# Changing Performance Styles of Twentieth Century Ashkenazi Cantorial Recitatives

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## INTRODUCTION

EASTERN European *chazanut* [hazzanut] is a form of art which has developed gradually since the mid-eighteenth century and reached a certain peak in the first half of the twentieth century. Eastern European cantors were brought up in the Orthodox tradition, some of them also in the Chasidic tradition, and their cantorial music stems from these musical legacies. In all of the great urban synagogues the congregations expected the cantor to sing traditional music based on the old *Nusach* motives (i.e. the traditional chant), yet at the same time they also expected the cantor to extend his music far beyond the traditional patterns. In their improvisations, also termed cantorial recitatives, the cantors sought to artistically elevate the traditional chant by using innovative melodic patterns and modalities, and by applying a great amount of coloratura and vocal virtuosity. Even in smaller towns such music was performed by itinerant cantors and, in a way, the cantorial singing was considered as both sacred prayer and entertainment. In various congregations one could hear connoisseurs arguing the merits of the cantor's performance. From this background the art of cantorial singing developed into an improvisational art which culminated at the beginning of the twentieth century in what is called "The Golden Age of the Cantorial Art."[1]

Since the beginning of the twentieth century, the increased production of commercial recordings brought the chazanut to its peak in terms of popularity and extent of distribution. The recordings released during the first half of the twentieth century were extremely popular among Jews in Europe, America, and elsewhere, and their huge success led to the development of a canon of recitatives that set the tone and standard for the entire cantorial world.[2] Due to this canon's unprecedented success,[3] both in terms of

[1] For an overview of the Golden Age era, see chapter six, "The Golden Age of Cantorial Art," in Heskes (1994, 56) and chapter seven, "The Golden Age of Hazzanut," in Edelman (2003, 127).

[2] It should be noted, though, that this process of commercialization of the cantorial art was subject to harsh criticism. Music scholars of that era and even some of the cantors themselves claimed that the popularization of this music was leading to its artistic deterioration. They complained that the musical sophistication of the nineteenth-century cantorial recitatives was being replaced by banal and dull vocal stunts. For example, in his survey on Jewish music and referring specifically to twentieth century cantorial music, Eric Werner states that "[one] cannot, of course, speak of genuine liturgical music in these cases since every prayer, every passage, was chanted to impress the listeners (*not the worshippers*) by the brilliance of their voices and their *vocal acrobatics*" (Werner 19, 236, italics mine). Similarly, Idelsohn also criticized the cantors: "By the latter means [phonograph records], they have *popularized (and at times also vulgarized)* the Synagogue song" (Idelsohn 1929, 334, italics mine). A similar approach was reported by a music critic of the time: "Hazzanut has become so uniform, it has acquired such a 'phonographic' character that there is very little to write about" (Goldblum 1925, as cited in Slobin 1989, 60). Even the cantors themselves criticized the products of the new recording industry: "Ever since the production of the commercial records, where the cantors expose only the voice, the technique and the virtuosity, *we lost the musical essence and the hermeneutical meaning of the prayer*" (Glantz 1960, 59, italics mine). Of course, one should refer to such statements with great caution, because musicians such as Werner, Idelsohn and Glantz all had their own views regarding the cantorate, which

popularity and wide distribution and in terms of its influence on the character of the cantorial recitative (see Klein 2011), many cantors following the golden age began to imitate the canonic style, using the earlier records to recreate the music in synagogue services, concerts, and in new recordings of their own. To this day cantors look to their predecessors of the golden age and regard them as models, imitating their style, their timbre, and even their mannerisms. The congregational admiration of the golden age cantors has not stopped, and cantors of our time constantly feel the need to please their audience by using golden age masterpieces in their services and especially in concerts and on CDs.

The first cantorial recordings were made mostly in Europe at the very beginning of the twentieth century by cantors such as Meir Schor and by European immigrants in New York such as Yechiel Alter Karniol. These recordings were limited in scope and dissemination and therefore were not as influential as the recordings of later generations. The next generation, the second, was fortunate to have cantors of the highest caliber such as Yossele Rosenblat, Zawel Kwartin, Gershon Sirota and others. In the 1940s a new generation of cantors developed who followed in the steps of their predecessors such as Shalom Kats, Moyshe Oysher and Moshe Ganchoff. These cantors form the third and last generation of the golden age.

As noted, contemporary cantors still rely heavily on compositions that were recorded in the great golden age. These cover versions seem in many respects to adhere to the original recordings, but they also demonstrate a new approach to the performance of cantorial music. The purpose of this article is to examine the changes in performance practice[4] between the era of the original performances (in the second recording

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influenced their judgment regarding its appropriate artistic development (see for example Klein 2008 for Glantz's view of the *chazanut*). Anyway, the resistance to the commercialization of the cantorate was not only for artistic reasons but for ideological and religious ones as well. One of the leaders of this approach was Cantor Pinchas [Pinye] Minkowsky (1859–1924). Minkowsky forbade the recording of cantorial music because he thought the renditions of sacred prayer belonged in the holy sanctuary of the synagogue and should not be played, as might have sometimes been the case with phonograph records, in inappropriate places such as pubs and stores (Zimmerman 1988, 367). However, the entire cantorial world eventually joined the recording industry. Contrary to Minkowsky, cantors such as Gershon Sirota and Zawel Kwartin, who had made many recordings of cantorial music, took pride in letters from Jewish soldiers who expressed their gratitude for lifting their morale while they were fighting in the Russo-Japanese war (Slobin 1989, 60).

[3] For an indication of the commercial success of the cantorial recording industry, see Samuel Rosenblat's (1954) description of his father Cantor Yosselle Rosenblat's successful career. For example, he reports that in 1918, his father earned $10,000 from his records, since he received 5% in royalties from record sales (p. 139). Similarly, Slobin (1989) describes the success of the "star" cantors in the early days of the recording industry. For example, Cantor Kwartin, who like Rosenblat was one of the first to record cantorial recitatives, is reported to have sold no less than half a million copies in Russia in just a few months (Slobin 1989, 18). As Kwartin attests, "sales figures in Europe and America showed that the ordinary Jew was eager to buy up all the discs the companies could produce" (p. 60).

[4] Performance practice is a broad field which includes several methodologies, depending on how it is defined. In the current paper, I use the following simple and intuitive definition: performance practice is the gap between the *what* (that is, the musical piece to be performed) and the *how* (the actual performance of the piece in question) and deals with the musical layer added by the performer (Bersin 2000, Fridberg 1995, Sundberg 1983). This definition assumes a distinction between the musical piece and its performance—a complicated philosophical question in itself—and views it as the gap between the score and the actual sound, that is, the sonic outcome of a specific performance. This includes various musical elements which are either vague or not indicated in the score, and are thus added, omitted, changed, or shaped by the performers themselves, such as speed, dynamics, timbre, and articulation. However, the score could also be imaginary;

generation) and contemporary performances. Firstly, I will demonstrate that there have indeed been significant changes in performance practices. Secondly, I will show how these changes in various performance elements generally reveal one coherent trend towards an increased attention to small performance details. I will also demonstrate how the focus of later generations on the fine details of performance has led to more varied and accentuated performances. In the final section of this essay, I will address the cultural significance of this change in the specific context of the cantorial world as well as in the music industry in general. The approach of contemporary cantors may well be a consequence of global trends in the commercial music industry. However, I would like to argue that it also reflects deeper cultural changes related to the decline of cantorial art in its original, functional synagogue environment, and to its realization in the recording studio. This change in performance, I will argue, is also consistent with the prominence of interpretation and commentary on canonized texts in the Jewish tradition.

## MATERIALS AND METHODS

This study consists of three sections, each of which deals with one of three parameters of musical sound: time, frequency, and intensity.[5] This should provide a broad perspective on the musical experience as a whole, despite the highly technical analytic approach and the fact that there are more performance characteristics that could be compared.[6]

The first section analyzes the dimension of *time* and examines various aspects of tempo. The following section concentrates on the dimension of *pitch* and focuses on special effects such as vibrato and glissando in terms of their frequency in the

this is the case with regard to oral traditions (Brinner 2001, 381) in which the performance layer would be the gap between the actual performance and the score one could have written for this music. Note that by this definition of performance practice, important aspects like improvisation or ornamentation are not considered (because they would appear in a score) although they are added by the performer. Also, this definition excludes another set of performance aspects which are not directly in the sounds (or the score) but are still important elements affecting the performance, such as where and when the performance took place, cultural contexts, and the use of authentic instruments (Jackson 2005). As a consequence, these two sets of elements (that which can be scored, or, not aural) are not within the scope of this paper. Rather, I will deal with those subtle vocal elements that differentiate performances of the same piece. See also footnote 6 below. Usually, scholars of performance practice are particularly interested in the commonalities and variations in the performance layer between different performers and performances of a certain repertoire. If these can be generalized and categorized they might be of significance to other musical aspects. This study goes in this direction.

[5] Timbre is another important dimension of the sound, but its characteristics (some of which are still under scholarly dispute) are complicated and therefore difficult to evaluate by means of simple computer analysis.

[6] The study of performance practices has advanced in the past several decades due to great technical developments, including computerized tools for voice analysis. These tools facilitate a highly detailed analysis of recordings using quantifiable measures, allowing a precise framework for performance analysis. In this study, modern technologies were used to evaluate cantorial performance in terms of quantifiable performance characteristics and to graphically represent the results of the analysis. As this is the first study of this kind on cantorial music it cannot include all the performance characteristics. Therefore, the focus in this study is on performance characteristics that can be best analyzed through a visual representation of the sounds such as glides, vibrato and intensity. Other important characteristics, such as note ornamentation, rhythmic execution, intonation, and timbre are not included either because they can be analyzed with other means (such as comparing transcriptions) or because the visual spectrogram is not especially revealing for these elements. See also footnote 4 above.

performance, as well as other quantitative issues. The last section focuses on the *intensity* of the musical sound and compares the use of dynamics.

Aside from the analytical examination of the sounds, ethnographic data, in the form of interviews, was also collected regarding the way various contemporary cantors and musicians view their performance practice style. These interviews, which are discussed in the last section, complement the analytical part of the study and provide some additional insights on the cantorial performances.[7]

In order to compare the various performance styles that have developed in the last century, I first defined two groups of cantors (see Table 1). These two groups represent the golden age cantors (especially the second generation, as described above), whose performances were recorded in the 1920s and 1930s, *versus* the later generation of cantors, whose recorded performances are from the last decade or two. In the current paper, I will refer to the former group as the *golden age* cantors or as the *earlier* group of cantors, while terming the latter group the *later* or *contemporary* cantors even though it includes cantors performing in the last twenty years.[8] The list of cantors was compiled after considering

| **First Group – Earlier Generation** | | **Second Group – Later Generation** | |
|---|---|---|---|
| Zawel Kwartin | 1874 – 1952 | Moshe Stern | 1935 |
| Gershon Sirota | 1877 – 1943 | Chaim Adler | 1939 |
| Joseph Rosenblat | 1882 – 1933 | Jaakov Motzen | 1951 |
| Mordechay Hershman | 1888 – 1940 | Ari Klein | 1952 |
| Moshe Koussevitsky | 1899 – 1966 | Dudu Fisher | 1952 |
| Pier Pinchik | 1900 – 1971 | Jaakoov Toledano | 1962 |
| Joseph Schmidt | 1904 – 1942 | Israel Rand | 1963 |
| | | Itzchak Meir Helfgot | 1969 |
| **Average** | **1887 – 1946** | **Average** | **1952.8 – ----** |

**Table 1.** Earlier and later generations.

[7] This combination of objective analysis of sound and the collection of ethnographic data could be useful to additional contexts other than the changing performance styles, and could be utilized for examining matters such as text interpretation or emotional meaning (for example the combination of interviews with examination of vocal modes of expression as performed by Rapoport [1996] in the opera style studies).

[8] For practical reasons and for the simplicity of the study, the intervening generations are not considered. I examine only the two extremes, in order to show the magnitude of the change. Therefore, as detailed below, the goal is to attain as wide a time gap as possible between the performances. It can be assumed, however, that the change in performance practice was gradual and evolutionary (for reasons addressed at the final section of the paper). Therefore, the extent of the change can be assumed to be proportional to the time of performance. The later the date of the performance, the greater the changes will be.

recording catalogs and the literature regarding the golden age. In choosing the cantors, beyond the need to choose the best representatives of each era (based on quality and popularity), considerations such as availability of matching performances in the other group, reliable information on dates of recordings, the quality of the recordings, and so forth, were considered. Obviously, such a list does not represent the entire range of cantorial performance styles in the twentieth century.

The cantorial world comprises several geographical areas (the United States, Europe, Israel, and elsewhere), and is also theologically and philosophically divided into various religious sects (such as Orthodox, Conservative, and Reform Judaism). Moreover, each individual cantor may well have his own personal style. One short list cannot possibly represent the entire cantorial world. Nonetheless, it is well known that the cantorial recording industry at the beginning of the twentieth century is mainly associated with the Eastern European Orthodox cantorial legacy. This is easily inferred from the catalogs of the major record companies (such as Columbia, Banner, Victor, RCA, and Syrena); most of the recorded recitatives during the first half of the twentieth century were of East European cantors singing in the Eastern European style. In addition, as noted by Shandler (2009, 16), Eastern European Jews or "Jews who had recently arrived from Eastern Europe, were the primary audience for these recordings." Therefore, the first group of cantors chosen for this study reflects this main artistic stream of the Orthodox Eastern European cantorate, which began in Eastern Europe and then spread to the U.S. and Israel. All members of the first group of cantors were born in Eastern Europe and represent the core Eastern European cantorial style, both in their composition and performance. Except Sirota and Schmidt, they all eventually emigrated to the United States or Israel. These cantors were all celebrated figures in the recording industry in the first half of the twentieth century. The contemporary cantors (see Table 1) are all highly valued professionals in today's cantorial world and base their singing mainly on Eastern European orthodox cantorial masterpieces (that is, those works performed by cantors of the earlier generation). This group is slightly more diverse in terms of its geographic origins, reflecting the cultural mobility of the contemporary world: Stern was born in Hungary and later emigrated to the United States and Israel; Klein was born in Canada and later lived in South Africa; Motzen was born in Israel, but he spent most of his career in Europe, Canada, and the U.S.; all the others (Rand, Fisher, Helfgot, Adler and Toledano) are Israeli.[9]

In choosing the members for the two groups, the goal was to attain as wide a time gap as possible between the two groups being compared—an average of approximately 63.7 years. The earlier generation consists of cantors who were musically mature and active in the 1920s and 1930s and constitute the first generations of cantors to record their music. On

[9] Still, although not all cantorial styles are represented by this list, the findings can be assumed to apply to a majority of cantorial performances in many geographical, cultural, and theological environments. As I will show in the final section of the essay, the performance trend described here is in many respects consistent with trends generally found in recordings of all genres of music, as well as cultural processes that manifested themselves in the twentieth century, and therefore could also be said to apply to cantorial music in general, and not only those examples examined in this study.

average, members of this group lived during the years 1887 to 1946. The later generation of cantors consists of those who have been musically active in the past two or three decades (on average, those born in 1952).

I have selected eight cantorial recitatives and, according to the list of cantors in Table 1, I formulated ten pairs of performances, one from the golden era and the other from contemporary practice (see Table 2 for the pieces, cantors and dates, and also see the Appendix for translations of the Hebrew texts). Here, too, the choice of compositions is based on several factors such as date of release, artistic quality, records sales and sound quality. The average time difference between the recorded performances is 71.2 years.

