C, the center.[22] We understand their relative minors [*Paralleltonarten*] E minor, B minor, D minor and G minor, whose tonic primes (I) are determined by fifth progression from the central tone e, as directly connected with these [major keys] (through identity of elements of their scales).[23] Thus, only the keys of the first and second fifths above and below the central keys C major and A minor count as purely fifth-related. Another meaning arises for A major and E♭ major, and likewise for C minor and F♯ minor (the minor-third–related keys on both sides). A major is not the key of the dominant of D major, but the variant of A minor; C minor is not the subdominant of G minor, but the variant of C major. Through this change in meaning, both move substantially closer to the center (see Figure 6). Likewise, we understand E♭ not as subdominant of B♭ major, but as relative major [*Parallele*] of C minor, and F♯ minor not as minor dominant of B minor, but as relative minor [*Parallele*] of A major (see Figure 7). Through these manipulations, however, the degree of relationship to the tonic (prime) proves to be (F = ascending fifth, T = ascending third; 1/F = descending fifth, 1/T = descending third) (see Figure 8). The Law

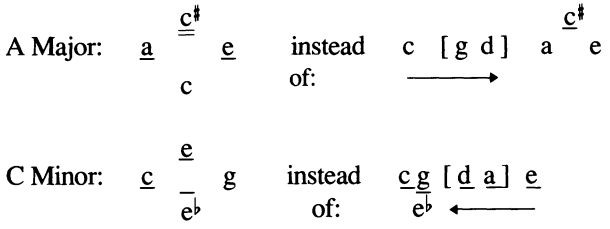


Figure 6

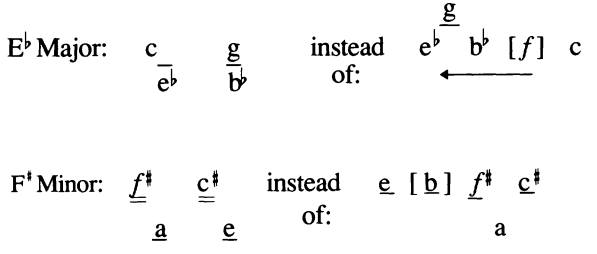


Figure 7

of the Greatest Possible Economy of Imagination shows its powerful force here with great clarity. The further transposed keys are once again clearly linked by fifth-relation to those just designated; that is, E major and B major are the keys of the first and second rising fifths from A major. For E major, the direct third-relation with the tonic is also valid; likewise, A♭ major is the under-third key of C major and D♭ major its subdominant. Correspondingly, F minor and B♭ minor are at home as the first and second under-fifths of C minor; likewise, C♯ minor and G♯ minor are the first and second upper fifths from F♯ minor (see Figure 9). For the most remote keys, F♯ major and C♯ major, G♭ major and C♭ major, E♭ minor and A♭ minor and D♯ minor and A♯ minor, mediation through their [modal] variant or their relative keys [*Parallelen*] (for whom homes have already been found) appears again to be offered (see Figure 10). At this point the complete domain of tones that may be regarded as major or minor tonics (primes) is moved into the closest distance to the central tones C and

A Major: Prime = $\underline{a} = \frac{T}{F}$ instead of: a = 3 F (figured from c)

E♭ Major: Prime = $e^{\bar{}\flat} = \frac{F}{T}$ instead of: $e^{\flat} = \frac{1}{3\,F}$ (figured from c)

C Minor: Prime = $g = \frac{F}{T}$ instead of: $g = \frac{1}{3\,F}$ (figured from $\underline{e}$)

F Minor: Prime = $c^{\sharp} = \frac{T}{F}$ instead of: $c^{\sharp} = 3\ F$ (figured from $\underline{e}$)

