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Modes in Klezmer Music: A Corpus Study Based on Beregovski's Jewish Instrumental Folk Music*

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ABSTRACT: This article investigates modal practice in Jewish instrumental music from Eastern Europe, now known as klezmer. "Mode" in this context refers to the melodic behavior of a given repertoire, including idiomatic figures, melodic tendencies, properties of stability and instability, and modulation pathways. The question, then, is, how can we model all those features of modal behavior that klezmer musicians know intuitively from experience? Studies in music cognition have used statistical properties of musical corpora to model enculturation and perception. In the present article, we provide descriptive and statistical analyses of 249 tunes from a volume collected and compiled by the preeminent Ukrainian Jewish ethnomusicologist Moshe Beregovski (1892–1961).

The analyses identify four basic modes following Beregovski 2015, Rubin 2020, and others. Modes and modulations were tagged in digital (kern) files; the digital files are available on a companion website (https://shanahdt.github.io/mode_in_klezmer/). Modulation pathways are presented with sample tunes and weighted network diagrams. Some of the modes and modulations map onto the major-minor key system of Western European repertoires while others are distinct; this variety underlines the intersectional nature of klezmer music. Pitch counts and melodic tendencies exhibit distinctive features of the modes, some of which correlate with intervallic properties. The histograms and melodic transition data are based on pitch rather than pitch class and thus do not assume octave equivalence. Overall, the article models a musical repertoire that blends elements from Western European music, Eastern and Southeastern European traditions, and the liturgical and folk traditions of Eastern European Jews.

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Introduction

[0.1] The concept of mode has been used in English-language scholarship as a rubric for cross-cultural studies of musical theories and repertoires, most notably in the New Grove article on

"Mode" by Harold Powers (1980), revised and updated with additional authors in the new edition (Powers et al. 2001). Drawing on prior work by Abraham Zvi Idelsohn ([1929] 1967) and Reginald Winnington-Ingram (1936), Powers placed the modern musicological concept of mode on a continuum between "particularized scale" and "generalized tune":

> To attribute mode to a musical item implies some hierarchy of pitch relationships, or some restriction on pitch successions; it is more than merely a scale. At the same time, what can be called the mode of a musical item is never so restricted as what is implied by referring to its "tune"; a mode is always at least a melody type or melody model, never just a fixed melody. (Powers et al. 2001, I.3)

In the present study, we draw on this broad concept of mode to provide descriptive and statistical analyses of modulation, pitch hierarchies, and melodic tendencies in Jewish instrumental music from Eastern Europe, now known as klezmer.(1) Our work draws on, confirms, and extends prior theories of mode in klezmer music and provides data for future comparative work. Finally, we update methodologies that have been used for the study of Western classical repertoires to account for distinctive aspects of klezmer music with implications for the analysis of other musical traditions.

[0.2] Harold Powers also voiced misgivings about the use of the terms "mode" and "modality" in cross-cultural studies. The misgivings have to do with the assumed equivalence of "mode" with terms from other cultures including Middle Eastern *maqām*, Persian *dastgāh*, South Asian *raga*, South-east Asian *pathet*, and East Asian *diao* and *chōshi* (see Powers 1992, 219). He posited two distinct music theoretical categories, which he termed "mode$_1$" and "mode$_2$," and argued that these have been conflated: "Closed and symmetrical systems of music-theoretical categories—my 'mode$_1$'—have been conflated with open-ended and heterogeneous networks of melodic types—my 'mode$_2$'" (215). Powers also observes, "Something called 'modality' has become a reified property ascribed to music in a widely and wildly varying number of musical practices, simple and complex, past and present" (215).(2) Stephen Blum cites and echoes these critiques, situating them in the context of a broader imperative for "comprehensive lexicographic studies of pertinent terminology in all major language groups" (2023, 86, 88–90).

[0.3] We address these critiques in three ways: (1) by providing a working definition of mode relevant to the present study, (2) by grounding our work in the history of discourse on klezmer and Jewish music more broadly, and (3) by not reifying "modality" as a property of the music as such —or at least not as a property that implies equivalence with other so-called "modal" repertories.

[0.4] For the purposes of the present study, the term "mode" refers to the melodic behavior of a given repertoire, including idiomatic figures (especially at cadences), melodic tendencies, and properties of stability and instability.(3) Mode in the present study implies the use of a given pitch collection, which may be arranged in a scale for heuristic purposes, along with characteristic alterations and departures from that collection. Our concept of mode for klezmer music does not assume octave equivalence, which is a notable departure from theories of tonality and definitions of the Church modes in Western music history.(4) The data below will show that certain scale degrees have distinct chromatic manifestations depending on their location in the tessitura; this is also commonplace in representations of the klezmer modes going back to Beregovski (2015, I-23 to I-24). Our concept of mode includes characteristic moves from primary to secondary modes with the same and different pitch centers. The analysis is based primarily on melodic characteristics, but harmonic implications are relevant in some instances. Mode in this case does not include extra-musical associations and, for the most part, does not correlate with genre, rhythm, or social function.(5) In the terms of Powers's analysis, we are dealing with an instance of "mode$_2$," which involves "open-ended and heterogeneous networks of melodic types" (1992, 215).