For each performance, a Fast Fourier Transform (FFT) spectrogram was produced for the entire performance in order to allow a quantitative analysis of various characteristics of the performances. The FFT is used to demonstrate the vocal signal in a graph in which the X-axis represents time and the Y-axis represents frequency (pitch). The intensity is denoted in different shades of grey.[10]

In the sections below, the findings presented will detail the characteristics of each performance element. These findings demonstrate how contemporary performances differ from earlier performances for each of the performance elements examined. The main difference is the contemporary cantors' great attention to detail and their accentuation of specific performance characteristics in contrast to the cantors of earlier generations. The performances of cantors belonging to the later generation are also more varied than those of earlier cantors. My analysis also shows how the contemporary approach of

| | **Composition / Composer** | **Early Generation Cantor** | **Contemporary Cantor** |
|---|---|---|---|
| *1* | *Ano ovda / David Steinberg* | Joseph Schmidt (1934) | Moshe Stern (1995) |
| *2* | *Shom'a vatismach / David Aisenstadt* | Gershon Sirota (1913) | Itzchak Helfgot (2002) |
| *3* | *Rachem na* - 1/ Joseph Rosenblat | Joseph Rosenblat (1908) | Ari Klein (1996) |
| *4* | *Rachem na* - 2 / Joseph Rosenblat | Moshe Koussevitsky (1935) | Ari Klein (1996) |
| *5* | *Veal yedei* / Zavel Kwartin | Zawel Kwartin (1928) | Dudu Fisher (1994) |
| *6* | *Elu devorim* – 1 / Jakob Rapaport | Mordechay Hershman (1926) | Jaakov Motzen (1993) |
| *7* | *Elu devorim* – 2 / Jakob Rapaport | Mordechay Hershman (1926) | Jaakov Toledano (1997) |
| *8* | *Rozo deshobos* / Pier Pinchik | Pier Pinchik (1923) | Chaim Adler (1995) |
| *9* | *Tiher* / Zavel Kwartin | Zawel Kwartin (1928) | Israel Rand (1996) |
| *10* | *Habet* / Jakob Rapaport | Mordechay Hershman (1926) | Moshe Stern (1995) |

**Table 2.** Compositions and cantors.

[10] The software was developed by students of the computer music lab at Bar-Ilan University, Israel. I thank Prof. Eliezer Rapoport for guiding me and permitting me to use the software. The reason I used FFT rather than a simpler tool for pitch analysis, such as the Melograph, is that the FFT is more easily used to analyze polyphonic sound signals. As almost all the existing recorded performances are polyphonic (with at least one voice or instrument accompanying the cantor), the FFT was the only suitable option to separately view and measure the vocal line itself.

manipulating the finest details is used to emphasize and highlight certain words or ideas in the prayer text, thereby adding subtle interpretative layers to the music.

## FINDINGS: CHANGES IN THE PERFORMANCE STYLE

### 1. Time

Music unfolds in time, and hence, much of the performer's interpretation lies within the dimension of time. The longer the duration of the performance, the more attention can be devoted to each note. As shown in Figure 1, performances by the earlier generation are an average of 27.26% shorter than the contemporary performances.[11]

The longer elapsed time does not necessarily mean that contemporary cantors sing slowly throughout the entire performance. A more detailed examination of the performances reveals that in many cases, the overall speed of the contemporary cantors is the same as that of the cantors of the earlier generation (even faster at times). In these cases, the longer duration of contemporary performances is the result of only a few lengthened notes, no more than one or two in each musical phrase. These notes are typically cadential, high, structurally significant, or sung on words of special hermeneutic significance. The longer durations of these notes allow the use of more varied vibrato types, extended glissandos, and more subtle dynamics (as is shown below).

A typical recitative phrase resembles the following musical phrase from the cantorial recitative *Elu Devorim* ("These are the things").[12] The performances shown here are of Cantor Hershman, who belongs to the earlier generation, and Cantor Motzen, who is one of the contemporary cantors.

One of the musical phrases (at the beginning of the second section of the text, the *Braita*) is set to the following words: "*Vehakeren koyems; leoilom habo*" ("and the principle remains in the World to Come"). The melody consists of two parts with two Hebrew words in each. As shown in Figure 2, the major difference between the two performances is the

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[11] Actually, the difference in the singing time is slightly larger. This is due to the fact that the elapsed time includes passages of instrumental or vocal accompaniment which are not identical in all performances. A more detailed measurement of a few of these compositions, stripping the portions of the accompaniment, and leaving only the cantor's singing passages, reveals that the difference between the generations is 31.34%. For instance, according to Figure 1, there is only a slight difference in the elapsed time between the two performances of *Elu Devorim* (see column 4). However, when the stripped performances (omitting the sections of the vocal and instrumental accompaniment) are compared, the difference between the length of the performances increases to 25.46%. This means that, although the earlier performances are generally sung in a faster tempo, they contain sections of vocal or instrumental accompaniment which may often be quite long and which prolong the overall elapsed time, distorting the actual difference in the singing speed (as calculated by means of the simple elapsed-time measurement).

[12] *Elu Devorim* takes its text from the Talmud (a collection of texts of ancient Jewish law) and is a combination of two sources (*Mishna* and *Braita*) which enumerate two types of deeds: 1) Those deeds without any fixed measure in terms of time or amount (by enactment of the law), such as giving to charity and devoting time studying the *Torah*; 2) those deeds the fruits of which can be enjoyed in this world, however, the reward for these deeds is reserved for the World to Come. Examples of the latter deeds are honoring one's parents, charity, hospitality, and visiting the sick. Both lists culminate with 'studying the *Torah*,' which denotes the preeminence of the *Torah*. These two passages were therefore selected to follow the daily morning blessing of the *Torah* (Munk 2007, 60).

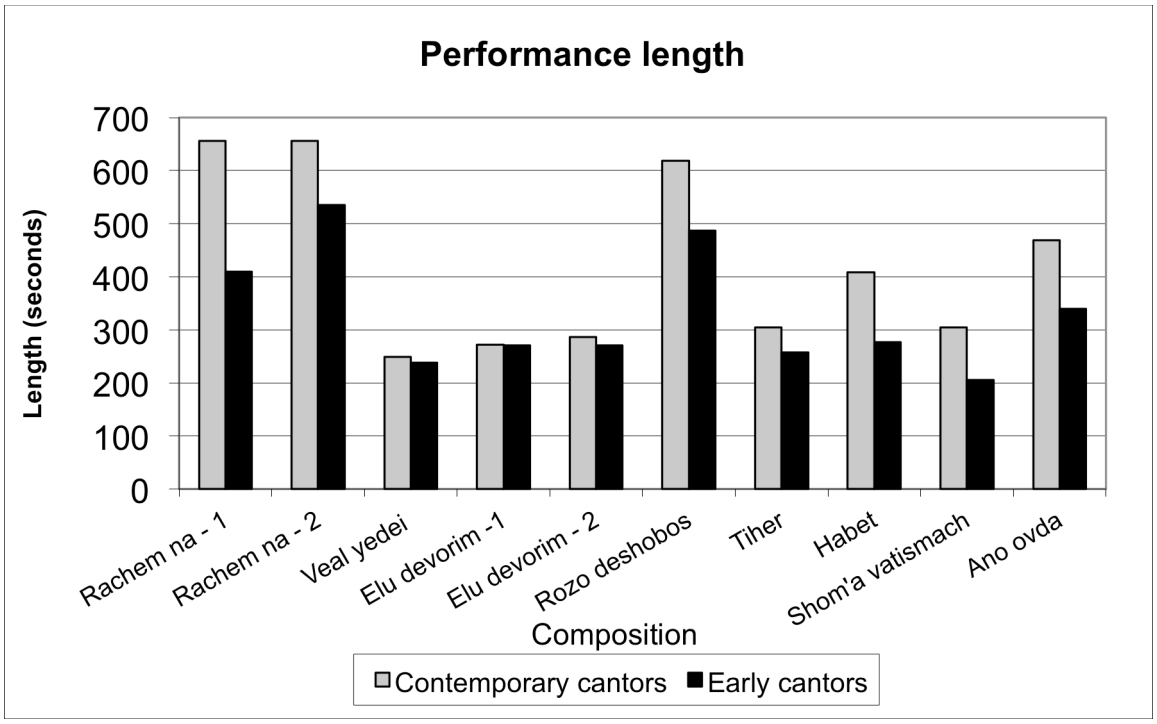


**Figure 1.** Differences in performance length.

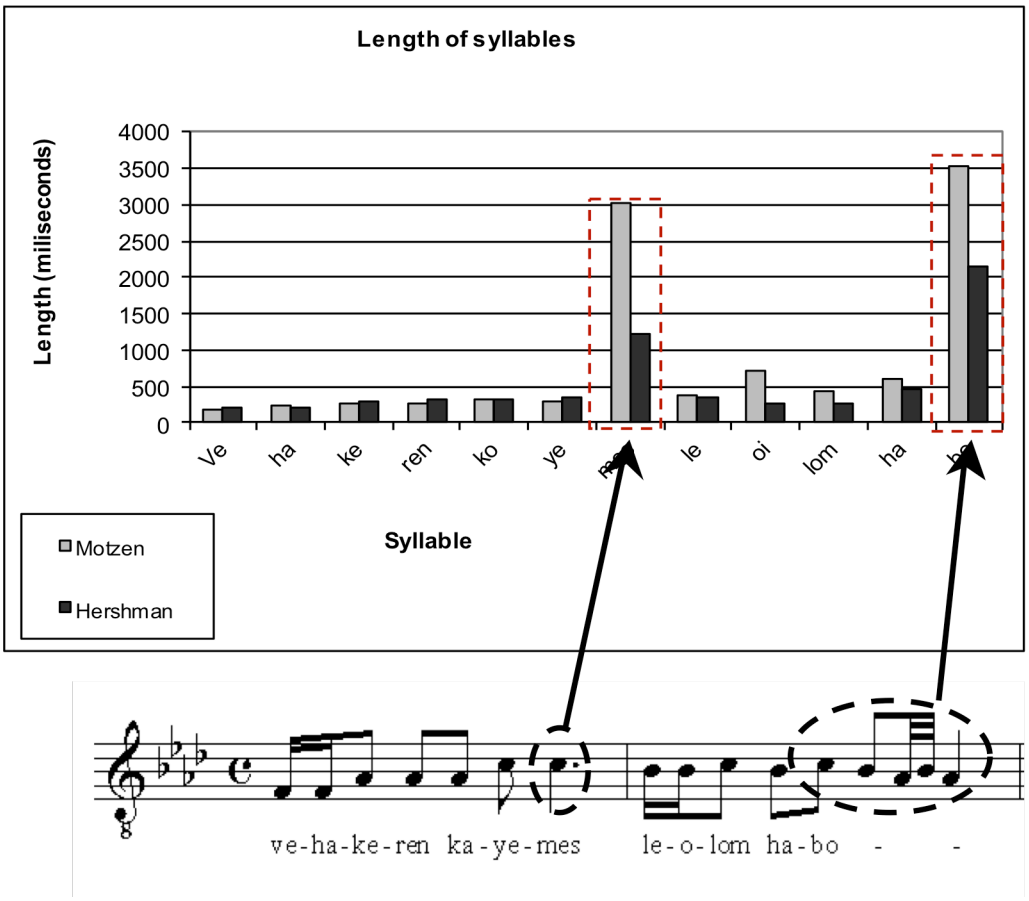


**Figure 2.** Length of syllables in a musical phrase from *Elu Devorim*.
[Audio File 1 – Hershman] [Audio File 2 – Motzen]

concluding syllable of each part (prolonged by the contemporary cantor at a rate of 145.55% and 63.42% respectively). The remaining notes have approximately the same length in both performances. Moreover, as can be clearly seen in the first part of the phrase, the contemporary cantor sings the short notes even faster than the cantor belonging to the earlier generation.[13]

I will now proceed to examine how the contemporary cantors make additional use of elongated tones and how the time dimension affects the pitch dimension in two performance elements: vibrato and glissando.

## 2. Frequency

### *2.1 Vibrato*

Carl Seashore identified vibrato as "the most important of all musical ornaments, both in voice and in instruments. It is the most important, firstly, because it occurs in practically all the tones of artistic singing and in sustained tones of various instruments; secondly, because of all ornaments it produces the most significant changes in tone quality; and thirdly, because it is the factor based on which artistic singing and playing are more frequently judged, whether the factor is consciously recognized as vibrato or not" (1936, 7). Indeed, both earlier and contemporary cantors make extensive use of this highly effective and expressive performance element. The findings suggest, however, that contemporary cantors handle vibrato differently as part of their overall more-detailed approach to each performance element.

The main differences in singing styles between the two generations are the dimensions and shape of vibrato, both of which are described below.

#### *2.1.1. Vibrato dimensions*

Two vibrato characteristics contribute to the impact of the vibrato on the listener: the vibrato *rate* and vibrato *extent*. The term *vibrato rate* (VR) signifies the speed of the vibrations (the frequency of the pitch fluctuations), while the term *vibrato extent* (VE) signifies the amplitude of the pitch fluctuations—see Figure 3.

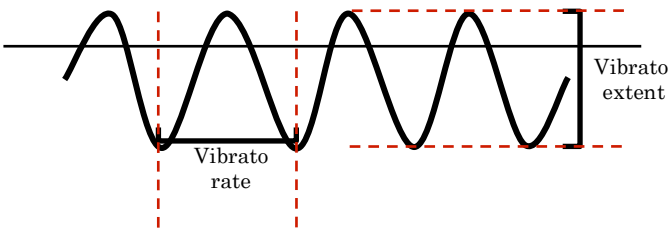


**Figure 3.** Vibrato rate and vibrato extent.

[13] It could be assumed that in this verse, by stretching these last syllables, the contemporary cantor emphasizes the meaning of the text. The long note emphasizes the concept of infinity associated with the World to Come.

As noted above, depicting all the recorded sound signals in the form of visual graphs allows vibrato characteristics to be measured. A sample of ten vibrato notes from ten pairs of performances—totaling 200 notes—are analyzed. The notes were selected so as to be distributed as evenly as possible throughout the sections of the piece (taking into consideration clarity of the spectrograms and a minimum of four vibrato cycles). While there is no consistent difference in the vibrato *extent* between the two time periods under consideration, the vibrato *rate* is indeed significantly different in the two periods.[14] The results (Figure 4 and the accompanying Table 3 in the Appendix) show a statistically significant difference ($p = 0.001$) between the two periods: the vibratos of the contemporary cantors are slower (average 5.25 Hz) than those of the earlier generation (average 6.26 Hz). In other words, the contemporary cantors' vibrato cycle (190.47 msec) is *longer* than that of the earlier cantors (159.74 msec) by 30.73 msec on average.[15] This difference in VR is quite significant and can be detected by the naked ear. Note that the average VR for Western classical music reported in the literature is approximately 6 Hz (MacLeod 2006, Prame 1994), although the literature does not actually compare the VR of different historical periods.

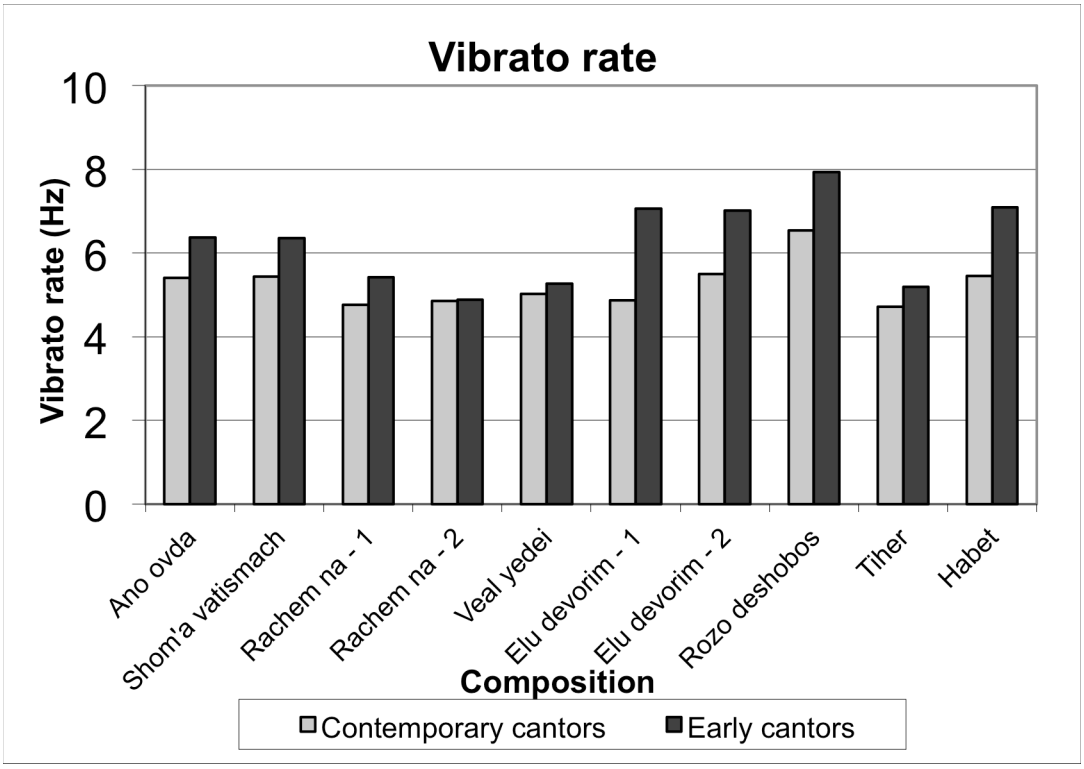


**Figure 4.** Vibrato rate – earlier cantors *versus* contemporary cantors.

[14] The VR and VE were calculated by means of software measuring the time and frequency points throughout the vibrated note in the spectrograms. The vibrato attributes cannot be visually inferred, that is, by the naked eye by looking at the spectrograms as they appear in print. Nor is it possible to visually compare spectrograms, as the time or frequency scales are not always aligned. Furthermore, these attributes were systematically compared note for note for a large number of vibrato notes. Thus, drawing inferences based on only a few spectrograms in this section could be misleading.