Figure 8

E (see Figure 11). Thus, [there are] a total of twenty-two tonal values, of which however $\overset{A}{\underset{=}{}}\sharp$ and $\overset{E}{\underset{=}{}}\sharp$ (and also $\overset{G}{\underset{=}{}}\sharp$ and $\overset{D}{\underset{=}{}}\sharp$) can only come into question as primes in minor (in D♯ minor and A♯ minor, and respectively, C♯ minor and G♯ minor), while $\overset{=}{\underset{C}{}}\flat$ and $\overset{=}{\underset{G}{}}\flat$ (as well as $\overset{-}{\underset{D}{}}\flat$ and $\overset{-}{\underset{A}{}}\flat$) can only occur as primes in major (in C♭ major and G♭ major, and respectively, D♭ major and A♭ major). I will not maintain that with this the totality of all imaginable *tones* is described, but the tonics (primes) certainly [are]. Through the major dominants of the last-named minor keys with sharps, the fourth upper-third column grows by a few tones, as does the third column of under-thirds, through the minor subdominants of the last-named major keys with flats[24] (see Figure 12). To go further than this makes little sense. D♭ and G♭ minor can certainly occur as keys on occasion for short stretches of time (in pieces in D♭ major and G♭ major); however, these keys scarcely bring any new tones with them. Higher major keys with sharps (G♯ major and D♯ major) are hardly imaginable without enharmonic transformation, and may remain out of the discussion, as easy as they are ultimately to describe schematically. The fourteen transpositions of the major and minor scales from C♭ to C♯ major and A♭ to A♯ minor certainly represent an immense space for harmonic motion, which occurs along with absolute pitch-height as a completely different tonal value. Each key, through its type of derivation from the fundamental scale (that is, through the fifth and third chains in ascent and descent), has a particular character. To define it briefly, all steps upward make the character brighter and more radiant, [while] all steps downward make it darker and cloudier. Since, however,

E Major: $\underline{e} = T$

B Major: $\underline{b} = F\ T$

} figured from c

A Major: $\overline{\underline{a}}^{\flat} = \frac{1}{T}$

D Major: $\overline{\underline{d}}^{\flat} = \frac{1}{F\ T}$

} figured from c

F Minor: $c = \frac{1}{T}$

B Minor: $f = \frac{1}{F\ T}$

} figured from $\underline{e}$

C Minor: $\underline{\underline{g}}^{\sharp} = T$

G Minor: $d^{\sharp} = F\ T$

} figured from $\underline{e}$

Figure 9

$F^{\sharp}$ Major as parallel major of $F^{\sharp}$ Minor, that is $I = \underline{\underline{f}}^{\sharp} = \frac{T}{2\ F}$ (figured from $\underline{e}$)

$C^{\sharp}$ Major as parallel major of $C^{\sharp}$ Minor, that is $I = \underline{\underline{c}}^{\sharp} = \frac{F}{T}$ (figured from $\underline{e}$)

$E^{\flat}$ Minor as parallel minor of $E^{\flat}$ Major, that is $I = \overline{\underline{b}}^{\flat} = \frac{2\ F}{T}$ (figured from c)

$A^{\flat}$ Minor as parallel minor of $A^{\flat}$ Major, that is $I = \overline{\underline{e}}^{\flat} = \frac{F}{T}$ (figured from c)

$D^{\sharp}$ Minor as relative minor of $F^{\sharp}$ Major, thus $I = \underline{\underline{a}}^{\sharp} = \frac{2\ T}{2\ F}$ (figured from $\underline{e}$)

$A^{\sharp}$ Minor as relative minor of $C^{\sharp}$ Major, thus $I = \underline{\underline{e}}^{\sharp} = \frac{2\ T}{F}$ (figured from $\underline{e}$)

$G^{\flat}$ Major as relative major of $E^{\flat}$ Minor, thus $I = \underline{\underline{g}}\flat = \frac{2\ F}{2\ T}$ (figured from c)

$C^{\flat}$ Major as relative major of $A^{\flat}$ Minor, thus $I = \underline{\underline{c}}^{\flat} = \frac{F}{2\ T}$ (figured from c)