[0.5] Since the latter half of the nineteenth century, the discourse on mode in Eastern Ashkenazi (Eastern European) Jewish music has focused primarily on "prayer modes" or "shtayger."(6) Theory codified by the Viennese cantor Joseph Singer (1840–1911) was especially influential; Singer "attempted to rationalize the practice of the Ashkenazi synagogue by explaining it as a system of musical modes that drew its inspiration from the 'Church modes,'" while also deriving from oral

discourse among Ashkenazi cantors (Seroussi 2009, 17–19). Singer's theory became the foundation for subsequent analyses (e.g., Cohon 1950; Levine 1980, 1989; Tarsi 2020), and it influenced practice through its adoption, with later modifications, in the curricula of cantorial schools (Seroussi 2009, 18–19; Cohen 2009, 76–79, 156–176; Bernard 2005).(7)

[0.6] Klezmer shares musical elements with Jewish cantorial music and the music of everyday prayer; it comes from the same cultural milieu and is part of the same "musical tapestry" as Mark Slobin describes it (2000, 7–8). Klezmer musicians sometimes draw on the names of the prayer modes (as outlined below). But the discourse that deals directly with modes in klezmer music is not as extensive, no doubt because the social status of the *klezmorim* (Jewish instrumental musicians) and their music was much lower than that of cantors (Rubin 2020, 18). We build on early-to-mid-twentieth-century work by the preeminent Ukrainian Jewish ethnomusicologist Moshe Beregovski ([1946] 1982, 2013, 2015), as well as more recent work by Joshua Horowitz (1993), Hankus Netsky (2015), Walter Zev Feldman (2016), and Joel Rubin (2020).

[0.7] Most importantly, our analysis is not an attempt to rationalize the messiness of modal practice in klezmer music, nor is it intended as a prescriptive guide for composers and improvisers. Klezmer has always been a dynamic tradition in dialogue with co-territorial and international traditions as well as other forms of Jewish music, and it continues to be so today. This ranges from funk-infused tracks of the Klezmatics to albums by the trio Veretski Pass, who freely combine Jewish and non-Jewish tunes. Our study is based on one geographic and historical snapshot of a wider tradition. That snapshot is significant—indeed, it is deeply valued among klezmer musicians—but a theory based on it should not be mistaken for a comprehensive theory of modes in klezmer music, nor should it close any options for creative musicians today. Composers and improvisers enculturated in the tradition may find gems of modal practice that they were not aware of in this analysis, and inspiration for new creativity.

[0.8] This study is based on a corpus of 249 tunes from the volume *Jewish Instrumental Folk Music*, compiled with ethnographic and theoretical essays by Moshe Beregovski (1891–1961). The volume includes tunes collected and transcribed by Beregovski and his colleague S. M. Schnaider along with documents from the archives of the Institute for Jewish Culture at the Ukrainian Academy of Sciences in Kyiv (Beregovski 2015, I-5, III-14 to III-15).(8) It was published posthumously, first in Russian (Beregovski 1987) and then in English (Beregovski 2001, 2015).(9) Our corpus leaves out four large concert pieces at the end of Beregovski's volume; it also leaves out tunes or sections of tunes without a time signature or with varying time signatures and frequent fermatas. Some of the data that we collected track events according to metric placement; thus, we decided not to include material without a regular meter.(10) This still leaves the vast majority of the volume, which has 254 tunes and four concert pieces.(11)

[0.9] Beregovski's instrumental volume is one of the most valuable sources that we have for the historical repertoire of Jewish instrumental music from Eastern Europe. It is akin to the "editorial selection by contemporary musicians of intentionally representative works" that Gjerdingen and Bourne (2015, 5.3.1) use to identify statistical properties of music from the Galant period of Western European music. Mark Slobin observes, "What is important about Beregovski's work is its quality. Quite simply, it is the only corpus of research on its topic that stands up to present-day ethnomusicological standards of fieldwork, transcription, and analysis" (1986, 253). Walter Zev Feldman's assessment is similar: "While acknowledging the pioneering work of Kiselgof and Engel, the interest of Lipaev and Findeisen, and the inspiration of An-sky, it would scarcely be possible to study the music of the klezmer were it not for the enormous contribution of one man: Moyshe (Moisei) Beregovski" (2016, 128).(12)

[0.10] Beregovski's work has been supplemented in recent years by a large collection of manuscripts from the Vernadsky National Library of Ukraine, with over 1300 melodies, now available through the *Kiselgof-Makonovetsky Digital Manuscript Project* (KMDMP) (Klezmer Institute n.d.).(13) These manuscripts include sources that Beregovski drew on for his volume. Beregovski's volume remains a vital collection, however, with broad representation of instrumental genres and many tunes that Beregovski himself collected. Our study of Beregovski's volume may serve as a

model for future computational analyses of the larger KMDMP corpus and as the basis for comparative study.(14)

[0.11] In employing corpus methods, we provide statistical data that augments stylistic understanding based on individual exemplars and enculturation. The data will be decontextualized in various ways; for instance, the bar plots do not differentiate events by rhythm, genre, or placement within the phrase. This is inevitable in corpus studies; one cannot measure everything all at once in a large collection of tunes—at least not in ways that are relevant to human understanding. Instead, one can add and take away features to shine light on individual aspects of musical style. In this study, the data are differentiated by mode and register.(15) We also present individual tunes and sections along the way, commenting on contextual features.

[0.12] It is important to understand the sources and methodologies that generate musical data, especially if one is interested in comparative study.(16) We document criteria for the mode designations below, along with other methodological details that impact the data. In addition, a companion website (https://shanahdt.github.io/mode_in_klezmer/) provides our mode designations for the entire corpus, which include changes of mode within tunes, digital files in machine-readable format (kern notation) with the sections and modes tagged, and pitch counts and melodic transition data that include and go beyond what is presented in the paper here.(17) We used the Humdrum toolkit (Huron 1997) to analyze these data and the R programming language for statistical analysis and visualization.

[0.13] The present study notably does not include detailed analysis of melodic idioms or schemata. Melodic idioms are essential features of the klezmer modes (see Malin forthcoming). The more generalized data in this article provide context for the close study of individual idioms.