[15] Note that when the VR value in terms of Hz is smaller, the vibrato cycle in terms of time is longer.

### *2.1.2. Types of vibrato shapes*

Another difference in contemporary practice regarding vibrato pertains to its shaping over time. A visual comparison of notes having vibrato from the ten pairs of compositions detailed above reveals that contemporary cantors use more diverse vibrato techniques than earlier cantors. The findings show that the following vibrato types are used only in contemporary performances and cannot be found in the earlier performances:

**1. Gradual change of the vibrato extent**

In the following examples, the vibrato extent changes gradually (increasing or decreasing) throughout the note. At the beginning of the note the vibrato extent is small (or large), and then gradually increases (or decreases) as the note continues.

Figure 5 demonstrates an increasing vibrato-extent type. The recitative is Zawel Kwartin's famous rendition of *Veal Yedei Avodecho* from the morning High Holiday prayers. This text is a collection of quotations from the Prophets describing the Lord's kingdom and dominion over the Earth. The climax of the piece is reached in the quotation from *Zechariah* (14, 9)**:** "And the Lord shall be King over all the earth; in that day shall the Lord be one, and His name one." The high A note from the concluding part of the verse "*U-she-**moy** e-chad*" ("and His name one") is shown in both spectrograms. In the contemporary version (Cantor Fisher), the vibrato gradually increases towards the end of the note, while Kwartin's vibrato extent remains steady throughout. This special construction of the vibrato maximizes the climax of the music at this point in the prayer.

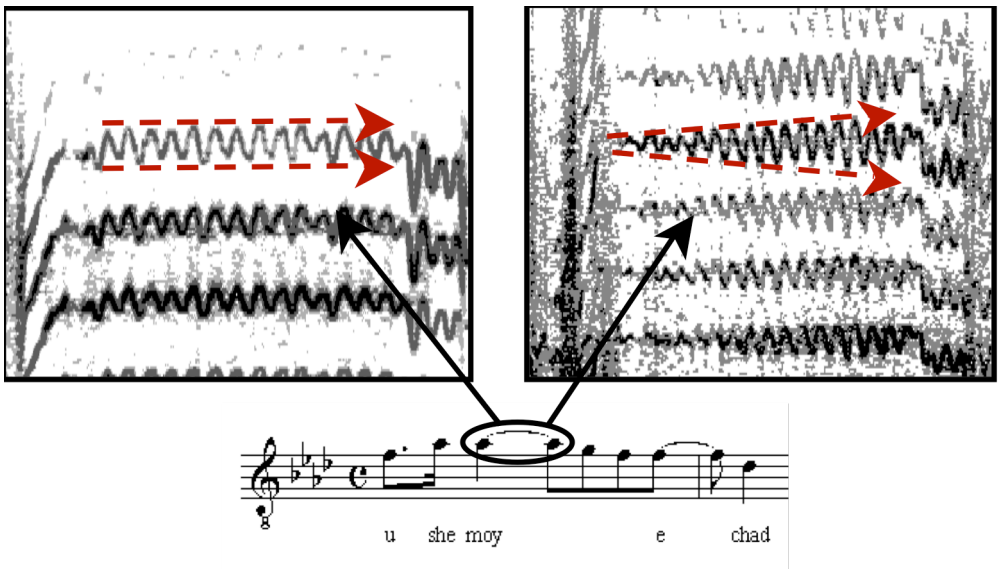


**Figure 5.** Increasing vibrato extent.

The spectrogram on the left shows the A note as sung by Cantor Zavel Kwartin, while the spectrogram on the right shows the same note as sung by contemporary Cantor Dudu Fisher. Notice the increasing VE in Fisher's rendition *versus* Kwartin's steady VE.

[Audio File 3 – Kwartin] [Audio File 4 – Fisher]

Figure 6 shows the opposite—a decreasing vibrato-extent—in the vibrato notes of contemporary Cantor Stern (see also Figure 7 for further explanation and a comparison of the two vibrato types). The high B♭ shown in the spectrograms is one of the melodic climaxes of the piece *Ano Avdo* ("I am the servant of the Holy One") set to the text from the

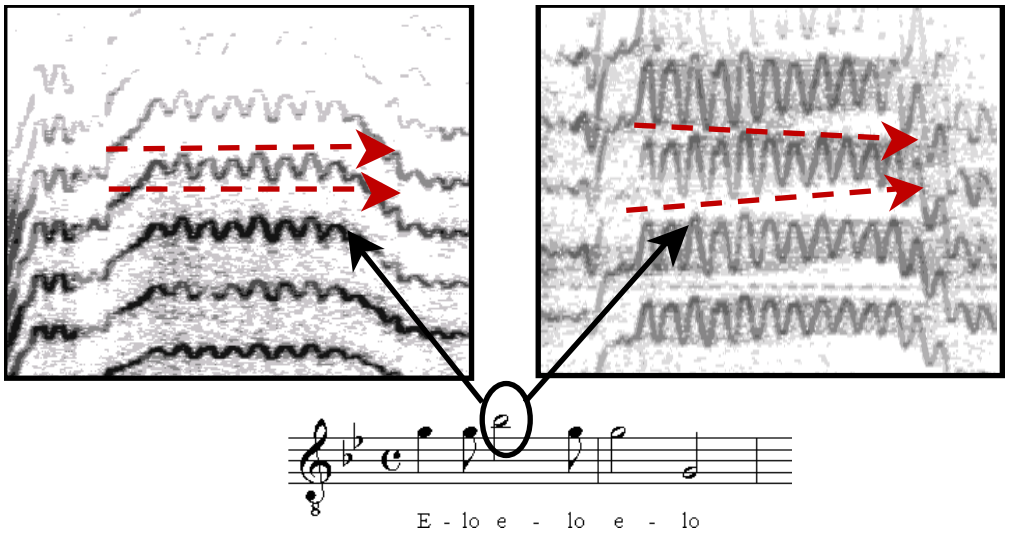


**Figure 6.** Decreasing vibrato extent.

The left spectrogram shows the B♭ note as sung by Cantor Joseph Schmidt, while the right spectrogram depicts the same note as sung by contemporary Cantor Moshe Stern. Notice the gradual decrease of the VE in Stern's vibrato *versus* Schmidt's steady VE.

[Audio File 5 – Schmidt] [Audio File 6 – Stern]

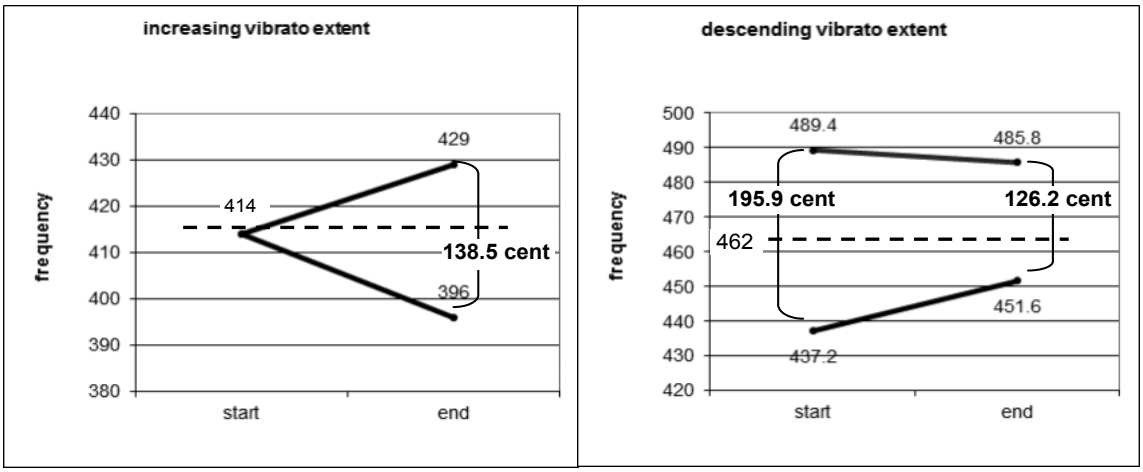


**Figure 7.** Increasing and decreasing vibrato extent.

The left chart shows the outline of the increasing vibrato of Figure 5, while the right chart shows the decreasing vibrato of Figure 6. As is widely accepted in the literature (Prame 1997, Howes 2004, Seashore 1967), the typical VE is between 50 to 100 cents in every direction above the middle frequency (the amount of 100 cents is equivalent to half a tone, meaning the VE ranges between a quarter of a tone to a semitone in each direction). In the left chart, notice how the vibrato increases to 138.5 cents (61 cents up and 76.9 down). In the right chart, the vibrato decreases from an extent of 195.9 cents (100.5 and 95.4 cents, up and down respectively) to an extent of 126.29 cents (86.9 and 39.39 cents, up and down respectively). This decrease is more than a third of the initial VE and is considered a large decrease.

Zohar (a foundational text in the literature on Jewish mysticism known as Kabbalah) and intoned while taking out the *Torah* Scroll from the Ark during morning prayers. According to the Zohar (*Vayakhel*, 206a), when the Ark is opened by the congregation, the Gates of Mercy are opened in heaven. Therefore this is a propitious hour to pray for one's deepest desires. The following text is a preamble to the actual plea: "Not in man do I put my trust, nor upon any angel do I rely, but upon the God of heaven, who is the God of truth…" This musical phrase focuses on the contrasting conjunction *but* ("*Elo*"), which is repeated over and over in order to emphasize the denial of trusting anyone but God. Here too, the special vibrato construction on a very high note emphasizes the importance of this sentence in the prayer.

**2. Steady tone leading to vibrato**

In this type of note construction, the cantor begins singing the note with a steady non-vibrating tone, and introduces the vibrato fluctuations only after substantial time has passed. Contemporary cantors emphasize the vibrato feature by postponing it, and by initiating it only after it can be contrasted to a previous steady part of the note. In both the contemporary and earlier cantorial singing styles, vibrato is used on every possible note (depending, of course, on the length of the note). A delay in its onset, therefore, has a remarkable effect. As with the previous type, this type of note construction is not found in performances of the earlier generation of cantors.

As noted above, the majority of contemporary cantors' enhancements are cadential notes, which are given more time and attention. A typical example of this vibrato type is demonstrated in Figure 8. Here, the B shown in the spectrogram is the final note of the musical verse.

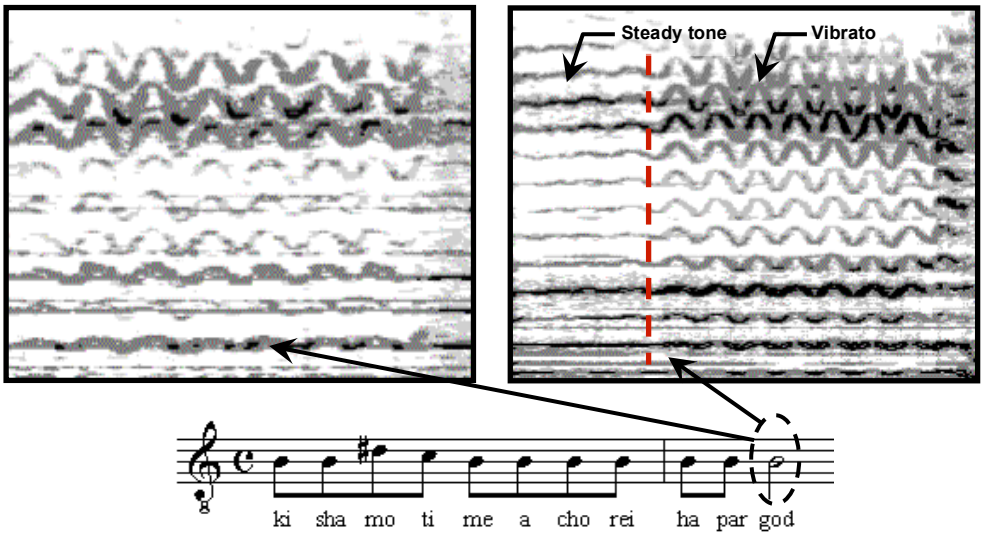


**Figure 8.** Steady tone leading to vibrato.

The left spectrogram shows the B note sung by Cantor Kwartin (earlier generation), while the right spectrogram shows the same note as sung by Cantor Israel Rand (contemporary). Notice Rand's note construction: first an initial steady segment followed by the vibrato. Kwartin's vibrato is the same throughout the note.

[Audio File 7 – Kwartin] [Audio File 8 – Rand]

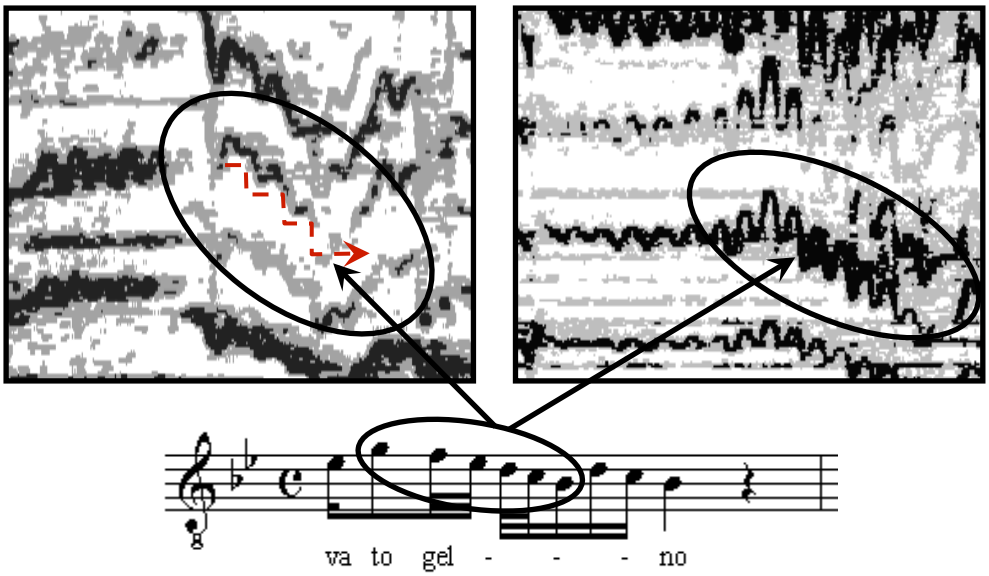


**Figure 9.** Vibrato in downward motion.

The left spectrogram depicts Cantor Sirota's terraced version of this musical passage. The right spectrogram shows Cantor Helfgot's vibrated version of the same notes.

[Audio File 9 – Sirota] [Audio File 10 – Helfgot]

### 3. Vibrato in downward motion

In this vibrato type, the vibrato is used to emphasize the downward direction of the melody by fluctuations in pitch. Instead of a regular stepwise downward motion from tone to tone, there is a vibrating glide towards the lower tones. A typical example is the melodic downward line (G-F-E♭-D-C-B♭) in Figure 9, performed by Cantor Sirota (left) and Cantor Helfgot (right) in the *Kabalat Shabbat* recitation of Psalm 97. This psalm describes the effects that result from God's assumption of the judgeship over the world: 1) the dismay it creates for the wicked, and 2) the light it brings to the righteous (Cohen 1950, 318). David Aisenstadt's composition begins in the second part of the psalm, in verse 8: "Zion heard and was glad, and the cities of Judah rejoiced, because of Thy judgments, O Lord." The downward melody depicted in the spectrograms is set to the word *Vatogelno* (rejoiced), which is the main theme in this verse. The special downward vibrato in Cantor Helfgot's performance clearly serves to highlight the magnitude of the delight described in this verse.