Figure 10

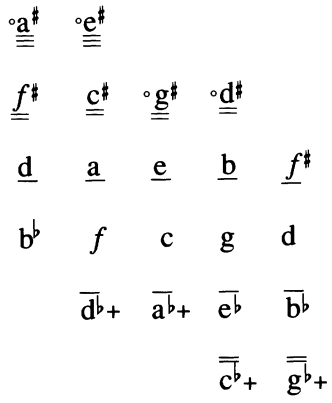


Figure 11

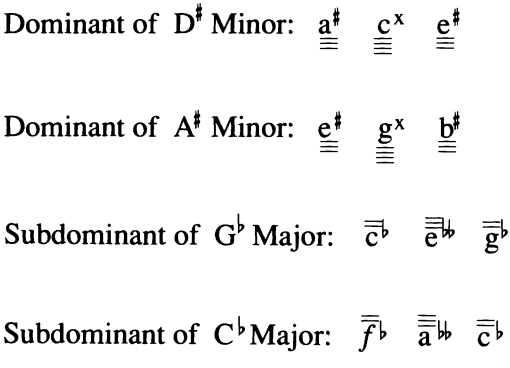


Figure 12

major—as opposed to minor—already has a bright and radiant effect, the brightest keys are the major keys with many sharps, and the darkest are the minor keys with many flats. In my analysis of the *Well-Tempered Clavier* I have attempted to show how the character of the keys affects the thematic invention in them.[25] Restrictions of space prevent me from going into greater detail concerning the problems of harmony as a subfield of tonal imagination, for naturally I cannot write a textbook on that topic here. Rather, by way of a few notes, I am attempting merely to give some idea of what an all-inclusive area this is. I renounce completely any attempt to give a similar orientation for the imagination in the area of *musical rhythm.* This is not to say

that clues are lacking. The complete theory of phraseology and the theory of musical period structure rest on the logic of tonal imagination in the area of rhythm. The distinction between lower and higher degrees of light and heavy, the transformation of heavy values into light ones and vice versa, [and] the boundary-articulations of motives and phrases, etc., etc. are all nothing other than segments of a theory of tonal imagination applied to the area of rhythm. Even the distinctions between opposing themes and between thematic and nonthematic parts, and thus the whole practical theory of composition and form, constantly treat none other than those structures that the composer imagines and combines.

V.
Auxiliary Mental Images (Leading tones)

I should like to bring up only one more question, which belongs to the most fundamental, primitive theory of music: that is, *how do we imagine more complex voice motions?*

The simplest to imagine are doubtlessly the *steps from one chordal component to another* (prime, third, fifth) *in which the harmony remains the same* (1–5, 1–3, 5–1, 3–1, 3–5, 5–3, or in minor, I–V, I–III, V–I, III–I, III–V, V–III). The collected intervals that come about in this way are consonant.

The change from a component of one harmony to a component of another closely related to it is already a more complex operation of the imagination. Only some of the steps that result thereby are consonant intervals. With the "plain-fifth step" (T-D, °T-°S), besides consonant (harmonic) intervals, melodic ones (seconds) also appear:[26]

1-5, 1-3, 3-5, 5-1, 3-1, 5-3
T-D, T-D, T-D, D-T, D-T, D-T.

With the "whole-tone step" (S–D), melodic steps are actually in the majority:

1-1, 3-3, 5-5, 1-3, 3-1, 5-3, 3-5
S-D, S-D, S-D, D-S, S-D, S-D, D-S

are steps of a second, and only

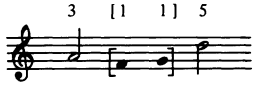
3-5, 5-3, 5-1, 1-5, 1-5, 5-1
S-D, D-S, S-D, D-S, S-D, D-S

are harmonic (fifths, fourths, minor thirds [major sixths]).

1-3 and 3-1
S-D D-S

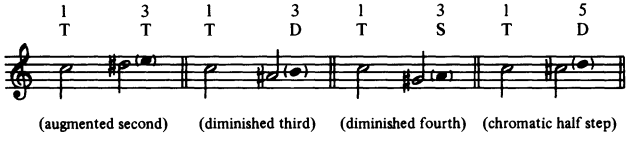
are possibly unmelodic [skips] (augmented fourths), concerning which there is more to say.