[0.14] Similarly, we do not present analyses of recordings or discuss performance practice or melody harmonization in the present article.(18) For musicians, dancers, and listeners, klezmer is as much about a style of performance—learned orally in workshops and lessons and from recordings—as it is about the notes and tunes. Rubin (2020, Chapter 6) provides a detailed study of ornaments and performance practice in recordings by the leading early-mid twentieth century clarinetists Naftule Brandwein and Dave Tarras. Performance practice is also documented and discussed in Slobin (2000, Chapter 5), Strom 2012, Malin 2025b, and in pedagogical videos such as the six short videos by the klezmer fiddler Alicia Svigals, produced by Stradmagazine (e.g., Svigalis 2013).(19) Many of the notated tunes in the volume are themselves transcriptions, some from recordings and some directly from the musicians.(20) And so the notation that we analyze here does capture some aspects of performance practice. There are only two tunes in the volume for which we have original ethnographic recordings; we present one of them below.(21) Further recordings are provided to give a sense for the possible sound worlds, not to represent the notation as such.

[0.15] The modes are not scales—they are musical worlds, if you will. Each mode is the background musical structure for hundreds of tunes carried in memory, notation, and recordings. The question, then, is, how can we model all those features of modal behavior that go beyond the scalar representations—all the things that klezmer musicians know intuitively from experience, the patterns that are part of muscle memory because they occur throughout the repertoire? Studies in music cognition have used statistical properties of musical corpora—collections of tunes or works—to model enculturation and perception. The idea is that perception is based on implicit learning over time with sensitivity to elements that are more and less common. This assumption has been successfully tested in the Western major-minor key system (e.g., Krumhansl 1990, Temperley 2001, Aarden 2003, and Huron 2006), and it is foundational for cognitive linguistics (e.g., Bybee 2013). We will explore statistical properties of the modes in sections 5–7 below.

[0.16] We proceed in section 1 with a sample tune and an introduction to klezmer modes. Section 2 provides further information about the structure of Beregovski's volume and outlines the distribution of modes at the level of the individual tune (i.e., with the temporary designation of an individual mode for each tune). Section 3 introduces the topic of modulation (shifts between modes); we present examples, outline modulation types, and provide criteria for identifying modulations. Section 4 documents modulation pathways through the corpus and compares them to the modulations in other klezmer corpora and Jewish cantorial music. Section 5 presents pitch

distribution data by mode. We present the data based on pitch rather than pitch class and thus do not assume octave equivalence as the pitch counts for key profiles typically do (Krumhansl 1990; Aarden 2003; Huron 2006). We also discover the phenomenon of "inward tilt," where alternative versions of a given scale degree in upper and lower octaves lead back toward the center of the range. Section 6 presents data on melodic tendencies or "transition probabilities"—i.e., the probabilities for a given pitch in the mode to repeat or move to other pitches above and below. We show how melodic tendencies correlate with intervallic properties of the modes. Finally, section 7 reviews the findings and reflects on the topic of style and the contingency of musical data.

1. A Sample Tune and Introduction to Klezmer Modes

[1.1] **Example 1** provides the notation for the Freylekhs no. 87 in Beregovski's volume with recordings by Abe Schwartz's Orchestra (ca. 1918), Joel Rubin and Joshua Horowitz (1994), and the Klezmatics (1991).(22) The recordings are of variants of the tune; they are meant to provide the general sound world in historical and more recent interpretations, not the details of this notation as such.(23) The term "freylekhs" refers to a broad genre of joyful tunes for dancing in duple meter (Beregovski 2015, I-14; Feldman 2016, 387).

[1.2] We chose this tune as an initial example because it illustrates characteristic features of one of the modes and of the repertoire and tradition more broadly. Sections are often demarcated by cadences and repeats (especially in tunes for dancing); they are often eight bars long; and there are typically two, three, or four sections in a tune. This tune is in three sections, marked A, B, and C in Example 1. Section C is preceded by a common four-bar figure known as a "fanfare," "shout," or "signal"; it is a repetition of a single pitch, often with elaboration or embellishment, in the rhythm <long, long, short–short, short–short> (see Beregovski 2015, I-15; Rubin 2020, 128; Netsky 2015, 110).(24) There is an identical cadence at the ends of sections A and C, and this is a common cadence in the mode at hand (Beregovski 2015, I-27; Horowitz 1993, 4; Horowitz and Segelstein 2004).(25)

[1.3] This tune's mode is known among klezmer musicians as "freygish" or "ahavah rabbah" (one of the Jewish prayer modes; see Levine 1989, 96–103; Bernard 2005, chapter 2; Avenary 2007). The term "freygish" derives from "Phrygian"; it is "Phrygian-ish," if you will. Scholars and musicians have musical, pedagogical, personal, and political reasons for choosing a given name, or deciding to use none of these.(26) Beregovski, for instance, needed to survive in a Soviet context and highlighting connections with Jewish liturgy may not have been wise; he used "altered Phrygian" for this mode (2015, I-23). Musicians also relate the klezmer modes to Turkish and Arabic *maqām*, comparing the freygish scale with *maqām hijaz*, for instance. In pedagogical materials, Horowitz (2016) observes that *maqām* theory "encourages awareness of neighboring cultures that have been vital for the creation of klezmer music" and "it may enable us to come closer to these same cultures in multicultural projects."(27)

[1.4] We use the term "freygish" in this paper because of its historical and current use among musicians.(28) The Freylekhs no. 87 is notated here in G freygish (G is the pitch center or tonic), with a key signature of B♮, E♭, and A♭. E♮s at the cadences are also significant: the sixth scale degree below the main tonic is raised in this mode. (The main tonic is the tonic pitch articulated most frequently, and typically the one that ends a piece. In the Beregovski volume, the main tonic is notated as G4.) Sections A and C of the tune focus on the pentachord from G4 to D5, dipping down frequently to F4 below the main tonic, and to E♮4 leading into cadences. Other tunes in the mode extend up to the octave and occasionally to the 9th above the main tonic.