### 4. Pure and steady tone

The last vocal technique I discuss regarding vibrato is the pure tone. Because vocal singing is based on breathing and stretching the vocal cords, the naturally produced tone is usually somewhat uneven in terms of pitch. This means that even when singing regular non-vibrato tones, the outline of the pitch as shown on a spectrogram will not form a completely straight line, but will fluctuate mildly. Nevertheless, contemporary performances sometimes feature a special kind of note that is absolutely straight without any vibrato whatsoever, not even the natural fluctuations of the human voice. Notes sung in this special way sound different than regular non-vibrato notes; one could say that they

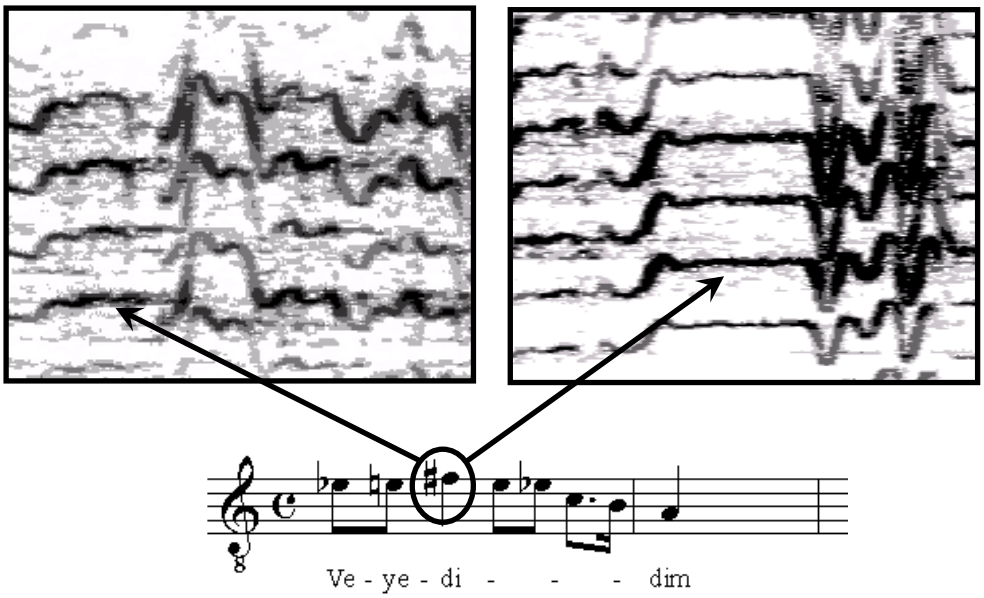


**Figure 10.** Pure and steady tone.

The left spectrogram shows Cantor Kwartin's F♯ note (see arrow) with the natural fluctuations, while the right spectrogram depicts Rand's straight note.

[Audio File 11 – Kwartin] [Audio File 12 – Rand]

are somewhat sharper and cleaner. This technique can be used when special emphasis is called for. As already mentioned above, all cantors customarily add vibrato to every tone. In this style, then, a tone that has no vibrato at all is most unusual, and its impact is therefore tremendous.

The example (Figure 10) is from Cantor Kwartin's *Tiher* recitative. There are small fluctuations in Kwartin's interpretation of the high F♯, while in Cantor Israel Rand's recording the same note is completely smooth.

### *2.1.3. Vibrato shapes within musical phrases*

The contemporary cantors' attention to the most minute performance attributes allows them to construct more complex musical phrases using vibrato. With more types of vibrato at their disposal, they can compose a varied tapestry of vocal sound. Two examples are presented below.

**Example 1: Various vibrato extents in a single phrase**

As mentioned above, no consistent difference exists between the two periods in the VE in a statistically random comparison of performances (that is, a note-to-note comparison, like the case of the VR). There is a striking difference, however, in the overall utilization of this vibrato characteristic when the notes within a complete and coherent musical phrase are compared. While the VE in the earlier generation's performances is similar across all notes of a phrase, more diverse vibrato extents can be found in the performances of contemporary cantors.

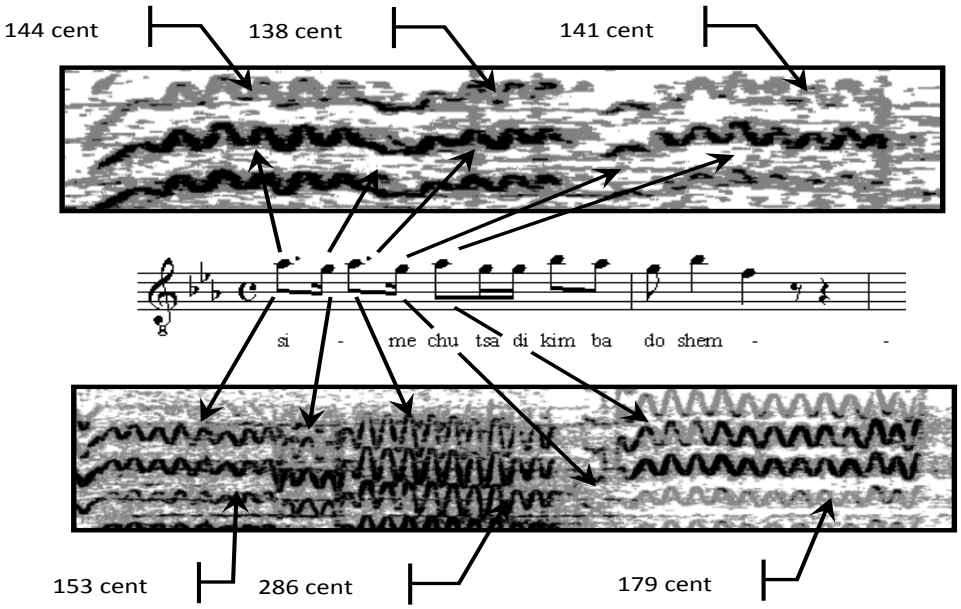


**Figure 11.** Various vibrato extents.

The upper spectrogram depicts Cantor Sirota's version of the three note trill. Notice how all of his vibrato notes have a similar extent. In contrast, the lower spectrogram shows Cantor Helfgot's version with three different vibrato extents.

[Audio File 13 – Sirota] [Audio File 14 – Helfgot]

The concluding verse in David Aisenstadts' *Kabalat Shabbat* cantorial recitative for Psalm 97 is the climax of this composition. The melody consists of a trill of three high A♭ notes that serve to emphasize the happiness of the righteous: "Simechu Tsadikim badoshem" ("Rejoice in the Lord, ye righteous"). While Cantor Gershon Sirota (from the earlier generation of cantors) creates a similar VE for these three notes (Figure 11), Cantor Helfgot (a contemporary cantor) creates three different VEs for each vibrato: first, a 153 cent vibrato, then a huge 286 cent vibrato and, finally, a medium-sized 179 cent vibrato (the amount of 100 cents is equivalent to a semitone). The radical changes in the vibrato extent in this short musical phrase, as opposed to the standard vibrato notes found in performances of the earlier generation, demonstrate how the contemporary cantors give a more varied rendition of the text.

**Example 2: Various vibrato shapes in a single musical phrase**

The final example of vibrato demonstrates once again how the contemporary cantor makes use of his large vocabulary of note types in order to eventually create a more vocally varied performance. Another phrase from the *Ano Avdo* prayer (described above) is shown in Figure 12. The concluding part of this prayer is a plea before the Lord: "May it be thy will to open my heart unto thy law, and to fulfill the wishes of my heart and the hearts of all thy people Israel for good, for life, and for peace." In the earlier performance (the upper spectrogram in Figure 12), each note is sung with the same kind of vibrato. Yet, in the contemporary version (the lower spectrogram), Cantor Stern uses no less than four different types of note construction for this short musical passage: He begins with a small-scale vibrato, which is then followed by a larger vibrato. Then, for an additional five

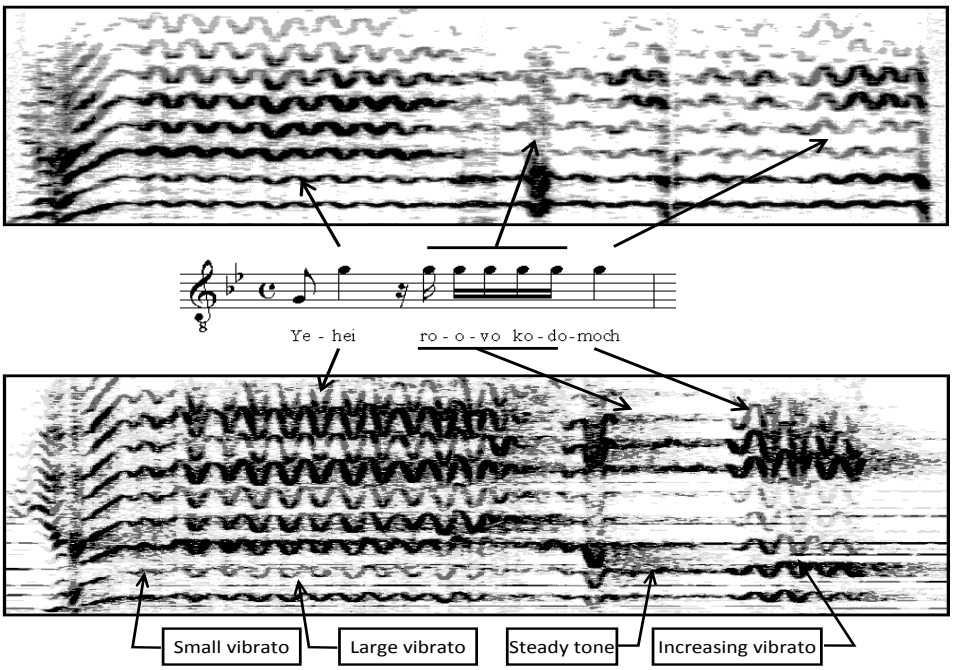


**Figure 12.** Various types of vibrato.

The upper spectrogram depicts Cantor Schmidt's version of this verse with the same vibrato type throughout the verse, while the lower spectrogram shows Cantor Stern's (contemporary) version with four different types of vibrato construction.

[Audio File 15 – Schmidt] [Audio File 16 – Stern]

sixteenth notes, he completely removes the vibrato. He concludes with an expressive increasing vibrato on the last note. This example too, shows the detailed approach to the construction of the notes by contemporary cantors, which enables them to devise more varied and complex renditions of musical phrases than the cantors of the earlier generation.

### *2.2. Glides (Glissandos)*

Another important performance feature is the ability of the human voice to manipulate the frequency of pitch throughout its duration via glissando. Unlike vibrato where the pitch frequency is repeatedly altered in an oscillating pattern, the glissando is a single smooth upward or downward glide in pitch at the beginning or end of the note. Consider, for instance, the following phrase from the *Elu Devorim* composition by Rapaport, as sung by Cantor Mordechai Hershman. As seen in Figure 13, the changes in frequency between the first six notes are very clear. However, the movement from the sixth to the seventh note (B♭ to E♭) is not achieved by means of a leap to the upper note, but is rather created by means of a smooth, continuous, and quite long glide.

In an analysis of the sound spectrograms of five pairs of performances (for five cantorial compositions), the glissandos were counted and measured. The findings show that: 1) contemporary cantors tend to add more glides between notes compared to cantors of the earlier generation, and 2) contemporary cantors prolong and extend the length of the glides in comparison to the earlier performances. As the findings below are presented

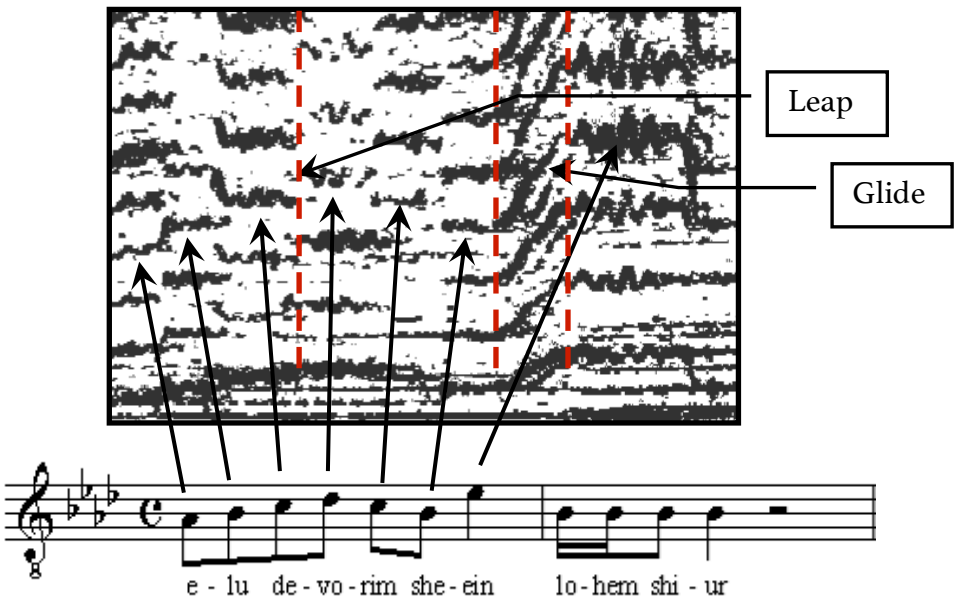


**Figure 13.** Glides between notes.

[Audio File 17 – Hershman]

in statistical charts, an example with a visual spectrogram is warranted in order to demonstrate the difference between the two generations of cantors. The spectrograms in Figure 14 show a musical phrase from the *Rachem no* recitative by Cantor Yossele Rosenblat. As is clearly seen, contemporary Cantor Klein adds no less than three glides (from D to G, F♯ to A, and B to D), whereas Cantor Rosenblat jumps abruptly from note to note without a noticeable glide.

The difference in the use of glissandos between the two generations of cantors is evident in the measurement of glissando frequency and extent as shown below.

### *2.2.1. Glissando frequency*

As seen in Figure 15, there is a consistent difference between the performances of the earlier generation of cantors and the contemporary performances. The contemporary cantors insert an average of 51.22% more glissandos than the cantors of the earlier generation. This difference in the frequency of glissando use between the periods is statistically significant ($p = 0.006$).

### *2.2.2 Glissando extent*

The impact and strength of a glissando is derived from the length of the glide.[16] The length of a glissando is measured in two ways: 1) absolute glide length and 2) the

[16] Actually, the glissando extent is also determined by the difference in *frequency* between the starting point and the end point of the glide (which is the beginning of the second note) and not only by the time difference. The pitch difference, however, is only relevant for initial/concluding phrase notes (or after breaks within a phrase) where there could be differences in the attack or decay segments of the note. In glides

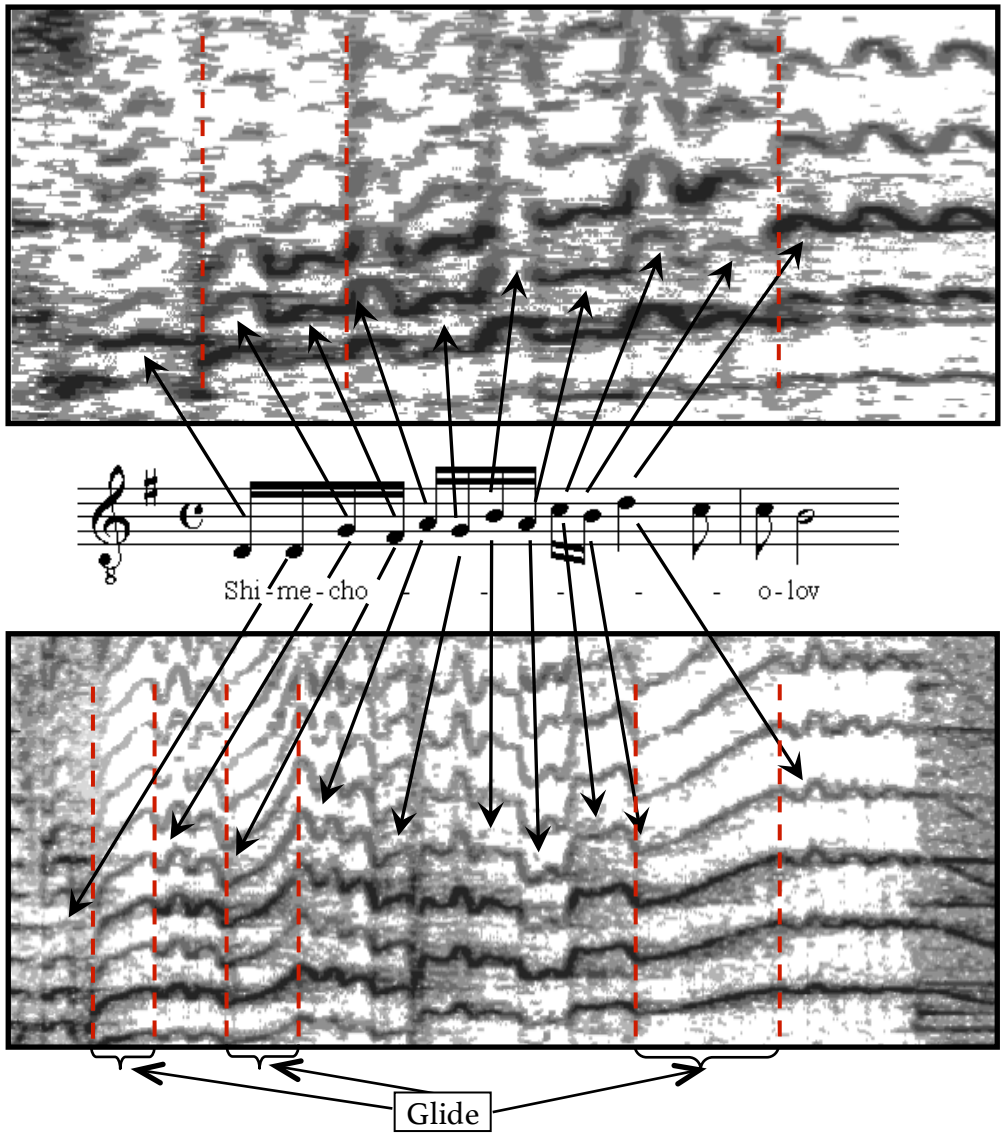


**Figure 14.** Glides *versus* jumps.

[Audio File 18 – Rosenblat] [Audio File 19 – Klein]

proportion between the actual gliding portion and the steady portion of the note.[17] I measured the latter in order to refute the notion that the differences in the glissando characteristics are merely a consequence of the length of the note itself. A total of one hundred glissando notes were analyzed. From five pairs of performances, ten glissando notes were randomly chosen for comparison. The findings show that the glissando extent

*between* notes, the source and target frequencies are obviously *the same* in early and contemporary performances, and therefore, only the *time* difference was measured. Moreover, the glissandos in the beginning or concluding phrase notes (attack and decay stages of the note) are found to be quite the same in all performances of cantors of both the earlier generations and the modern age—usually not more than half a tone.