The elementary singing method of the future that takes into account the theory of tonal imagination will give thorough consideration to the systematic practice of all such melodic motions to a component of another harmony, and it will have to order the resulting difficulties progressively and work on their conquest. I am thinking of these future exercises in particular when I point out a circumstance that comes up in this connection. Whole categories of intervals are not directly imagined, but rather need an auxiliary mental image [*Hilfsvorstellung*]. Strictly speaking, this is true even for the harmonic (consonant) intervals from one harmony to another, as for example $\frac{3-5}{5-D}$ (in C major: A–D). Not to be conscious of the harmonic progression S–D, but rather to sing mechanically a fourth or a fifth as though it were I–V or 5–1 above an oblique D major or minor, would be a fatal white lie, which would avenge itself soon enough through its lack of any use in the development of excellence. However, if one definitely imagines the subdominant F with the A, and just as definitely the dominant G with the D, one finds the D not directly from the A, but through the auxiliary mental image of the two primes, F and G (see Example 11). The tritone, F–B, is also to be intoned with reliability above the auxiliary mental image of G. However, for it there is still another possibility (see Example 12). When C follows B, the mental image of the following C—of the fifth (or lower fourth) of F—suffices in order to be able to find and intone the B with security. However, a preparatory *schooling in intonation of the leading-tone melodic progression* is certainly necessary to guarantee this possibility—a schooling that is one of the most important tasks of elementary vocal instruction. A large number of intervals become easily singable (imaginable) through the auxiliary mental image of a succeeding leading tone (even when it does not follow in reality) (see Example 13). Like the ascending leading tones, the descending ones can also be drawn upon to make intervals that are difficult to deal with easy (see Example 14). In some cases the auxiliary, imagined tone can have multiple meanings, but that is not too significant. The important common attribute of all of these cases is that a voice progression that is difficult to imagine in itself is made easy through *the auxiliary mental image of tones to which it leads (ascending or descending leading tone)*. Since the leading tone is always third of the fifth (or lower-third of the lower-fifth) of the tone to which it leads, a close relationship between this phenomenon of imagination and the easily understood and imagined *secondary dom-*

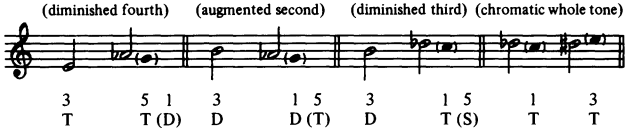


Example 11

Example 12



Example 13



Example 14

inants and subdominants may be established, even if the phenomena are not identical. The *leading chords,* which contain a leading tone to all three tones of the following chord, also belong in the same category (for example, F♯–G; G♭–F, etc.).

That we imagine tonal relationships thoroughly in the sense of pure tuning is beyond question. However, [the question of] how it is possible in spite of this that the imperfect, compensatory intonation of our commonly used tempered music satisfies us and proves to be a usable means of allowing the tonal imaginings of the composer to arise once again in the imagination of the listener must be reserved for discussion in a later, new study. The possibility (even the necessity) of the *exchange of coinciding enharmonic tone-values* intrudes upon us

from all sides as soon as modulation strays into regions that allow *a simpler understanding more in the central area of the tonal system.* No intonation, no matter how exact, can stop this simplification of the understanding. Consequently, I express my conviction that *it is the study of enharmonic identification that ultimately will solve and explain the contradictions between the results of tone-psychological investigations and the practical experiences of musicians.*

NOTES ON THE TRANSLATION

1. There is some confusion as to the date of this publication, which Seidel and Mickelsen give as 1874. The work exists in several guises; it was entitled "Über das musikalische Hören" as Riemann's dissertation (University of Göttingen, 1873). It was printed twice in Leipzig, in 1873 as *Musikalische Logik,* and in 1874 under the dissertation's title. The work appeared even earlier in the *Neue Zeitschrift für Musik,* vol. 68 (1872), published as "Musikalische Logik," under the pseudonym Hugibert Ries. This version was later reprinted in *Praludien und Studien: Gesammelte Aufsätze zur Ästhetik, Theorie und Geschichte der Musik,* Vol. 3 (Leipzig, 1895), 1–22.
2. In referring to his previous publications on phrase markings, Riemann's citation is incorrect. His 1882 article in *Musikalisches Wochenblatt: Organ für Musiker und Musikfreunde* (Leipzig), "Eine musikalische Tagesfrage," deals with issues relating to tuning and temperament. He probably means to cite his 1883 articles from *Musikalisches Wochenblatt,* vol. 14: "Ueber musikalische Phrasirung" and "Das Musik-Dictat als Vehikel der Phrasirungslehre." These two mark the beginning of a series of articles on rhythm and phrase structure, including: "Was ist eigentlich Phrasirung?", Vol. 16 (1885), "Gesangphrasirung," Vol. 18 (1887), "Die Phrasirungbezeichnung als dauernder Bestandtheil der Notenschrift der Zukunft," Vol. 19 (1888), and later "Zur Klärung der Phrasirungsfrage," Vol. 25 (1894).
3. *System der Musikalischen Rhythmik und Metrik* (Leipzig). The publication year should be 1903, not 1904 as Riemann states.
4. *Grosse Kompositionslehre,* vol. 3, *Der Orchestersatz und der dramatische Gesangstil* (Berlin and Stuttgart, 1913).
5. Alexander Wheelock Thayer, *Ludwig von Beethovens Leben* (Leipzig, 1907–8).
6. Riemann's article includes three footnotes; these have been indicated in the text by an asterisk.
7. *Tonhöhe* has been translated here as pitch height in order to make the distinction between what Révész terms "pitch height" and "pitch quality," terms which are rendered by present-day psychologists respectively as "pitch height" and "chroma" (or by music theorists as "pitch" and "pitch class").
8. Presumably, Riemann refers here to the discrepency between the simple ratios of just intonation and those of tempered tuning.
9. The tune is "Die Lorelei" by Friedrich Silcher (1789–1860).
10. J. Murray Barbour notes that the nineteenth century was "particularly rife" with experimental attempts to increase the number of divisions within the octave (*Tuning and Temperament: A Historical Survey* [rpt. New York, 1972], p. 111). This research was directly related to the fact that "just" or "pure" intonation was favored by most music theorists of the century—Sechter, Hauptmann, Helmholtz and Öttingen among them. One purpose for building such experimental instruments was to prove the superiority of pure tuning over tempered systems, and in so doing, to justify the acoustic bases of these theoretical systems. These experiments in intonation were generally carried out on harmoniums that were built using one of two principles: either the octave was divided into multiple parts by extending principles of Pythagorean tuning, just