[1.5] Annotations in Example 1 show a shift to F major at the beginning of section B and a shift back to G freygish with the melodic descent and cadence at the end of the section. The identification of F major as the mode of this section is based on melodic features, especially the melodic outline of A–F in the first, third, and fifth bars of the section. The second and fourth bars outline a C-major harmony, the dominant of F major. Functional harmony is relevant in some parts of this repertoire (Manuel 1989).(29)

[1.6] Freygish is one of four modes that are commonly identified in klezmer music.[(30)] **Examples 2–5** provide scalar representations and common names for the four modes.[(31)] They are notated with G as tonic, which is indicated with an open notehead. We follow Beregovski in this regard; the tunes in the instrumental volume (Beregovski 2015) are all notated in G.[(32)] Accidentals above indicate common pitch inflections, i.e., chromatic alternatives for the given scale degree.[(33)]

[1.7] Here are further notes on each scale:

a. Freygish / Ahavah Rabbah. We extend the scale down to the E♮4 in the lower register because melodies often go down to this pitch, but rarely further. Thus, even in scalar representations, we can make choices that reflect the behavior of melodies in the mode. Note also that the scale has E♮4 in the lower register and E♭5 in the main octave. The modal scale can be compared with scalar elements of the Turkish makam *hicâz* (Signell 1977, 32–35; 2001).[(34)]

b. Raised fourth / altered Dorian / mi sheberakh. In this study, we adopt the name "raised fourth" from Slobin (1982, 184) with the understanding that this refers to the scale given here and melodies built from it. The raised fourth is also a common pitch in the major mode in klezmer, but that will be identified as "major"—see below.[(35)] The modal scale can be compared with scalar elements of the Turkish makam *nikriz* (Signell 1977, 33; 2001).

c. Major / adonai malakh. Note that F♮ is the most common default in the upper range and F♯ in the lower register. The modal scale can be compared with scalar elements of the Turkish makam *acemaşiran* (Signell 2001).

d. Minor / magen avot. Note the options of ♭$\hat{2}$ (A♭) and ♭$\hat{5}$ (D♭). The modal scale can be compared with scalar elements of the Turkish makam *nihavent* (Signell 2001).

[1.8] It is possible to explore other configurations of modes in klezmer, including, for instance, ones that differentiate at finer levels between forms of major that align with the major mode of Western classical repertoires and forms with the lowered seventh, aligning more closely with the prayer mode adonai malakh.[(36)] But we can still address these distinctions with statistical data drawing on the four basic types. In other words, we think of the identification of four modes as a starting point, not an endpoint, and a strategic choice that allows for further study and differentiation.

[1.9] Most of the genres in Beregovski's volume include tunes in all the modes. The freylekhs, for instance, is the most common genre in the instrumental volume, with 78 instances; these include 21 in the freygish mode, 11 in the raised-fourth mode, 26 in minor, and 20 in major. (The Western association of minor with sadness does not apply in klezmer.) The main exception is that the major mode is not found as a primary mode in the tunes for listening (part I of the volume).[(37)] (The primary mode is typically the mode in which a tune begins and ends; see further details below.) The raised-fourth mode also has a particular association with the *doina*, a Romanian instrumental genre without a regular meter (Loeffler 2001).[(38)]

2. Modes in Beregovski's Instrumental Volume: An Overview

[2.1] Beregovski's *Jewish Instrumental Folk Music* (2015) has 254 melodies with four large concert pieces at the end as noted above. The 254 melodies are divided into "Non-Dance Music" (nos. 1–84) and "Dance Music" (nos. 85–254). Within this overall bipartite division, tunes are grouped roughly by genre. First there is a set of dobridens and dobranochs, melodies for greeting guests (from the Ukrainian and Russian for "good day" and "good night"; nos. 1–12); then ritual items for the wedding and free improvisatory melodies (nos. 13–22); then a series of skotshnes (more elaborate tunes that can also be used for listening or dance) with other genres mixed in (nos. 23–59); and so on. Within the genres, there are further groupings by mode. Thus, our study of the four klezmer modes builds on a structure that is already implicit in Beregovski's work.

[2.2] The companion website identifies an overall or primary mode for each tune; the tunes can be sorted by mode and other features. Beregovski notates all the tunes in G, so the overall modes are G minor, G freygish, G raised fourth, or G major. **Example 6** shows the percentages of tunes in each mode.[(39)] Most of the tunes begin and end in the same mode, and the overall mode designation is clear. There are twenty-eight tunes that begin and end in different modes. **Example 7** lists these

with explanations for our mode designations.[40] These designations align with Beregovski's tune groupings; for instance, Beregovski groups the tunes that begin in B♭ major and settle into G minor with other G minor tunes.[41] The analyses below account for changes of mode within tunes, so the overall designation does not affect the pitch counts for individual modes. In other words, when we analyze material in G freygish, it is only those parts of the tunes that are in the mode, not the entire tunes.

3. Modulation Types and Criteria

[3.1] Tunes often shift modes, as in Example 1 above. We will be interested in the modulatory pathways, including common and less common ones. But first, how should we define modal change in this repertoire? In some cases, the change is evident and clear. In other cases, the shift is fleeting, more like a local gesture than a full change of mode.