[17] The longer the glide portion and the smaller the steady portion, the larger the glissando extent, and vice versa.

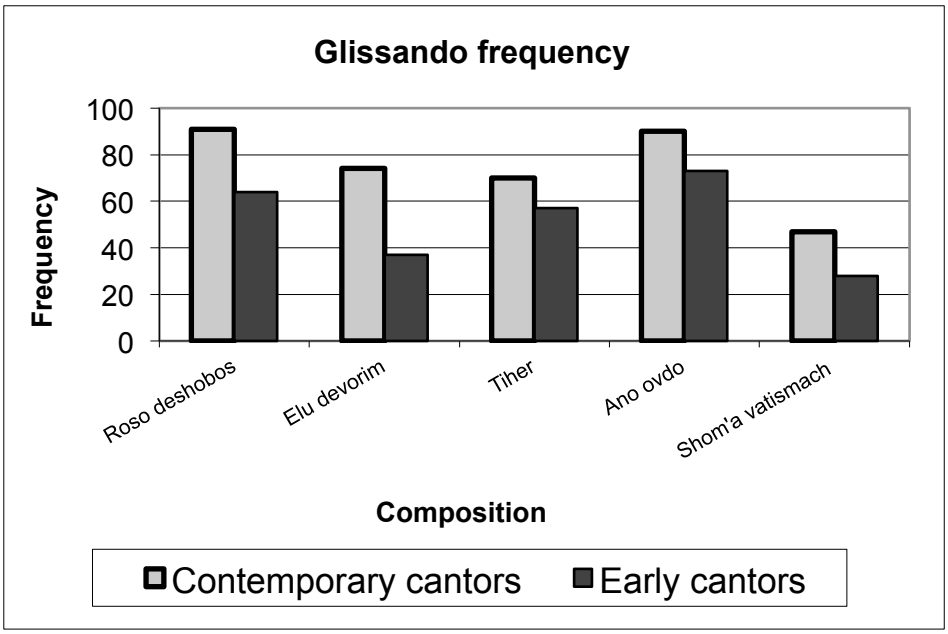


**Figure 15.** Glissando frequency.

is far greater in the contemporary performances than in the early performances in both respects (absolute and proportional):

1. Absolute glissando length: As shown in Figure 16 (and in the corresponding detailed Table 4 in the Appendix), the average length of glissandos in contemporary performances is greater than in the performances of the earlier generation of cantors. The average difference is 46.33% and is statistically significant ($p = 0.008$).

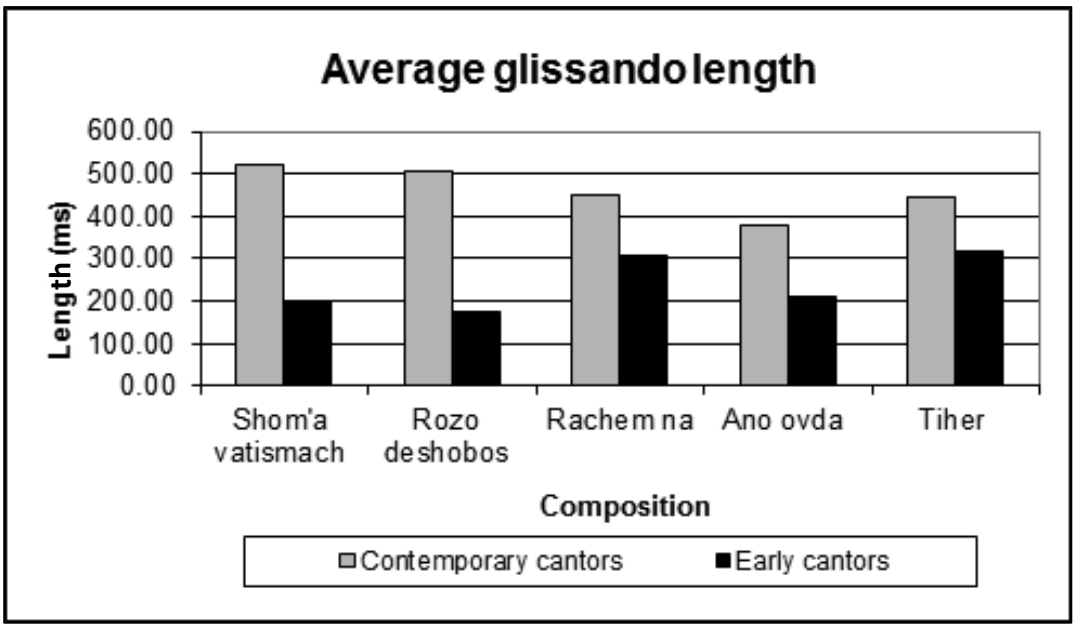


**Figure 16.** Average glissando length.

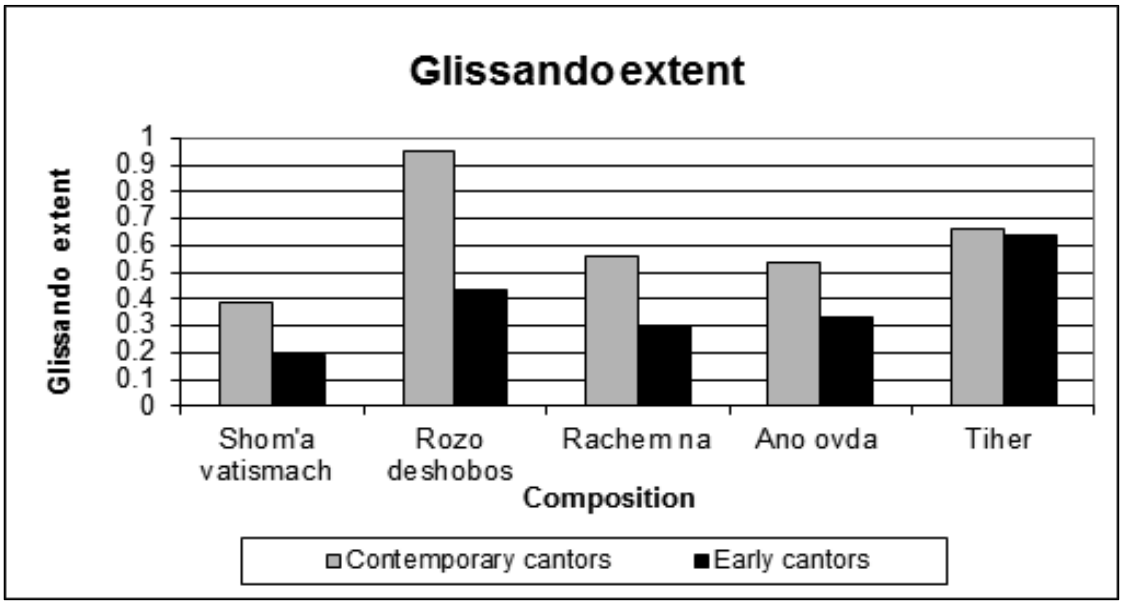


**Figure 17.** Glissando extent.

2. Proportional glissando length: As shown in Figure 17 (and in the corresponding Table 5 in the Appendix), the proportion between the glissando portion and the steady note portion is larger in the contemporary performances. The average difference is 38.85% and is statistically significant ($p = 0.03$).

### 3. Intensity

A key performance element is dynamics. Every performer strives to assign the right volume to each musical passage according to his interpretation of its function in the composition. Most performers will play or sing quietly in places that require tranquil music and, in turn, will sing or play loudly in dramatic and exciting musical passages. When the music is set to words, the impact of dynamics on the overall musical experience is especially dramatic. All singers use dynamics in order to interpret and emphasize portions of the text and, in this regard, the contemporary cantors do not differ from the earlier generation of cantors.

Note, for instance, the intensity curve of the *Veal Yedei Avodecho* recitative in Figure 18. Both cantors interpret this text and music similarly and, consequently, both dynamic curves of these performances are approximately the same: the *fortissimo* segments are 3, 9–10, 19 and 23–25, in between are *piano* and *pianissimo* segments, and the overall curve constitutes a crescendo, or increase of intensity. Naturally, the dynamics match the text: since this text consists of four quotations from the Scriptures (three from the Prophets and one from the Pentateuch), the cantors build four matching dynamic peaks—one for each verse (illustrated by the four arrows in Figure 18). The first peak matches the first verse: "Thus saith the Lord, the King of Israel, and his Redeemer the Lord of hosts: I am the first, and I am the last, and beside Me there is no God" (*Isaiah* 44, 6). The following dynamic peak in segment 9–10 "word-paints" the upward direction described in this segment of the verse: "And saviours shall *come up* on Mount Zion to judge the mount of Esau; and the

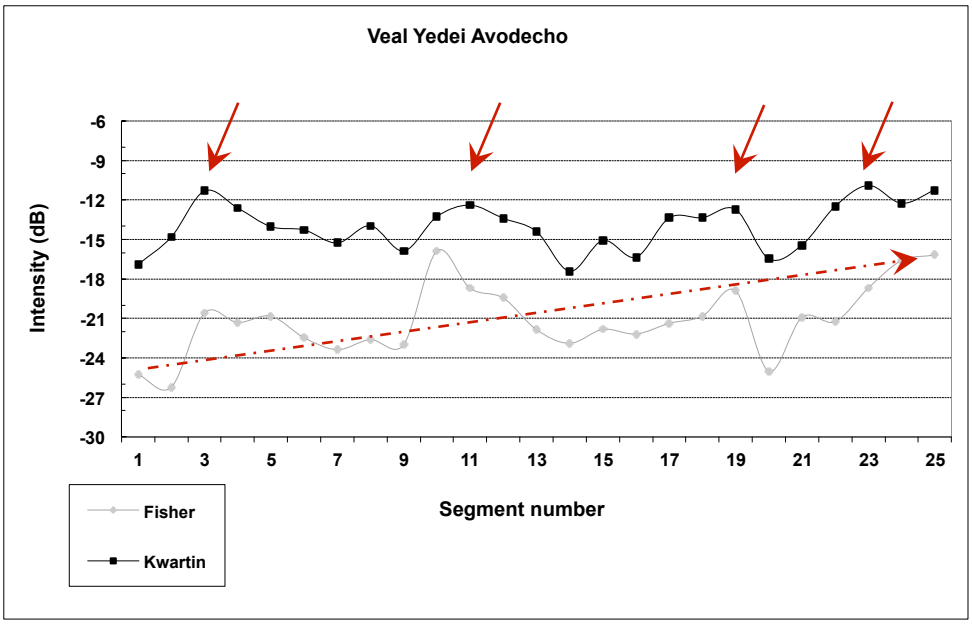


**Figure 18.** Intensity curve for the *Veal Yedei Avodecho* recitative.

kingdom shall be the Lord's" (*Obadiah* 1, 21, italics mine). The next peak in segment 19 emphasizes the main theme of the *Rosh-HaShana* service, namely, that God is the one and only Master of the universe: "And the Lord shall be King over all the earth; in that day shall the Lord be one, and His name one" **(***Zechariah* 14, 9**).** Finally, the last peak in segments 23–25 is set to the proclamation: "Hear, O Israel: the Lord our God, the Lord is one" (*Deuteronomy* 6, 4).

Although both contemporary cantors and cantors of the earlier generation use dynamics skillfully in their musical renditions, there is still a striking difference regarding the particular use of dynamics between the generations. As has been established so far, the contemporary cantors emphasize the most minute performance attributes (such as timing, vibrato, and glissando) in their performances. The same is also true with regard to dynamics. Beyond the overall adjustment of intensity according to the general mood of the text and music (as exemplified in Figure 18 above), contemporary cantors also set and adjust the intensity of each specific note according to its particular role in the music. This particular setting of each note to a certain intensity is not prevalent in the earlier performances.

Below are three examples.

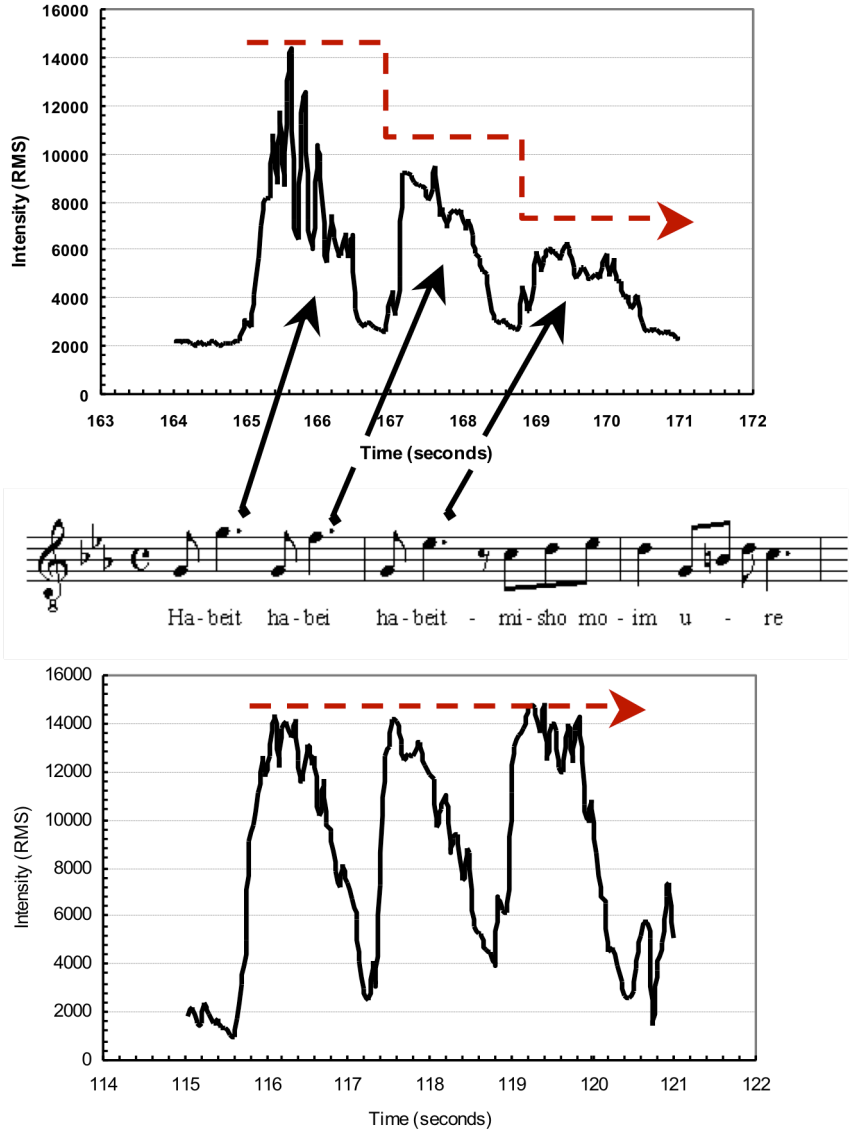


**Figure 19.** Downward intensity curve.

*Habeit Mishomoim U'r"* – intensity curve. The upper chart shows the intensity curve of contemporary Cantor Stern and the lower chart shows the intensity curve of Cantor Hershman, who belongs to the earlier generation of cantors. Notice the terraced arrow in the upper chart *versus* the straight arrow in the lower chart.