tuning, or both; or the octave was divided into multiple acoustically-equal parts. Shohé Tanaka's "Enharmonium" was among the most famous of the former type, while R. H. M. Bosanquet's "generalized keyboard" was the most successful of the latter variety. Not all acoustic researchers favored the 53-note harmonium, as Riemann's comment suggests. Indeed, the harmonium designed by Hermann Helmholtz was among the more conservative instruments, with only 24 notes per octave [Helmholtz, *On the Sensations of Tone,* trans. A. J. Ellis (rpt. New York, 1954), 315–318].

Barbour provides an excellent summary of these and other experimental instruments in *Tuning and Temperament* (pp. 107–132), and in his "Just Intonation Confuted" [*Music and Letters* 19 (1938): 56–58]. Primary sources include: Shohé Tanaka, "Studien im Gebiete der reinen Stimmung," *Vierteljahrsschrift für Musikwissenschaft* 6 (1890): 1–90; R. H. M. Bosanquet, *An Elementary Treatise on Musical Intervals and Temperament* (London, 1876) and "Temperament; or, the Division of the Octave," *Proceedings of the Musical Association* (1874–75): 4–17; and A. J. Ellis's appendices to Helmholtz, *On the Sensations of Tone,* 466–483.

11. These words, transliterated here from the Greek, mean high-pitched and bass in musical contexts, sharp and heavy in other contexts.
12. Otto Abraham, "Das absolute Tonbewusstsein. Psychologisch-musikalische Studie," *Sammelbände der Internationalen Musikgesellschaft* 3 (1901–2): 1–86; Otto Abraham, "Das absolute Tonbewusstsein und die Musik," *Sammelbände der Internationalen Musikgesellschaft* 8 (1906–7): 486–491; Felix Auerbach, "Das absolute Tonbewusstsein und die Musik," *Sammelbände der Internationalen Musikgesellschaft* 8 (1906–7): 105–112.
13. Riemann was obviously aware that the "absolute" standards for pitch have varied over time; his comment is somewhat simplistic, however. Although his statement is correct with regard to 17th-century German organ tuning, Riemann fails to mention that there were in fact several pitch standards concurrently used in the Baroque era. According to modern scholarship,

    > the terminology was not systematic, and its scope varied in different regions.
    >
    > The oldest and stablest term is choir pitch. . . . This was often contrasted with a chamber pitch . . . lying a whole tone lower. Several north German authors described a second chamber pitch a semitone lower still. During Bach's tenure at Leipzig, singers, woodwinds, and strings tuned to *Kammerton;* the organ and trumpets were pitched in *Chorton* a whole tone above. Other terms denoted standard pitch for high winds . . . and for opera. [*The New Harvard Dictionary of Music,* s.v. "pitch (4)"]

14. Throughout the next section of this essay Riemann refers to *mehr oder weniger Groß der Schallwellen* (greater or lesser size of soundwaves). Presumably, Riemann refers to the time or *period* of a wave form and not its amplitude. This has been translated as "wavelength" throughout. In his earlier essay, *Das Problem des harmonischen Dualismus* [Leipzig, 1905; reprint from *Neue Zeitschrift für Musik* (1905): 1–4], Riemann discovers the "true root of harmonic dualism" in the opposition of the ratios of frequency vibration numbers in ascent to ratios of string lengths in descent. In the present essay, Riemann seems to be using the temporal period of a wave form for precisely the same purpose as he had used the spatial length of a string in the earlier work.