[3.2] **Example 8** shows a clear modulation in the Dobranoch no. 4 with a recording by Ezekiel's Wheels Klezmer Band (2016).[42] Sections A and C are in G freygish; section B is in C major. There is a key signature change and section B emphasizes pitches from the C-major triad (mm. 17–18) followed by its dominant, G major (mm. 19–20). This pattern repeats again for the following four measures, C major (mm. 21–22) to G major (mm. 23–24).

[3.3] **Example 9** shows an equally clear shift in the Freylekhs no. 150. This A section is in G major; a new key signature then indicates a shift to G raised fourth for a fanfare and B section. The fanfare itself highlights C♯, which can signal the shift to the raised fourth mode.[43] The Freylekhs no. 150 is the first in a set of seven tunes that shift from G major to G raised fourth (nos. 150–56); Beregovski seems to have grouped them together for this reason.

[3.4] Example 8 above involves a change of tonal center, from G to C. Example 9, on the other hand, involves a change of mode with the same tonic, akin to a shift between parallel major and minor keys. We include both types under the rubric of modal shifts or klezmer modulation.[44]

[3.5] When there is a change of pitch center, we indicate the new mode with the pitch and mode (e.g., C major) and a Roman numeral representing the tonic triad and its relation to the primary mode (e.g., IV for a major triad on the fourth scale degree). The Roman numeral on its own does not fully specify the mode: an upper case IV may indicate major or freygish and the lower case iv may indicate minor or raised fourth.

[3.6] **Example 10** provides a third instance of a clear and unambiguous modulation, this time without a change of key signature. This is section B and the beginning of section C from the Dobranoch no. 6 with a recording by the Joel Rubin Music Ensemble (1997). The tune begins in G minor, section B takes us to B♭ major (III), and section C takes us back to G minor. Modulations to the relative major (III) do not involve new key signatures, so we rely on pitch emphasis and cadences. Here, B♭, D, and F—the pitches of the B♭ major triad—are clearly emphasized. Modulations from G freygish to C minor (iv) similarly do not require accidentals or a new key signature; emphasis and cadences are the main criteria determining the change of mode.

[3.7] In all examples so far, secondary modes have coincided with sections of tunes. This is often the case, and the section is an important compositional unit in klezmer tunes, as Rubin has noted (2020, 171). But modes can and sometimes do shift within sections. **Example 11** provides the first section of the Dobranoch no. 11 with a recording by the Joel Rubin Ensemble (2007). The section begins and ends in G minor; annotations show moves to B♭ major (III), C minor (iv), B♭ major (III) again, B♭ raised fourth/C freygish (IV), and finally a return to G minor (i).[45] Sequential repetition is significant in this instance: mm. 1–8 are repeated up a third in mm. 9–16 (with small changes), and mm. 17–20 are repeated down a step in mm. 21–24 (also with small changes). We tag these modes in our data and account for them in the analysis below and on the companion website. (Measures 25–28 are tagged as C freygish because they land on C. Mode shifts within four-bar spans are discussed below.)

[3.8] For the purposes of this study, we document mode changes that align with phrases of four bars or longer. These spans are long enough to sense a change of pitch center, even if one may also hear motion toward a larger goal. The attention to relatively local shifts allows us to document modal pathways such as the ones in Example 11 above (these are characteristic moves, as we shall see). And it will allow us to compare our results with prior work by Horowitz (1993) and Rubin (2001, 2020) on klezmer, and Bernard (2005) and Tarsi (2020) on cantorial music.

[3.9] In most cases, we have chosen not to tag hyper-local shifts within four- or eight-bar phrases. **Examples 12 and 13** provide excerpts from the Dobriden no. 1 and the Freylekhs no. 135 with recordings. In section B from the Dobriden no. 1 (Example 12), two phrases begin with segments that imply B♭ raised fourth / C fregyish and proceed to cadences in G minor. In the Freylekhs no. 135 (Example 13), two-bar segments imply C minor and B♭; the phrase then moves to a cadence in G minor or G raised fourth.(46) In both examples, we have tagged the phrases as G minor and interpreted the secondary modes as local shifts, not full modulations.(47) The recording in Example 12 is from Beregovski's original ethnographic recordings made in 1930 in Odessa; the singer is an actor named Gurovich (Vernadsky National Library of Ukraine 2013, track 40). The recording in Example 13 is by the Joel Rubin Jewish Music Ensemble (1997).

[3.10] The benefit of this method is that it allows us to interpret the modes not as hermetic entities, but as inherently fluid pitch collections and tonal centers. Thus, the pitch profile for G minor will be based on music that includes brief forays into C minor, B♭ major, and B♭ raised fourth / C freygish. In other words, our representation of G minor as a klezmer mode does not draw strict boundaries around the G-minor pitch collection as an abstract entity. At the same time, by tagging shifts at the four- and eight-bar phrase levels, we can document common modulatory pathways.

[3.11] There is one more common situation to address. Cadences at the ends of klezmer sections sometimes prepare a return to the primary mode after an excursion. And these cadences may introduce (or re-introduce) a mode with a distinct pitch collection. **Example 14** provides section C from the Skotshne no. 115 with a recording by the Joel Rubin Jewish Music Ensemble (1997). The section is in G major, but the last two measures shift to G raised fourth, preparing for a *da capo* return. **Example 15** provides section C from the Freylekhs no. 31. This section is in F major (VII), but the last two measures shift to G freygish, once again preparing a *da capo* return. Example 1 above also has a section in F major with a cadence that reintroduces G freygish, the primary mode. In these examples and others like them, we identify a change of mode at the cadential measures.

[3.12] **Example 16** provides a flowchart for the decision-making process with references to examples above. The companion website also includes notes on modal identification where there may be ambiguities (see the "mode notes" tab under Mode Analysis). The goal is not to create a definitive method for identifying modulations in klezmer music. Rather, it is to create a method that is consistent and transparent, allowing readers to reproduce or modify the methods and results.