[Audio File 20 – Hershman] [Audio File 21 – Stern]

**Example 1:** The first textual verse of the *Habeit Mishomoim U're* composition is as follows: "Look from heaven and see how we have become an object of scorn and derision among the nations." In this particular composition, this initial verse is fragmented and repeated over and over by the cantor in various musical phrases. In one of these musical phrases, the word *habeit* (look) is repeated three times in a descending melodic line, G-F-E♭ (see Figure 19). While the cantor of the earlier generation (Mordechay Hershman) sings all three notes at the same volume, the contemporary cantor (Moshe Stern) decreases intensity as the melody descends. As seen in the intensity curve in Figure 19, the high G is

the loudest, the second note is softer and the concluding note has the lowest intensity. The downward direction of the melody on this word serves to emphasize the action of looking down from the heavens. This decreasing intensity reinforces the word-painting of the melody.

**Example 2:** The following musical phrase is a typical cantorial melodic embellishment in the form of an ascending and descending sequence using a small melodic motive. The two words *Kulho Arkin* (all abandon) that comprise this melodic passage are taken from the Aramaic *Zohar* text intoned as a preface to the *Shabbat* evening

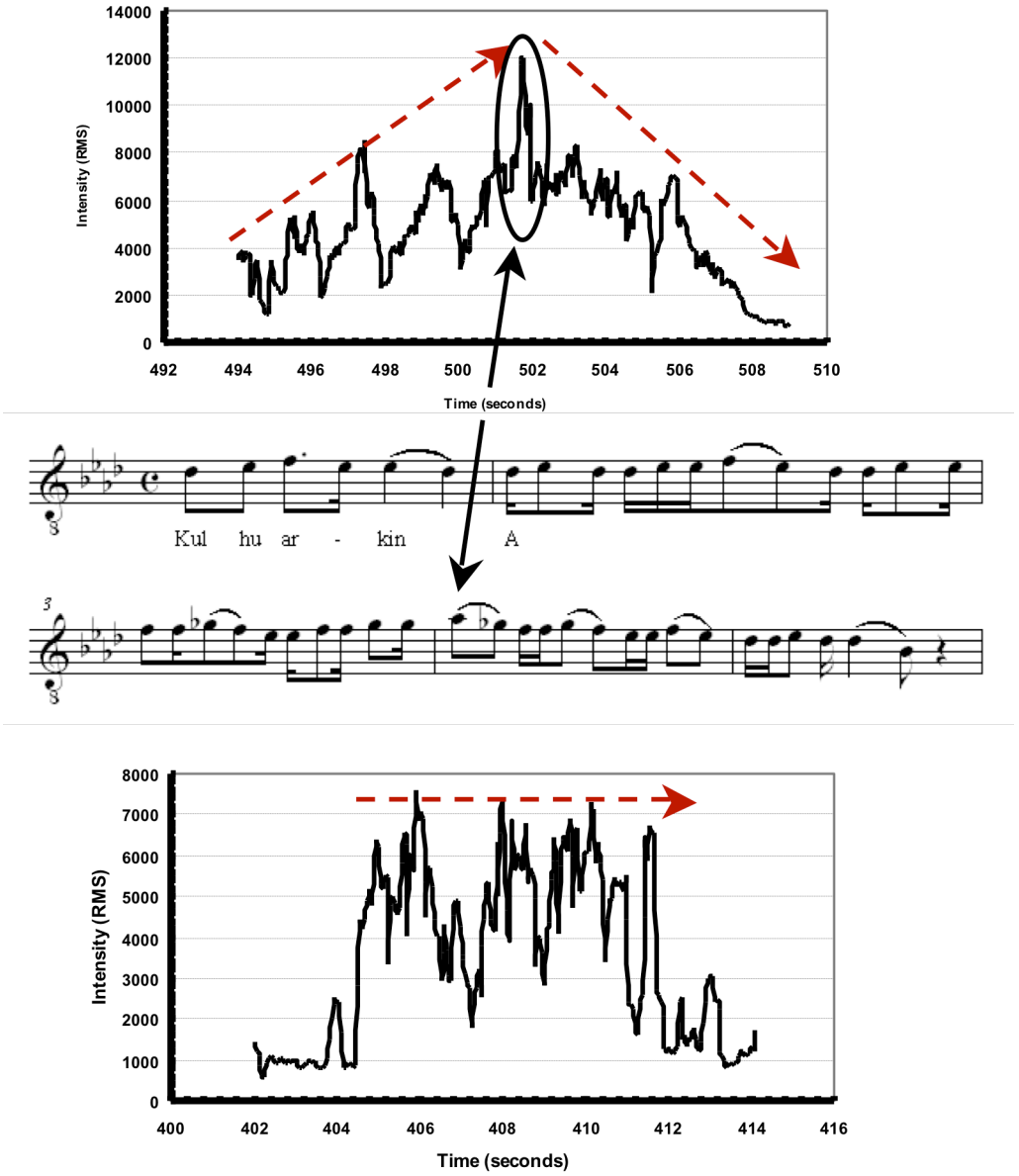


**Figure 20.** Up-and-down intensity curve.

*Kulho Arkin* - intensity curve. The top chart shows the intensity curve of contemporary Cantor Adler while the lower curve belongs to the Cantor Pinchik from the earlier generation. Notice the up-down arrows in the upper chart versus the straight arrow in the lower chart.

[Audio File 22 – Pinchik] [Audio File 23 – Adler]

service. These words describe how the holiness of the *Shabbat* day causes the evil powers that are present on ordinary weekdays to abandon the world. As in the previous example, while the cantor from the earlier generation (Pinchik in the lower chart of Figure 20) sings the entire phrase with the same intensity, the contemporary cantor (Adler, in the top chart) creates a rising and descending intensity curve for this musical passage in accordance with the melodic direction. Here, too, the melody can be viewed as serving to emphasize the meaning of the words; the rising motion of the melody symbolizes the departure of evil powers from the world. The matching change in intensity in the contemporary performance reinforces the word-painting motion of the melody.

**Example 3**: The concluding interval of the following phrase (from the *Ano Ovdo* recitative) rises. While the contemporary cantor (Stern, in the upper chart of Figure 21) adjusts the intensity of both notes according to the upward direction of the interval, the early-generation cantor (Schmidt) sings both notes with the same intensity.

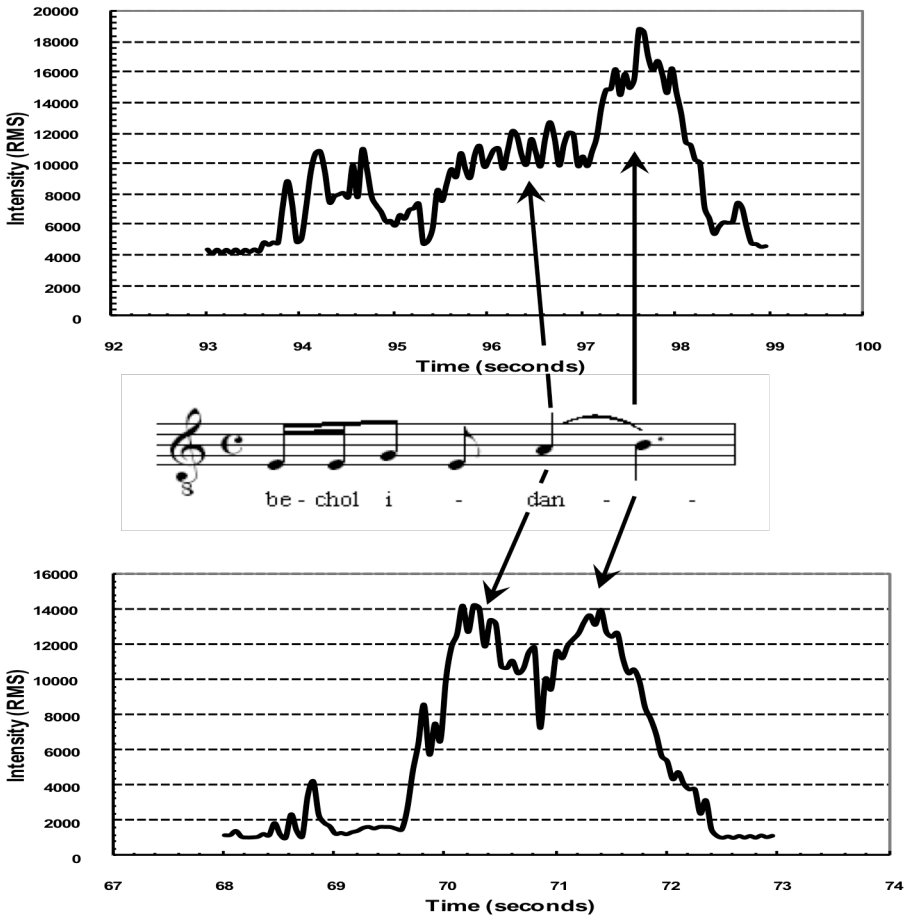


**Figure 21.** Upward intensity curve.

*Bechol idan* - intensity curve. The upper chart shows the intensity curve of contemporary Cantor Stern while the lower curve represents the intensity curve of Cantor Schmidt from the earlier generation. Notice the large increase in the intensity between the A and the B notes in the upper chart versus the even intensities for A and B in the lower chart.

[Audio File 24 – Schmidt] [Audio File 25 – Stern]

These three examples demonstrate how contemporary cantors sing individual notes at a dynamic level corresponding to their pitch height in the melody. A few instances such as these where found in each examined performance. Early generation cantors, however, were not found to match the singing volume to the pitch height. They maintain a common intensity level for small groups of notes, and diversify the intensity only on a larger scale (as shown in Figure 18). This difference fits the overall contemporary cantors' approach of high sensitivity to minute performance elements, in which they also vary intensity according to the height of individual notes.

## DISCUSSION

The purpose of the following section is to analyze the results and to provide an explanation for the differences in performance practice between the periods examined. After summarizing the main results, I will turn to a discussion of possible explanations for them. I will first point out that performers who were interviewed for this study were only partly aware of the differences between their performances and the historical performances (with which they were all obviously familiar). However, as I suggest below, this is not surprising, as practitioners do not always reflect on broader trends and changes, even if they themselves might be associated with such trends. Secondly, I will discuss one particular point that came up in these interviews and which could be considered a possible explanation for the changes in the cantors' performance practice. Interviewees pointed out some technical developments which took place at the beginning of the twentieth century. However, as I will suggest in my discussion below, these technical changes do not adequately explain the significant findings of the current study. I will then suggest a broader approach that takes cultural changes (some of which may of course be related to technological changes) into consideration, and better accounts for the scope and magnitude of the findings. Finally, I will elaborate on another point that came up in the interviews. Most cantors emphasized their desire to be innovative. Although I believe this point does not explain the changes in the cantors' performance style, a reconstruction of the explanation might provide real insight into the deep changes which occurred in Jewish religious practices in the twentieth century.

### Summary of Findings

This study shows that there are significant differences between the performance practices of the earlier and later generations of cantors. Changes in performance practice were observed in three dimensions of sound—time, pitch, and intensity. Contemporary cantors sing more slowly than cantors from the earlier generation (at an average rate of 27.26%), spending more time on key areas (such as cadences and climaxes). The vibrato of contemporary cantors is also slower, that is, having a smaller VR (at an average rate of 19.23%). They also diversify the shape of the vibrato, not only among various notes in a phrase (as in Figures 11 and 12 above), but also within individual notes (as in Figures 5–6 and Figures 8–10 above). Contemporary cantors use more glissandos between notes (an average of 51.22%), and also lengthen the glides between the notes (by 38.85–46.33%). Finally, contemporary cantors tend to shape the intensity of individual notes according to the specific musical context.

These changes in the cantorial vocal style should not be viewed merely as unrelated technical nuances; they reveal a coherent evolutionary change between the generations in their approach to singing. Contemporary cantors pay greater attention to detailed performance characteristics than cantors of the earlier generation. Contemporary cantors focus on subtle performance details, nurturing and manipulating every possible vocal element. The focus of contemporary cantors on the fine details of the performance allows them a broader range of vocal expression. The wider range of vocal resources makes room for more diverse modes of expression (as shown in Figures 8, 10–12, 14, and 21 above). In some cases, however, their attention to the most minute attributes of vocal expression seems to serve deeper interpretative purposes (since it is used to highlight and interpret certain words or ideas of the prayer text, such as in Figures 2, 5, 6, 9, 19, and 20 above).

Although the changes in the vocal performance style may admittedly be somewhat subtle, they are nonetheless significant even for less perceptive listeners. For example, the slow speed of contemporary performances not only allows subtle manipulation of other vocal attributes (which may even be difficult for trained musicians to notice), but also changes the flow of the musical phrase and, therefore, affects the audience's comprehension and appreciation of various musical events within the particular performance.

It should be noted, however, that this study does not purport to offer a comparative aesthetic judgment. It does not claim that contemporary performances are better than golden age performances or vice versa. It merely accounts for the specific changes in performance. Nor does this study seek to suggest anything regarding the relative popularity of the two styles. Indeed, the audience appreciation and the extent of the reception of the changes can be measured in a study analyzing the audience preferences to the two performance styles, but this is not the subject under discussion in the current paper, and would not necessarily indicate anything conclusive regarding the aesthetic value of the performances. It may be noted in passing that, judging from the exceptional popularity of golden age recordings of cantorial music even today, it would be a mistake to assume that the contemporary performances are generally preferred by the public (notwithstanding what could be perceived as its advantages, such as increased variety and attention to minute details in the performance). On the contrary, it seems that there are still many listeners who prefer the performances on the old 78-rpm records over contemporary performances. Even though some members of the public may prefer recordings from the golden age for a variety of reasons not necessarily related to performance characteristics (such as nostalgia and conservatism), it does not seem a far stretch to also hypothesize that some people are not attracted to the exaggerated vocal sophistication of the new performances, finding this style weary, heavy, and tedious. It may also be that some audiences find that an emphasis on every vocal detail contradicts the intimacy and restraint that are associated with a prayer. Either way, whether we favor or dislike the contemporary changes, this study highlights the substantial differences between the performance approaches of each of the generations.

It should also be noted that the changes presented in this study refer to recorded performances only and not to actual performance of services in the synagogue. One could

assume that similar trends apply also to synagogue performances. Nevertheless, it could also be that the context of the functional prayer and the actual liturgical ceremony influences the performance practice due to various reasons such as the context of the specific prayer in the service, the type of text, the music's relation to the traditional *Nusach*, the type of audience, and more.

**How do Contemporary Cantors View the Change?**

Regrettably, cantors of the early generation did not provide us with self-reflective statements about their own performance practice (sources such as letters, personal documents, and annotated texts are not readily accessible and will require further historical study) but contemporary cantors were approached and asked about their views regarding their performance practice *versus* the early recorded recitatives. I interviewed several cantors and cantorial performers (such as conductors, teachers, and choirmasters). One pattern that seems to emerge from the interviews—although the cantors' views revealed in these interviews are quite complex—is that most cantors tend to be more aware of certain aspects of the change while completely oblivious to others. As far as the subtle performance attributes dealing with the delicate construction and manipulation of the vocal notes, contemporary cantors are generally unaware of any differences between their own performance practices and those of the earlier generation (at least with regard to those differences discussed in this article).[18] This includes vibrato types, vibrato rate, the recurrence of glissandos within a given performance, the length of the glissandos, and various characteristics pertaining to intensity. However, the cantors are indeed aware of other differences that are more easily noticeable and which are not related to the subtle vocal design of individual notes, such as the speed of the performances, instrumental arrangements, melodic embellishments, vocal diction, and pronunciation. Nevertheless, it is clear that contemporary cantors did not *consciously* choose to divert from the earlier performance practice and to adopt a new style.

Moreover, contemporary cantors were surprised to learn that there is such a significant difference between the generations. For instance, they were surprised to hear that they use longer glissandos and also do so much more frequently than the earlier cantors did (as Figures 15-17 above attest).[19] This is true also with regard to the vibrato rate

[18] Among those interviewed are the cantors Israel Rand, Yitzhak Helfgott, David Weinbach, Binyamin Munk, and Dudu Fischer, and conductors Ellie Yaffe, Mordechai Sobol, and Raymond Goldstein.