15. Riemann's repeated assertions in *History of Music Theory, Books 1 and 2* [trans. Raymond H. Haggh (Lincoln, 1962), 11–12, 14, 21, 23, and elsewhere] that *De Divisione Naturae* of Johannes Scotus Erigena is the earliest extant treatise that clearly describes organum, pre-dating *Musica enchiriadis* of pseudo-Hucbald, has engendered considerable controversy. See, for example, Jacques Handschin, "Die Musikanschauung des Johannes Scotus (Erigena)," [*Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte* 5 (1927)] and Henry George Farmer, *Historical Facts for the Arabian Musical Influence* [(London, 1930); chapter 48, "John Scotus and Organum"]. Much of the controversy surrounds Riemann's translation. *De Divisione Naturae* is a theological tract, and the passage may not concern early polyphony at all. Raymond Haggh's commentary on Riemann's *History of Music Theory* (p. 346) argues that

> The treatise De *divisione naturae* is philosophical in nature and is concerned primarily with the science of *musica,* representing it in terms of dialectic, arithmetic, geometry, and astrology. Whether the quotation given by Riemann can be regarded as a description of a type of musical composition is by no means a certainty.

Regarding Riemann's contention that Scotus Erigena embraced the *senario* and "saw in the numbers 1–6 the solution of the riddle of the nature of harmony," much less has been written. Henry George Farmer, however, devotes an entire chapter to John Scotus and polyphony. Much of this chapter recounts an extended polemic between himself and Kathleen Schlesinger ["Is European Musical Theory Indebted to the Arabs?; Reply to the Arabian Influence on Musical Theory," *Musical Standard* (May 2 and 16, 1925) and several subsequent articles], who espouses Riemann's views for the most part. Farmer argues that the *senario* is a common philosophical concept that has appeared in a number of contexts in the writings of various authors, and that John Scotus possibly does not refer to sounding music at all. Further, he objects to Schlesinger's argument that John Scotus was an expert musician with practical knowledge of the music of his day.

16. *De Divisione Naturae* is available in several editions. Riemann's source was a mid-19th century printing, edited by C. B. Schlüter (Monasterii Guestphalorum, 1838). It may also be found in vol. 122 of J. P. Migne's *Patrologiae cursus completus, Series Latina,* and in a modern reprint edition [Frankfurt am Main, 1964]. Partial translations are available in *Periphyseon: On the division of Nature,* translated by Myra L. Uhlfelder (Indianapolis, 1976) and *Periphyseon (De Divisione Naturae) Liber Primus,* translated and edited by I. P. Sheldon-Williams (Dublin, 1968), though neither of these publications translates the passage that Riemann cites regarding the *senario.*
17. This description of the opposition of major and minor, with its distinction between ascent in frequency and descent in wavelength, is an even more striking misreading of Zarlino than Riemann presents in his *History of Music Theory* (Mickelsen, 107–109). In essence, this is Zarlino reinterpreted according to Riemann's ideas in *Das Problem des harmonischen Dualismus* (see note 14). A number of writers have commented on Riemann's misinterpretation of Zarlino, disputing his contention that Zarlino was the first to discover the dualistic opposition of major and minor. Among these are Carl Dahlhaus ("War Zarlino

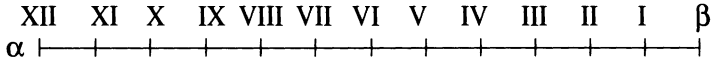
Dualist?" *Die Musikforschung* 10/2 [1957]:286–290), Robert W. Wienpahl ("Zarlino, the Senario, and Tonality," *Journal of the American Musicological Society* 12/1 [1959], particularly pages 29–30 and 34), Mickelsen, pp. 6–8 and Ruth A. Solie in her review of Mickelsen (*19th Century Music* 2/2 [1978]: 184). Briefly, Riemann's position hinges principally upon two errors in translation. First, as all of the above authors note, Riemann errs in his translation of Zarlino's "*replicate*" as "*Oktavversetzungen*" or "inversions," when Zarlino clearly means "compound intervals." Thus, as Solie states,

> . . . Riemann develops an image of chords in thirds and fifths constructed mirror-like on either side of a fundamental tone, whereas Zarlino's reference is simply to a contrapuntal style of which thirds, fifths, tenths, twelfths, and so on constitute the basic vocabulary (p. 184).