4. Modulation Data

[4.1] So what are the common modulatory pathways? Given a tune in G freygish, where is it likely to go? What are some of the more unusual moves? How many tunes modulate and how many stay in one mode? Now we can begin to answer these questions. Overall, nearly two-thirds (63%) of the tunes modulate based on the criteria above. **Example 17** shows the breakdown of modulating and non-modulating tunes in each mode. Tunes in major modulate the least; they tend to be simpler, perhaps because they are all from the dance portion of the volume. The listening genres in the first part of the volume tend to be more intricate—and these are exclusively in the fregyish, minor, and raised-fourth modes.

[4.2] Digging down to the next level, **Examples 18–21** provide network diagrams for the first non-primary modes starting from G freygish, G raised fourth, G major, and G minor. The thickness of the arrows represents the frequency of the given modulation; numbers along the pathways indicate the instances of each. Previous examples illustrate many of the common pathways: Example 1 illustrates the pathway from G freygish to F major (VII), Example 8 illustrates the pathway from G

freygish to C major (IV), Example 9 illustrates the pathway from G major to G raised fourth (i), and Examples 10 and 11 illustrate the pathway from G minor to B♭ major (III). Examples 14 and 15 illustrate cadences that return from G raised fourth to G major and from F major to G freygish, respectively. The complete set of tunes that corresponds with each pathway can be found in the "Mode Analysis" section of the companion website. For instance, entering "Freygish" at the top of the mode column and "C minor" in the secondary modes column generates the 24 instances of the modulation from G freygish to C minor.(48)

[4.3] A few things stand out to us in these modulatory pathways. First, each mode has one pathway that is much more common than any of the others. This is characteristic of language systems and musical styles as well; learning the most common pathways is a first step in becoming attuned to the style. Second, there are features of the diagrams that map onto the major-minor key system of eighteenth- and nineteenth-century Western European repertoires and other features that are notably distinct.(49) The modulation from minor to the relative major (G minor to B♭ major) is a shared characteristic; the modulation from major to the raised fourth mode on the same tonic (G major to G raised fourth) is distinct. This, in turn, underlines the intersectional nature of klezmer music, with its influences from cosmopolitan, co-territorial, and other Jewish domains (see Feldman 2016, 11–20). Third, there is a reciprocity in the parallel shifts. **Example 22** illustrates this with another network diagram. Darker arrows represent greater frequency; the dotted pathways are represented by only one to three instances. We can interpret these parallel pathways in terms of overlapping and non-overlapping structures of the scales. G major in klezmer and the G raised fourth mode share the tetrachord <C♯-D-E-F> (when major uses ♯$\hat{4}$, which it does occasionally). G raised fourth mimics G minor when it alternates C♯ and C♮, and also with its use of the occasional E♭. The A♭ of G freygish appears occasionally in minor, but not with B♮, and it does not appear in any of the other modes. All of this will be verified with the pitch histograms in section 5.

[4.4] These results largely align with other studies of klezmer modulation. Horowitz focuses on modulations or "modal progressions" in the freygish mode and works from "sources dating between 1908–1938, recorded or published in Eastern Europe and America" (1993, 1). He identifies moves from freygish to VII major and iv minor as "quite common" and modulations to IV major as "very common" (12, 17, 20), which aligns with our findings.(50) Rubin's corpus consists of thirty tunes from the solo clarinet recordings of Naftule Brandwein and Dave Tarras, made in New York in the 1920s (Rubin 2020, 112, 142). His analysis of shifts to parallel modes (identified as "modal interchange") between sections can be compared most directly with our results. He finds that the most typical movements are (1) between the major and raised fourth modes in both directions, and (2) between the minor and raised fourth modes in both directions (166). We find the major/raised fourth movement to be most common in the Beregovski corpus, and the minor/raised fourth movement to be present but not as common (see Example 22 above). Rubin also finds parallel motion to and from the freygish mode to be rare or non-existent (166), as we do.(51)

[4.5] There are similar patterns of modulation in Eastern Ashkenazi cantorial music, along with some notable differences. Bernard documents modulations working from influential twentieth-century sources and his own training at the Hebrew Union College–Jewish Institute of Religion (2005, ch. 5).(52) Bernard observes that the raised fourth mode (identified as "Ukrainian-Dorian") "does not exist as a stable mode; it is used as an excursion or temporary modulation" (80); see also Tarsi 2020, 217). This is the most notable difference; the raised fourth is a stable mode in the Beregovski corpus and in klezmer music more broadly. Bernard's examples of modulations from the other modes all match common pathways in our corpus. For instance, from the freygish mode, Bernard has modulations to iv (minor) (2005, 82–83), IV (major) (91–92), and VII (major) (88).(53) Bernard's only modulation from major is to the parallel raised fourth mode (86), and this is the most common pathway in our corpus as well.(54) As these modulations set texts in liturgical contexts, there are also opportunities for text painting and musical references across the liturgy (77, 85–87, 90, 96).(55)

[4.6] A deeper comparison across these three sources (Horowitz 1993, Rubin 2020, and Bernard 2005) and others will require a separate study. Examples in this paper and material on the companion website, however, provide a foundation. Consider, for instance, the pathway <G freygish → C major (IV) → D freygish (V) → G freygish>. Cantors identify this as the "Sim shalom

maneuver," based on a prayer for peace where it sometimes appears (Bernard 2005, 90–91). Horowitz documents this pathway with examples from Naftule Brandwein and Beregovski (1993, 27–29). A search on the companion website yields four instances in the Beregovski corpus: nos. 32, 90, 102, and 180.(56) Thus, with the companion website, we can explore a variety of modulation pathways in Beregovski's instrumental volume and compare them with other repertoires. **Example 23** provides an annotated score for the Freylekhs no. 90 with a version of the tune for Yiddish theatre with the singer Jennie Goldstein (1966).(57)