[19] The reason for their surprise, as they explain it, is that they associate the vocal glide, especially in downward direction, with the sigh of a crying or pleading person. For many cantors, as well as for the Jewish audience, this type of vocal expression fits the image of the old-time Jew in the Diaspora, pleading and longing for salvation. In view of the new reality experienced by most contemporary Jews, one would expect the contemporary cantors to minimize these seeming references to the Diaspora. However, as noted above, the findings suggest quite the contrary. It could be assumed, however that contemporary cantors add more glides to their singing, probably because they want to evoke the traditional singing style. They regard the glissando as one of the hallmarks of traditional *chazanut*. They therefore wish to intensify their association with the old-time legacy by using it more frequently, even if they do so unconsciously. Raymond Goldstein, an arranger and teacher of cantorial music, explains that the cantors' desire to sing in the "correct" style makes them over-imitate their krechts (a wailing, sobbing bent note) and other vocal manipulations. He complains that "you can't see the wood for the trees" and explains that because of too many embellishments, one cannot hear the continuous melodic line. He says, therefore, that one of his goals when working with young cantorial students is to fight this trend of "Gramophone cantors," as he calls them, who imitate any

(as shown in Figure 4 above) and the other vibrato manipulations (as in Figures 5–12 above). The most vivid example was an interview with Cantor Israel Rand. When shown the results of this study and the respective spectrograms of his performance of the *Tiher Rabbi Yishmael* recitative and Zewel Kwartin's performance, Rand started humming his own version to himself, as if trying to experience the difference that he saw on the spectrograms. Even after seeing the spectrograms showing his increasing vibrato and the gradual increase of his VE (Vibrato Extent, see definition above), Rand needed to sing the phrase to himself in order to realize that the precise features of his own performance practice were those typical of the contemporary cantorial style. Clearly, the increased vibrato was not the result of a deliberate choice on his part.

All this should not come as a surprise. Performers are often unaware of the specific features that make their performance special, unique, or emotionally expressive. Authors dealing with the kinds of subtle elements of performance which are analyzed in this paper agree that such detailed vocal attributes are indeed shaped intentionally to achieve certain expressive effects, but they also agree that the process of picking the various attributes is unconscious (Rapoport 1996, Sundberg 1998, and Howes 2004). While performers try to come up with the best-possible performance, often expressing dissatisfaction with other performances, the features that differentiate their performance from others are often obscure even to them. A salient feature of performance in general is that it is often hard to quantify and formalize. Thus, it is the researcher's rather than the performer's role to specify the distinctive features of each performance and to hypothesize about processes of change. However, this does not mean that contemporary cantors are not aware that their performance is *different*; all that can be said is that their choice to perform the recitative differently did not involve a conscious choice among various possible performance practices (the "early practice," the "contemporary one," and so on). Rather, it was the outcome of a more general choice to provide a unique, personal or, simply, the best-possible performance. The specific musical attributes that make the performance what it is were not consciously manipulated from an aesthetic, artistic or philosophical standpoint. The cantors do not refer to the various recorded performances in terms of historical eras; rather, they view differences in performance as an outcome of personal style, taste, and voice quality. Indeed, not only performers, but also composers and other artists, often fail to realize that their creations are part of more general trends. While many artists are subject to the same influences from the *Zeitgeist*, very few are aware of the transitions taking place during their time and are consciously adhering to them.[20]

## Technical Developments

Some components of the new performance practice were more vividly apparent to contemporary cantors and some explanations were given for the changes. For example, the fact that a contemporary performance is slower than an early one did not strike many

squeak in the recording ("even if it is only a result of a crack in the record…"), and he encourages the cantors to express the music in their own ways.

[20] But this is not to say that there is no explanation for the change, and that explanation is not related to the cantors' aspirations. I merely state that the nature of the change is not conscious. As detailed below there are several ways to explain the change, some of which refer to the cantors' perceptions and desires.

of those interviewed as peculiar or surprising. Most of them related the high speed of early recordings to the shorter length of the records at the time. Another reason given for differences in speed is related to orchestration issues in contemporary recordings. Conductor Mordechay Sobol (director of the Yuval Ensemble for Jewish and Cantorial Music), for instance, views the change in the size of the orchestras and choirs as the most significant change in performances. He maintains that the huge orchestras and choirs in contemporary recordings, and the complexity of the musical arrangements such ensembles entail, require the tempo and timing to be executed very differently than in the simple and modest vocal or instrumental accompaniments in the recordings of the earlier generation of cantors. While these distinctions are valid, they do not suffice to explain the change in the performance speed. A lengthy discussion of this particular issue is not a part of this study, but some brief remarks will be offered. Regarding the limited length of recordings: 1) time limits explain only why *early* performances are fast, but not why a change occurred; 2) the difference in speed is also apparent in short compositions to which the time constraints did not apply; 3) there was no sudden change in the performance speed once LP records overcame this limitation; and 4) even ignoring all these obvious problems, there are other ways to deal with the time constraint, such as composing a shorter piece if it was intended for a record (as Cantor Kwartin [1952] attests in his memory book), dividing the piece into two to extend over both sides of the record (as was done for many pieces at the time), or shortening—even omitting—the instrumental or chorus interlude passages. Regarding the orchestration, while this development might serve to explain the later need for changing the speed in some pieces, it cannot really serve as a complete explanation, as there are numerous contemporary recordings with only piano or organ accompaniment and yet their speed is still slower than that of early recordings.

There is a more important reason for questioning the above arguments as relevant for the change in speed. The differences in record length and orchestral complexity only serve to explain one specific aspect from a whole range of changes which cantorial music underwent during the golden age of the cantorate. Such a broad phenomenon usually calls for a broad, overarching explanation rooted in deep conceptual and cultural processes. Such an explanation would be more profound and comprehensive than explanations regarding technical processes which lead to only one particular aspect of the change.

**The Recording Industry and its Impact on Cantorial Music**

In much of the literature describing and analyzing the impact of the early-twentieth-century recording industry on the development of music in general and on performance practice in particular, authors generally agree that the phenomenon of recording has detracted from the spontaneity and expressiveness of the musical performance, making it more precise and more technical.

Robert Philip (1992) concludes his analysis of contemporary Western music performance practice with the following observation: "recorded performances from the early part of the century give a vivid impression of being projected as if to an audience. They have a sense of being 'put across', so that the *precision and clarity of each note is less important* than the shape and progress of the music as a whole. They are intended to

convey what happens in the music, to characterize it. The accurate reproduction of the musical text is merely a means to this end" (230, italics mine). But, as Philip (1992) notes, "in the late twentieth century the balance has shifted significantly. *The accurate and clear performance of the musical text has become the first priority* and the characterization of the music and its progress is assumed to be able to take care of itself" (italics mine). In other words, the recording industry increased the performers' awareness of the most subtle features of the performance which led, in turn, to an increased focus on "clarity, control, literalness, and evenness of expression, and away from informality, looseness, and unpredictability" (229). Richard Taruskin (1995, 111) views this change in approach as a shift "from vital to geometrical," that is, from a free and spontaneous to a strict and rigid performance, tightly controlled in every respect. As Timothy Day (2000, 151) notes, this technical and controlled approach promoted by the commercial recording industry has also inevitably led to "emotional coolness."[21]

This phenomenon also applies to cantorial music, in which the recording industry has increased the performers' awareness of the performance details (note length, vibrato, glissando, and intensity). Here too, the more technical contemporary approach and the focus on minute performance details could be regarded as a trend towards more clarity and control, and away from informality, looseness, and unpredictability, as noted by Philip. The intimate and seemingly informal character of early cantorial singing has changed in favor of a performance which is more organized, precise, and focuses on the most minute performance attributes. The way contemporary cantors approach the cantorial recitative, developing and nourishing the minutest details of each musical maneuver, may often be somewhat tedious, and comes at the expense of the emotional excitement that accompanies a more spontaneous, less technical, performance.

Although the change in performance practice engendered by the recording industry is common to a variety of musical genres, in the context of cantorial music, I believe it reflects a deeper process related to the fact that the art of cantorial music has gradually been phased out of its original functional role as part of the synagogue ritual. The times when nearly every synagogue had its own professional cantor are over. In the synagogue, one no longer hears the cantor spontaneously pouring his heart out, as was the case at the beginning of the twentieth century. Since the end of the golden age around the middle of the twentieth century, there has been a gradual decline in the number of synagogues occupying a professional cantor.[22] Cantorial music is now mainly performed in concert halls and in the recording studio. Currently, in the synagogue, the cantorial recitative is only performed on special occasions. Today's synagogue music is based on the traditional *Nusach* along with some new additions that have gradually penetrated the synagogue scene over the years (such as Carlebach's *Nusach*, popular tunes, *chasidic nigunim*, and so

[21] Philip, Taruskin, Day, and others based their work primarily on instrumental genres of Western art music, and only to a lesser extent, on vocal music. Nevertheless, their assertions regarding the effect of the recording media are also true regarding vocal music, because the conceptual change in the approach to the performance ultimately affected all musical genres. Findings regarding vibrato and glissando features, as well as tempo and dynamics, are just as relevant for singing as for any other instrument.

[22] See also "The Canonization of the Tradition of Improvisation" below and footnote 28.

forth).[23] Thus, today's public is exposed to the cantorial recitatives almost solely via recordings and concerts. The somewhat detached recording or concert performance of a cantorial recitative lacks the ecstatic dimension of the live prayer in the synagogue. Indeed, recordings of cantorial performances do not constitute an act of prayer. Their connection to the actual prayer is merely due to the origin of both the text and the music.[24] This emotional detachment is consistent with the general trend towards a more technical approach to singing encouraged by the commercial industry, and has probably accelerated the evolution of cantorial performance practice in this direction.

Furthermore, the gradual removal of cantorial art from the context of the synagogue brought the music to the foreground. In the synagogue, the prayer itself (that is, the text) was at the center of the ceremony. The music was definitely an important part of the synagogue ceremony, and the ambitious cantor sought to impress, excite, and inspire the worshipers with creative music. Still, the intricacies of the performance were not the cantor's main goal. In contrast, the effect of the recording studio, and the very different artistic context and the absence of any considerations pertaining to the religious ritual, intensified the role of the music, which in turn, led to a change in performance practice. That is, contemporary cantors place much more emphasis on various specific performance elements than the earlier cantors, and do so in a way that is much more technical.

While the transition to the recording studio was a general phenomenon that influenced many musical genres, the impact of this transition was greater and more radical in cantorial music compared to Western classical music. There is obviously a difference between the excitement accompanying a live performance before an engaged audience in a concert hall and the cool detachment of the empty recording studio, but there is an even greater difference between the atmosphere of the recording studio and the emotions evoked by a communal religious ritual.

Although the technological developments in the early twentieth century led to a shift in cantorial practice, these changes cannot be said to have been forced by the new technological media, since musical style can easily be adapted to one technology or another. Rather, these new technologies encouraged cantors to sing also outside of the synagogue and drove the decontextualization of performances. It is this change of context and its cultural significance that have pushed towards a change in the performance practice in cantorial music.

### The Cantors' Desire for Originality and Personal Interpretation

Another explanation for the differences in performance practices is the cantors' desire for originality and personal interpretation. The cantors interviewed mentioned this

[23] On the change in the musical practice in synagogues in the twentieth century, see Klein 2011.

[24] Even though the earlier generation's performances in this study were also recordings, they nonetheless give a vivid impression of being projected to a praying congregation in the synagogue, maintaining the excitement of an actual prayer. Presumably this is due to the fact cantorial music had not yet left the sphere of the synagogue completely, and was still a part of the religious ritual. Contemporary performances, in contrast, are more removed from this functional environment, and therefore lack the religious excitement of the live ceremony.

point—which, as explained below, is also related to the impact of the recording industry—as a general comment and not with respect to a specific performance attribute. All cantors stressed that their main goal was to provide a unique, personal, and fresh rendition of the composition. Contemporary cantors try to avoid being labeled as mere "imitations" of the famous cantors of the golden age, and thus aspire to offer new interpretations of the musical work. Moreover, they seem to feel that the public expects new interpretations. This is especially true when a contemporary cantor's natural singing style or voice quality resembles that of a famous figure from the golden age. For instance, Cantor David Weinbach's singing style is known for its striking resemblance to that of Cantor Samuel Malavsky. Likewise, the quality of Cantor Helfgot's voice resembles that of Cantor Moshe Kousevitsky. When I interviewed them, they both stressed that when they sang the recitatives associated with Malavsky or Kousevitsky, they strove to imbue them with a personal interpretation. Weinbach said: "What you learn to do is how to take a *chazanut* piece and not imitate the [recorded] cantor like a parrot, but rather to understand the piece and to adapt the performance to your personality. You have to put your own personality into the piece."[25]

Moreover, all the cantors interviewed stressed the need to understand the text of the prayer in question and its connection to the music. They further noted that the composition should be performed so as to interpret the text. Although the cantors found it hard to pinpoint exactly what aspects of their performance serve an interpretive purpose, I believe they are referring to those instances where their highly technical approach, with their emphasis of minute performance attributes, highlights the text, thereby adding subtle interpretative layers to the music (as has been already noted in Figures 2, 5, 6, 9, 19 and 20).

Artistic creation and certainly artistic innovation are clearly the products of a creative drive and the desire to generate something "new" or "different." Yet this obvious characteristic of artistic creation does not in itself explain most artistic developments. This simple point entails a host of questions: why now (and not earlier or later in history)? Why these changes (rather than others)? And why is it that the changes introduced by many artists seem to be in the same direction? Clearly, the mere artistic aspiration for innovation does not constitute an adequate explanation, and does not provide answers to *these* questions. In order to understand the developments of a specific genre at a specific period in time, the internal constraints and currents that drive this artistic genre and the forms of development it has experienced need to be investigated and considered.

### The Canonization of a Tradition of Improvisation

As noted, the recording industry has had a tremendous impact on all kinds of music, mainly resulting in an era of more precise and less spontaneous music. This effect on cantorial music was augmented by the general move away from the synagogue—a place of worship—to the recording studio (even more so than the similar move from the concert

[25] Although also analyzed for this study, Cantor Weinbach's performances are not presented in this paper for technical reasons. However, when I interviewed him, he proved to be very conscious of his performance style, even more so than other cantors.

hall to the recording studio in Western music). But the recording industry had another important effect on cantorial music. Until the beginning of the twentieth century, cantorial art was not merely a performance practice but also (perhaps, even, first and foremost) a compositional practice, meaning, that the cantors sang their own original works. Some of the works were composed for the service ahead of time, but more frequently, the cantors would improvise on the spot. These nineteenth-century cantor-composers were extremely fruitful in their spontaneous synagogue improvisations. Many of the successful improvisations were written down in numerous anthologies from that time (for example, see Idelsohn's long list of cantors and anthologies in his *Jewish Music* (1929, 287–95).

The recording industry brought original pieces performed by the cantors of the golden age to a much broader audience. This new experience and exposure has led to the wide acceptance of certain pieces and to the marginalization of others. Before the era of the recording industry, only the audiences at cantors' synagogues were exposed to their creations. Through recordings, however, the compositions (for example, those by Rosenblat) became available to listeners all over the world. The congregations in other synagogues—by now acquainted with the music of the new "star" cantors[26]—started asking their cantors to imitate the music they grew to like: "Do *Rosenblat*" or "Do *Kossewitsky*."[27] The cantors gradually found themselves composing less, and more often performing well-known pieces by other cantors. These well-known pieces eventually formed a canon, that is, a repertoire that every cantor must be familiar with and capable of performing.

The canonization of cantorial music can perhaps also be attributed to the sacred context in which cantorial music was practiced. Cantorial music is part of a broader Jewish religious practice and tradition. Religious practices tend to fixate and commemorate monumental historical elements through canonization and sanctification. As certain parts of the ritual gain importance, they become part of tradition itself and a new starting point for future generations. Naturally, the phenomenon of canonization is not restricted to liturgical texts or rites but also applies to music and other art forms.

After the revolution of the recording era, the penchant for canonizing religious practice, in tandem with the development of the recording industry, led to a significant decrease in new compositions.[28] It also led to a change in the cantor's role. While in the past cantors mainly created new pieces, cantors of later generations began to mainly perform works belonging to this newly generated canon. The artist's natural desire to be

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[26] The term is Mark Slobin's (1989, 22).

[27] Of course, similar trends occurred even before the emergence of the recording industry, as with the tremendous popularity of Cantor Salomon Sulzer, who attracted a substantial number of imitators (Schleifer 1996, 144), but the wide distribution of recorded music expedited the process significantly.

[28] There are, of course, many different reasons for the deterioration of the innovative spirit of the cantors performing cantorial recitatives, the most important of which is probably the annihilation of European Jewry in the Holocaust, which also affected other aspects of Jewish cultural creativity. Other reasons may be a change in public taste, a decreased tolerance for long musical ceremonies in the synagogue, and financial issues, such as the cost of employing a full-time cantor. In any case, the rise of the recording industry is a prime factor in the deterioration of the innovative spirit of the genre of the cantorial recitative since it led to the canonization of the cantorial compositions and, in turn, to a slowing of musical innovation.

innovative and to broaden the boundaries of the genre could no longer be satisfied by the creation of new pieces. A new channel had to be developed to fulfill this need. This channel turned out to be the altered performance practices described in this paper.