Dahlhaus points out a number of additional similar mistakes in Riemann's translation and interpretation. Second, both Dahlhaus (p. 290) and Wienpahl (p. 29) note a passage in which Riemann miscopied the original, substituting the singular *della Terza* for Zarlino's plural *delle Terze*. So where Zarlino speaks of the two types of thirds and their positioning in the upper or lower part of the fifth (to create major and minor triads), Riemann interprets only one type of third and places it above and below the fundamental to create the two types of triads. This misinterpretation, of course, supports Riemann's position that Zarlino was the earliest adherent to the dualistic view of the major and minor triads as polar opposites.

18. Riemann's purpose in this passage is to trace the expansion of accepted musical ratios from the Pythagorean system of 1:2:3:4, through the *senario* of Zarlino, and finally to a series of twelve that he attributes to the 14th-century Arab theorist Mahmud al-Schirazi, also known as Qutb al-Din (Mickelsen, p. 110, and *Studien zur Geschichte der Notenschrift,* pp. 77–85). In tracing this expansion Riemann also seeks precedents for his dualistic theories and (seemingly) finds them in Zarlino and al-Schirazi. His explanation of the *Messel* theory in *Studien zur Geschichte der Notenschrift* (pp. 77–78), for example, links the Arabian theory almost immediately to his concept of undertones:

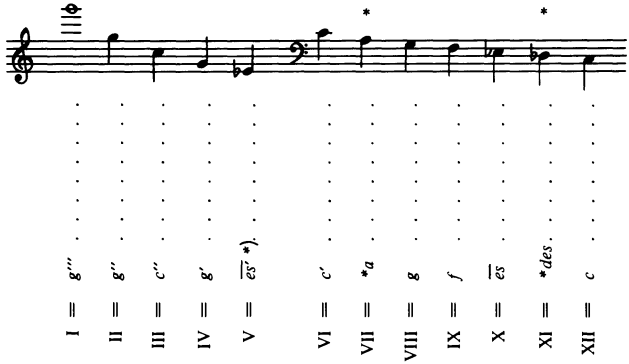
> The basis for the *Messel* theory lies in a stretched string . . . which is customarily divided into 12 equal parts.



Example 1N

If, for the string length ß - I ($=\frac{1}{12}$ the entire length) we assume, with Kiesewetter [*Die Musik der Araber* (Leipzig, 1842), 25], the pitch g‴, the pitches of the series are as shown in Example 2N: that is, the undertones . . . from g‴ [down] to the twelfth. Although it is bound to astonish us that the undertone series has been made the basis of a tonal system—just as the over-

tone series, since Rameau, has been for us—the additional results are bound to surprise us still more.



Example 2N

These "additional results" of the theory include an overview (based on Kiesewetter) of al-Schirazi's discussion of consonance and dissonance, including thirds and sixths among the consonant intervals. Riemann argues elsewhere [Mickelsen, p. 110] that the *Messel* theory is probably much older than this 14th-century treatise, possibly from before the time of El Farabi (ca. 925); thus the Arabs' recognition of thirds and sixths as consonances considerably predates Western recognition of these intervals as consonant.

Of course, modern scholarship disputes Riemann's conclusions. Mickelsen, for example, takes Riemann to task (p. 41) on the issue of undertones, and even the definition of the term, *Messel,* differs considerably from Riemann's *Musiklexikon* to Willi Apel's *Harvard Dictionary* (2nd ed.). The latter source gives the following definition (s.v. "*Messel*"):

> . . . a term used in Arab theory to indicate fractions of the type $(n+1)/n$, e.g., . . . $\frac{4}{3}$, . . . $\frac{5}{4}$, etc. . . . It corresponds exactly to the Latin term *sesqui-*. All intervals represented by such fractions were considered consonant by the Arabs. The messel has nothing to do with an early recognition of the third or sixth as consonances. . . . the sixth ($\frac{5}{3}$) does not occur in this series and hence is not a consonance.