5. Pitch Distribution by Mode

[5.1] Modulation pathways provide one answer to the question, "what does it mean to be in X mode?" From a given mode, some pathways are common, some are less common, and some appear not to exist, at least in the Beregovski corpus. But we can also answer the question "what does it mean to be in X mode?" by considering the melodies themselves, without modulation. We can do this by studying melodic idioms and especially common cadential patterns for each of the modes (see Malin forthcoming). And we can do it with statistical data on pitch content and melodic tendencies. We explore the pitch content of the modes in this section and melodic tendencies in the next.

[5.2] The use of "count data" to represent a musical landscape is common in corpus studies, and one of the best ways of demonstrating the frequency of occurrence of pitch events is through histograms. The focus on frequencies of events, rather than the analysis of the context in which those events appear, is often referred to as a "bag-of-notes" approach to a corpus: we can learn information simply by examining which notes are present (see Moss 2019 for a discussion), and using those notes as a proxy for the enculturation of listeners (see Krumhansl 1990, Temperley 2001, Aarden 2003, and Huron 2006). Examples here will show the occurrence of pitches in percentages to facilitate comparison across modes and with other repertoires. The companion website provides both raw counts and percentages. The companion website also provides bar graphs for pitches by cumulative duration.

[5.3] Notably, we do not assume octave equivalence, as the pitch counts for key profiles typically do (Krumhansl 1990; Aarden 2003; Huron 2006). Pitches occur more or less often and behave differently depending on where they are in the overall range. Tunes in G freygish, for instance, have E♭ in the main octave and E♮ in the lower octave (see Examples 1 and 2 above). Our bar plots will thus include the pitches that are present through several octaves.(58) Finally, in the context of Beregovski's volume, G4 to G5 represents the main octave, G5 and above represents higher octaves, and pitches below G4 represent lower octaves. In performance, the entire range can shift depending on the instrument and the needs of the moment.

[5.4] **Example 24** provides a bar plot of pitches for sections and passages in G freygish. The basic profile of the mode is clear: pitches of the modal scale predominate from F_4 below the main tonic to G_5 an octave above. The histogram based on durations, available on the companion website, is similar. The main difference is that the tonic pitches—G_4 and G_5—are more prominent than here, which likely is due to longer durations of tonic arrivals at cadences.

[5.5] There are additional subtleties in this profile. First, F_4 is the most prominent pitch below the main tonic. In comparison, the D_4 below the main tonic is hardly present (with less than 1 percent). So, tunes in G freygish frequently dip down to F♮ below the main tonic, and sometimes E♮, but rarely to D. The Freylekhs no. 87 (Example 1 above) illustrates this. Second, scale-degree $\hat{6}$ in the main octave is represented by E♭, whereas below the tonic, it is E♮.

[5.6] We will refer to the distinctive treatment of E♭ and E♮ as an "inward tilt." E♭ in the upper register leads the melody down (or "inward" toward the center of the scale) whereas E♮ in the lower register leads the melody back up (also "inward," toward the center of the scale). Data on melodic transitions confirm these tendencies. In the upper register, E♭5 descends to D_5 72% of the time and ascends to F_5 only 12% of the time. In the lower range, E_4 ascends to F_4 95% of the time

and never descends to D_4. (The remaining 5% consist of a few skips from E_4 to G_4.) This reflects a melodic "regression to the mean" that Huron (2006, 80–85) has identified in many musical cultures and time periods: once melodies reach outer parts of their ranges, they tend to return to the mean. Regression to the mean in turn could be understood to generate the inward tilt of E_4 and $E♭_5$ in the freygish mode, assuming that intonation and chromatic inflections lean in the direction of melodic motion. We will see analogous tilts in the raised fourth mode and major, and we return to the issue of melodic tendencies below.

[5.7] There are some notable differences between this mode-profile and previously studied tonal profiles, such as that of Krumhansl and Kessler (1982), the Aarden-Essen key-profile (Aarden 2003), and the Temperley-Kostka-Payne profile (Temperley 2001) (the first being experimentally derived and the latter two being derived from corpora). For example, whereas the previous work found that $\hat{1}$ is followed by $\hat{5}$ and then $\hat{3}$ in prominence (with the rest of the diatonic pitches below that), here we have scale degrees $\hat{1}$, $\hat{3}$, and $\hat{4}$ of the freygish mode being quite equally weighted, followed by $\hat{5}$. This may indicate that the freygish mode functions primarily as a melodic construct, with fewer ties to triadic harmony. (If we add G_4 and G_5 together, the tonic becomes the most common scale degree. But $\hat{3}$ and $\hat{4}$ remain more common than $\hat{5}$ when we combine registers.)

[5.8] **Example 25** provides a bar plot for sections and passages in the G raised fourth mode. The pitches of the mode are clear again, but D_5 or scale-degree $\hat{5}$ is the most frequently occurring pitch by far. In comparison, G_4 ($\hat{1}$), B_4 ($\hat{3}$) and C_5 ($\hat{4}$) were all of comparable prominence in the freygish graph; see Example 24 above. The focus on $\hat{5}$ is a defining characteristic of the raised fourth mode: melodies in the mode tend to focus in and around the fifth scale degree. The histogram based on durations also shows $\hat{5}$ in the main octave (D_5) as most prominent (see the companion website). G still functions as tonic—it is the characteristic arrival point at the ends of phrases and sections, and melodies in the mode are primarily harmonized with a G-minor triad.