As noted above, the recording industry had a similar impact on Western music and probably also on other types of music. Musicians became less "spontaneous," "loose," or "unpredictable" and more "accurate," "controlled" and "geometrical." However, while musical performances of Western music generally became more "accurate," that is, featuring more precise reproductions of the score, contemporary cantorial music not only attempted to create precise reproductions of early twentieth century masterpieces, but rather *developed* these pieces. As demonstrated in this study, the later cantors added a handful of technical embellishments to the early twentieth century pieces. Their performances are not simply more accurate reproductions of these pieces, but also include a variety of details that cannot be found in the early performances.

Thus, compared to the performance of Western classical music, and despite many similarities, the recording industry did have a somewhat different effect on cantorial music. Two possible explanations come to mind. Firstly, the change in the cantor's role before and after the advent of the recording industry was greater than parallel developments in other musical genres. The impact of the recording industry on cantorial art was the almost complete eradication of the role of the cantor-composer. Only one aspect of cantorial art has survived, namely, the performance of canonized masterpieces. Cantors, as musicians who have abandoned an important innovative element in their art (namely, the act of composing), are likely to look for more radical means of expression than the mere precise reproduction of the score, and have thus sought to change the manner in which cantorial music was performed in earlier generations.

The second reason is no less significant and complements the first one. While cantors sought ways to develop the music they were now performing, they had an important tradition on which to rely. The art of *chazanut* developed from the embellishment of chant formulae (*Nusach*) using mainly improvisation techniques. This tradition, which relies on the framework of the *Steiger*[29] and develops it into a complete cantorial recitative, contains the improvisational tool kit that every cantor carries with him. While barred, as it were, from composing totally new cantorial recitatives, the new generation turned to improvisation, which was the other innovative endeavor they were familiar with. Each note now received special treatment, which led to a greater diversity in note construction and to the extended use of such features as the glissando and vibrato. As noted above, the attention to minute performance details is the most immediate result of the revolution caused by the recording industry. However, unlike many classical musicians who, as mentioned above, shifted "from vital to geometrical" and strove for an accurate

[29] Jewish liturgical music uses modal systems which some of the cantors refer to as *Steiger*. There have been attempts to define the *Steiger* since the nineteenth century, but there is still no consensus in the literature. Some scholars think about a mode as a scale (with special intervals), while others define a mode as a collection of musical motives or phrases. The three common modes are *Ahava Raba* (Phrygian with a major third), *Magen Avot* (natural minor) and *Adonai Malach* (major with a lowered seventh). See Idelsohn 1929 and Cohon 1950.

representation of the musical score, keeping their interpretive nuances to a minimum, cantors exploited the contemporary sensitivity to the most minute musical attributes in order to enhance the performances' vitality by adding embellishments and fine alterations of the sound.

In addition, the style of adding various embellishments to canonized pieces is somewhat similar to the Jewish tradition of interpreting and adding commentary to canonized texts. The process of canonization and the embellishment of the masterpieces of the golden age by enhancing various performance attributes in existing pieces is somewhat akin to the role of textual commentary in Jewish liturgical tradition. The newer recordings pay homage to the early ones by expanding all performance parameters and by adding subtle layers of interpretation to the text. Like many other aspects of Jewish religious life that have been reinterpreted over time, the new cantorial performances can also be regarded as exegetical interpretations of earlier performances by cantors of the golden age. Indeed, as should be clear by now, an analysis of the changes that occurred in the performance practice of cantorial art during the twentieth century is fascinating not only due to the vocal intricacies it involves, but also since it is related to other processes of change underlying the cantorial world and can shed more light on the fascinating continuing evolution of this unique singing style.

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# APPENDIX

| | Vibrato rate (Hz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Composition | *Ano Ovda* | | *Shom'a Vatismach* | | *Rachem Na* | | *Rachem Na* | | *Veal Yedei* | |
| Cantor | Schmidt | Stern | Sirota | Helfgot | Rosenblat | Klein | Kussevitsky | Klein | Kwartin | Fisher |
| 1 | 6.37 | 5.41 | 6.40 | 5.56 | 5.40 | 4.22 | 4.30 | 4.22 | 5.10 | 4.62 |
| 2 | 6.29 | 5.71 | 6.00 | 5.80 | 4.90 | 5.29 | 4.80 | 5.29 | 5.22 | 5.40 |
| 3 | 6.02 | 5.10 | 6.30 | 5.19 | 5.30 | 5.11 | 4.80 | 5.11 | 5.30 | 5.20 |
| 4 | 6.80 | 5.15 | 6.80 | 5.50 | 6.10 | 4.47 | 4.50 | 4.47 | 5.10 | 4.90 |
| 5 | 6.71 | 5.29 | 5.60 | 5.60 | 5.00 | 4.70 | 5.30 | 5.66 | 4.90 | 5.00 |
| 6 | 6.54 | 5.56 | 6.60 | 5.30 | 5.50 | 5.17 | 5.12 | 5.17 | 6.52 | 4.70 |
| 7 | 6.17 | 5.88 | 6.19 | 5.26 | 5.26 | 4.16 | 5.42 | 4.16 | 4.95 | 5.06 |
| 8 | 6.02 | 5.26 | 6.08 | 5.21 | 6.17 | 4.72 | 4.87 | 4.72 | 5.04 | 5.12 |
| 9 | 6.21 | 5.41 | 6.32 | 5.60 | 5.30 | 4.80 | 4.93 | 4.80 | 5.20 | 5.10 |
| 10 | 6.54 | 5.26 | 7.31 | 5.40 | 5.29 | 4.91 | 4.81 | 4.91 | 5.30 | 5.06 |
| Average: | 6.37 | 5.40 | 6.36 | 5.44 | 5.42 | 4.76 | 4.89 | 4.85 | 5.26 | 5.02 |
| Difference in % | 15.14 | | 14.48 | | 12.30 | | 0.70 | | 4.69 | |
| | | | | | | | | | | |
| Composition | *Elu Devorim* | | *Elu Devorim* | | *Rozo Deshobos* | | *Tiher* | | *Habet* | |
| Cantor | Hershman | Motsen | Hershman | Toledano | Pinchik | Adler | Kwartin | Rand | Hershman | Stern |
| 1 | 6.80 | 5.88 | 6.80 | 5.20 | 8.47 | 5.71 | 5.32 | 4.72 | 7.25 | 5.38 |
| 2 | 6.52 | 5.30 | 6.52 | 5.45 | 8.47 | 6.13 | 5.21 | 4.61 | 6.62 | 4.88 |
| 3 | 7.50 | 4.50 | 7.50 | 5.45 | 7.58 | 7.14 | 4.98 | 4.63 | 7.41 | 5.41 |
| 4 | 7.00 | 5.10 | 7.00 | 5.20 | 8.20 | 6.90 | 5.56 | 4.33 | 6.67 | 5.41 |
| 5 | 7.30 | 4.50 | 7.07 | 5.40 | 8.06 | 6.94 | 5.10 | 4.65 | 8.62 | 5.49 |
| 6 | 7.40 | 4.70 | 7.20 | 5.80 | 7.87 | 7.04 | 5.75 | 4.81 | 7.46 | 5.68 |
| 7 | 6.70 | 4.60 | 7.10 | 6.15 | 7.81 | 6.25 | 5.00 | 4.85 | 6.25 | 5.24 |
| 8 | 7.07 | 4.70 | 7.30 | 5.40 | 9.09 | 6.80 | 5.05 | 4.83 | 6.85 | 6.02 |
| 9 | 7.20 | 4.40 | 6.86 | 5.52 | 7.09 | 6.41 | 5.10 | 4.95 | 7.04 | 5.26 |
| 10 | 7.10 | 5.04 | 6.80 | 5.40 | 6.67 | 6.10 | 4.85 | 4.74 | 6.76 | 5.71 |
| Average: | 7.06 | 4.87 | 7.02 | 5.50 | 7.93 | 6.54 | 5.19 | 4.71 | 7.09 | 5.45 |
| Difference in % | 30.98 | | 21.64 | | 17.51 | | 9.24 | | 23.19 | |

**Table 3.** Vibrato rate.

| | Glissando length in milliseconds | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Composition | *Shom'a Vatismach* | | *Rozo Deshobos* | | *Rachem Na* | | *Ano Ovda* | | *Tiher* | |
| Cantor | Sirota | Helfgot | Pinchik | Adler | Rosenblatt | Klein | Schmidt | Stern | Kwartin | Rand |
| 1 | 240 | 470 | 100 | 500 | 210 | 550 | 287 | 431 | 573 | 1024 |
| 2 | 292 | 539 | 170 | 930 | 420 | 520 | 254 | 551 | 181 | 337 |
| 3 | 143 | 339 | 184 | 327 | 248 | 287 | 403 | 506 | 188 | 182 |
| 4 | 160 | 469 | 83 | 237 | 395 | 534 | 218 | 586 | 259 | 215 |
| 5 | 310 | 495 | 201 | 423 | 187 | 168 | 86 | 247 | 343 | 347 |
| 6 | 127 | 355 | 140 | 444 | 165 | 244 | 76 | 256 | 203 | 150 |
| 7 | 80 | 322 | 102 | 467 | 361 | 393 | 337 | 412 | 367 | 497 |
| 8 | 175 | 267 | 230 | 444 | 242 | 400 | 254 | 416 | 178 | 181 |
| 9 | 269 | 1593 | 235 | 729 | 581 | 774 | 51 | 107 | 585 | 865 |
| 10 | 230 | 380 | 305 | 582 | 253 | 624 | 130 | 270 | 302 | 640 |
| Average: | 202.60 | 522.90 | 175.00 | 508.30 | 306.20 | 449.40 | 209.60 | 378.20 | 317.90 | 443.80 |
| Difference in % | 61.25 | | 65.57 | | 31.86 | | 44.58 | | 28.37 | |

**Table 4.** Glissando length in compared groups.

| | Proportion between the glissando and the steady portions of the note | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Composition | *Shom'a Vatismach* | | *Rozo Deshobos* | | *Rachem Na* | | *Ano Ovda* | | *Tiher* | |
| Cantor | Sirota | Helfgot | Pinchik | Adler | Rosenblatt | Klein | Schmidt | Stern | Kwartin | Rand |
| 1 | 0.186 | 0.348 | 0.500 | 1.429 | 0.096 | 0.220 | 0.395 | 0.502 | 0.484 | 0.846 |
| 2 | 0.429 | 0.574 | 0.067 | 0.346 | 0.183 | 0.234 | 0.376 | 0.560 | 0.407 | 1.272 |
| 3 | 0.130 | 0.175 | 0.466 | 0.650 | 0.477 | 0.941 | 0.194 | 0.227 | 0.462 | 0.499 |
| 4 | 0.268 | 0.911 | 0.264 | 0.856 | 0.388 | 0.837 | 0.147 | 0.451 | 0.527 | 0.627 |
| 5 | 0.186 | 0.258 | 0.202 | 0.547 | 0.189 | 0.300 | 0.551 | 0.679 | 1.128 | 1.309 |
| 6 | 0.166 | 0.436 | 0.513 | 1.011 | 0.385 | 0.744 | 0.311 | 1.089 | 0.118 | 0.050 |
| 7 | 0.052 | 0.195 | 0.767 | 1.136 | 0.142 | 0.236 | 0.598 | 0.794 | 2.005 | 0.742 |
| 8 | 0.210 | 0.226 | 0.278 | 0.727 | 0.147 | 0.467 | 0.207 | 0.207 | 0.154 | 0.048 |
| 9 | 0.181 | 0.578 | 0.996 | 1.997 | 0.291 | 0.601 | 0.338 | 0.669 | 0.716 | 0.542 |
| 10 | 0.076 | 0.163 | 0.274 | 0.790 | 0.697 | 0.994 | 0.175 | 0.180 | 0.378 | 0.696 |
| Average: | 0.188 | 0.386 | 0.433 | 0.949 | 0.299 | 0.557 | 0.329 | 0.536 | 0.638 | 0.663 |
| Difference in % | 51.23 | | 54.40 | | 46.29 | | 38.57 | | 3.79 | |

**Table 5.** Glissando proportional extent in compared groups.

***Ano ovda*** (Zohar, Parashet Vayakhel, recited when the Torah ark is opened)

I am servant of the Holy One, blessed be He, before whom and before whose glorious Torah I bow at all times. Not in man do I trust, nor on any angel do I rely, but on the God of heaven who is the God of truth, whose Torah is truth, whose prophets speak truth, and who abounds in acts of love and truth. In Him I trust, and to His holy and glorious name I offer praises. May it be Your will to open my heart to the Torah, and to fulfill the wishes of my heart and the hearts of all Your people Israel for good, for life, and for peace.

***Shom'a vatismach*** (Psalms, 98, recited as part of Kabalat Shabbat [welcoming Shabbat])

Zion hears and rejoices, and the towns of Judah are glad because of Your judgments, Lord. For You, Lord, are supreme over all the earth; You are exalted far above all heavenly powers. Let those who love the Lord hate evil, for He protects the lives of his devoted ones, delivering them from the hand of the wicked. Light is sown for the righteous, and joy for

the upright in heart. Rejoice in the Lord, you who are righteous, and give thanks to His holy name.

***Rachem na*** (from the Blessing after the meal)

Have compassion, please Lord our God, on Israel Your people, on Jerusalem Your city, on Zion the dwelling place of Your glory, on the royal house of David Your anointed, and on the great and holy House that bears Your name. Our God, our father, tend us, feed us, sustain us and support us, relieve us and send us relief, Lord our God, swiftly from all our troubles. Please, Lord our God, do not make us dependent on the gifts or loans of other people, but only on Your full, open, holy and generous hand so that we may suffer neither shame nor humiliation for ever and all time.

***Elu devorim*** (recited after the morning Blessing over the Torah)

These are the things for which there is no fixed measure: the corner of the field, first-fruits, appearance before the Lord [on festivals, with offerings], acts of kindness and the study of Torah. These are the things whose fruits we eat in this world but whose full reward awaits us in the World to Come: honoring parents; act of kindness; arriving early at the house of study morning and evening; hospitality to strangers; visiting the sick; helping the needy bride; attending to the dead; devotion in prayer; and bringing peace between neighbors, and between husband and wife – but the study of Torah is equal to them all.

***Habet*** (from the *Slichot* section of the Monday and Thursday morning prayer)

Look down from heaven and see how we have become an object of scorn and derision among the nations. We are regarded as sheep led to the slaughter, to be killed, destroyed, beaten and humiliated. Yet, despite all this we have not forgotten Your Name. Please do not forget us.

***Rozo deshobos*** (Zohar, Parashet Teruma, recited before the Shabbat evening prayer)

The mystery of Shabbat is that Shabbat is united with the mystery of the One so that the mystery of One may rest upon her. In the evening prayer of Shabbat, the holy throne of glory is made One in the mystery of Oneness, and thus made ready for the high and holy King to rest upon it. And when Shabbat enters, the Divine Presence becomes One and separated Herself from the Shadow Side, and She is released from all her trials, and lingers in the Oneness of the holy light, and adorns Herself, crown upon crown, for the holy King. All the powers of rage and Her accusers flee and pass away from Her, and there is no other power in all the worlds [but Hers]. Then Her face shines with heavenly light, and the holy nation adorns Her here below, while each of its members adorn themselves with new souls. This is how this prayer begins, as they bless Her in joy, their faces shining.

***Veal yedei*** (recited on Musaf of Rosh Hashana)

And through Your servants, the Prophets, the following is written: So said Hashem, King of Israel and its redeemer; Hashem of Legions: "I am the first and I am the last and aside from Me there is no other god." And it is said: the saviors will ascend mount Zion to judge Esau's

mountain, and the kingdom will be Hashem's. And it is said: Then Hashem will be King over all the world, on that day Hashem will be One and his Name will be One. And in Your Torah is written as follows: Hear, O Israel: Hashem is our God, Hashem, the One and Only.

***Tiher*** (from the *Piyut* that tells the story of the ten Martyrs, recited at Musaf of Yom Kipur)

Rabbi Ishmael purified himself and pronounced the name of God in awe. He ascends to the heavens, and inquired of the angel robed in linens, who said to him, "Accept the judgment upon yourselves, you beloved and pure, for I have heard from behind the curtain that this is your fate." Rabbi Ishmael descended and related to his friends the word of God. Then, the evil man commanded to slay them with force. And two of them were taken first for they were the leaders of Israel, Rabbi Ishmael the High Priest, and Rabbi Shimon Ben Gamliel, the president of Israel.