19. The syntonic comma is usually expressed as $\frac{1}{9}$ of a whole tone; it is unclear why Riemann says $\frac{1}{10}$. Perhaps Riemann based his calculations upon cents; the syntonic comma contains 21.5 cents and a whole tone 200 cents; thus, $\frac{21.5}{200}$ is approximately equal to $\frac{1}{10}$.
20. Riemann's notation here graphically shows the number of commas by which two pitches of the same letter-name differ. He explains the system clearly in *The Nature of Harmony* (Riemann/Fillmore, pp. 26–27):

> Hauptmann's letter notation distinguishing the third-related from the fifth-related tones has been improved upon by Helmholtz and von Oettingen so

as to distinguish underthirds and overthirds; thirds related in the first from those related in the second degree, and so on . . . Instead of using large and small letters, the mark - is invariably used to indicate the comma (80:81). Thus $\underline{e}$ is a comma lower than e; $\underset{a}{\bar{}}\flat$ is a comma higher than a♭, $\underline{\underline{c}}\sharp$ is two commas lower than c♯, etc.

21. See the appendix of tables in Renate Imig, *Systeme der Funktionsbezeichnung in den Harmonielehren seit Hugo Riemann* (Düsseldorf, 1970), 231–265; Riemann's table appears on pp. 258–259. Manfred Wagner's discussion of Weber's *Tonartverwandtschaften,* pp. 170–171 of *Die Harmonielehren der ersten Hälfte des 19. Jahrhunderts* (Regensburg, 1974), contains similar tables. Finally, Lewin proposes as one of his musical spaces a modular harmonic space, very much like Riemann's, in *Generalized Musical Intervals and Transformations,* p. 21.
22. Presumably, Riemann means by "pure-fifth related to C" those tonalities that may be reached by direct fifth progression from the tonic, *or* its dominant or subdominant. Riemann uses the I to symbolize minor tonic primes.
23. Apparently, Riemann is forced to select E as the generating tone because of his view of the minor triad, despite the fact that A clearly plays the analogous role to the C of the major scheme.
24. Referring to Figure 5, it may be seen that four-comma Gx and three-comma B♯ would indeed be added to the tops of the fourth and fifth columns *after* the C column as a result of dominants of these new keys; however, the minor subdominants that Riemann describes are already present in Figure 5 in the C, G and D under-third columns.
25. That Riemann subscribed to the idea of key characteristics is clear from this passage. His definition in the *Musiklexikon* (trans., Shedlock, s.v. "character of keys") asserts that the key characteristics are aesthetic in nature and do not depend on unequally tempered sounds. While the keys of C major and A minor are plain and simple, "the deviations on the upper-tone side (♯ keys) appear more intense, clearer, more brilliant; those on the under-tone side (♭ keys) relaxing, more sombre, more veiled." He adds that there is a further aesthetic effect depending upon whether the key is major or minor: "major sounds clear, minor sombre." The key characteristics to which Riemann refers in his analysis of the *Well-Tempered Clavier [Katechismus der Fugen-Komposition* (Leipzig, 1890–1894), volumes 1 and 2 containing analyses of the "Well-Tempered Clavier" and volume 3, an analysis of the "Art of the Fugue"] are much more elaborate, however. His premise is that Bach's choice of thematic material is governed by the character of the key in which each composition is written. From volume 1, for example [*Analysis of J. S. Bach's Wohltemperirtes Clavier by Dr. H. Riemann,* 2 vols., trans. J.Shedlock (London, 190?)]:

> The key of *F-minor*— sombre both by its minor character, and by its position on the undertone side of the fundamental scale (key of the under-third of *A-minor)*—yet, standing in close relationship to the fundamental major scale (C), and commanding the C-major chord as dominant, it receives a consoling ray of light—is one of the most melancholy of keys. It does not express sorrow as deep as that of *E♭-minor,* nor passion as morbid as that of

C♯-minor, but it is impregnated with deeper feeling, greater solemnity, pensiveness, introspection, than almost any other key. . . . (p. 76)

An excellent source of further information on this subject is Rita Steblin's *A History of Key Characteristics in the Eighteenth and Early Nineteenth Centuries* (Ann Arbor, 1983), which gives numerous charts by a variety of authors detailing the characteristics associated with various keys, as well as the historical context for these ideas.

26. The following steps are read "root of the tonic to fifth of the dominant," "root of the tonic to third of the dominant," etc.