[5.9] The raised fourth bar plot above illustrates additional elements of the mode. In the lower register, D_4 is more prominent than any of the other pitches below G_4. This reflects the common use of arpeggiated tonic ascents from the lower $\hat{5}$. **Example 26** illustrates with the Dobranoch no. 10 (Beregovski 2015) and a recording by the Joel Rubin Ensemble.[(59)] In comparison, the freygish mode emphasizes F_4 ($\hat{7}$) and not D_4 ($\hat{5}$) (Example 24 above).

[5.10] We see an "inward tilt" in the raised fourth mode, but this time with $\hat{7}$. In the upper register, $F♮_5$ occurs more frequently than $F♯_5$, whereas in the lower register, $F♯_4$ occurs more frequently than F_4 (see Example 25 above). The inward tilt again corresponds with melodic tendencies, F_5 leading downward and $F♯_4$ leading upward. In the upper register, F_5 descends by step 73% of the time and ascends by step only 7% of the time. In the lower range, $F♯_4$ ascends by step 58% of the time and never descends by step. (It skips down to D_4 17% of the time and up to A_4 25% of the time.)

[5.11] B_4 (natural) and C_5 (natural) in the raised fourth bar plot (Example 25 above) come in part from local passages of G major within G raised fourth sections. The Skotshne no. 105 illustrates; see **Example 27**. Both sections are in the raised fourth mode, and both feature brief passages with $B♮$ and $C♮$, bracketed in the example. The tune also features elements that are shared between the klezmer major and raised fourth modes: the upper tetrachord, typically descending (G_5–F_5–E_5–D_5), and the tetrachord one step down, also descending (F_5–E_5–D_5–$C♯_5$). The presence of $C♮$ in the raised fourth bar plot (Example 25 above) also comes from passages that alternate $C♯$ and $C♮$, within G raised-fourth sections. Beregovski ([1946] 1982, 551) notes that this is a common occurrence in the raised fourth mode. The Sher no. 186 (not provided here) is a good example.

[5.12] **Example 28** provides a bar plot for the sections and passages in G major. The inward tilt differentiating upper and lower registers is evident here as in freygish and the raised fourth mode: the upper register balances F_5 and $F♯_5$ about equally, while the lower register features $F♯_4$

exclusively. In the upper register, F_5 descends by step 88% of the time and ascends by step only 3% of the time. In the lower register, $F\sharp_4$ ascends by step 47% of the time and descends by step 11% of the time.

[5.13] Otherwise, the prominence of B_3 ($\hat{3}$) in the major-mode bar plot is quite striking. B_3 ($\hat{3}$) is also the most prominent pitch in the histogram based on durations, although G_4 ($\hat{1}$) is close behind. (See the companion website.) What does the focus on $\hat{3}$ in major look and feel like in the klezmer repertoire? **Examples 29 and 30** provide sample sections. These melodies and others like them hover on and around $\hat{3}$ to a remarkable degree, perhaps to highlight the key difference between the major and the raised-fourth modes, which are often set back-to-back within tunes. Examples 29 and 30 both lead to sections in the raised fourth mode. There are also more frequent fanfares on $\hat{3}$ in major than in the other modes; examples include the Freylekhs no. 114 (fourth section), the Freylekhs no. 158 (opening), and the Skotshne no. 164 (second section).

[5.14] **Example 31** provides the bar plot for sections and passages in G minor (the last of the four G modes). Scale-degree $\hat{3}$ is prominent again; this time we can explain it in terms of frequent local moves to the relative major. To review the methodology, when entire phrases are in B♭ major we designate them as such, but when a G-minor phrase includes individual measures that imply B♭ major, we include them in a broader G-minor conception. The bar plot thus includes B♭ as a prominent pitch along with C and D. The strength of F♮ in both registers also reflects the common tilt toward B♭ since F is $\hat{5}$ in B♭. The phenomenon of "inward tilt" is less relevant here, since F often leads to B♭ rather than up or down by step. In the histogram based on durations, G_4 is the most prominent, but $B\flat_4$ is close behind.

[5.15] The bar plot for G minor gives data on the frequency of some of the variable pitches of the mode. Thus, $A\flat_4$ ($\flat\hat{2}$) and $C\sharp_5$ ($\sharp\hat{4}$) are present in small numbers. And we see a trace of $\flat\hat{5}$ ($D\flat_5$); see Malin's discussion of the $\flat\hat{5}$ schema (forthcoming). Occasional instances of $E\natural_5$ suggest local inflections of G raised fourth; $E\natural_5$ also frequently combines with $D\flat_5$ in the $\flat\hat{5}$ schema.

6. Melodic tendencies

[6.1] Bar plots in the previous section provide static representations of the modes: they indicate pitch content, but not melodic tendencies. We turn now to look at melodic tendencies and patterns. The data will show, first of all, that klezmer melodies share statistical properties with a wide variety of other traditions. But looking more closely, we will observe how the modes differ and how melodic tendencies correlate with intervallic structure.

[6.2] Huron summarizes research on the melodic tendencies in a wide variety of musical traditions, observing that "the majority of melodic movements are descending small intervals" (2006, 76). Conversely, large intervals are more commonly ascending rather than descending. Thus, melodies often skip or leap upwards with bursts of energy and descend with smaller intervals, especially by step. This turns out to be similar to common speech contours that ascend rapidly and then gradually descend (77).

[6.3] The same is true of klezmer music, at least based on data from the Beregovski volume. **Examples 32–35** show the ten most common two-note transition patterns in each of the modes, from most to least frequent. The companion website provides all the melodic patterns in each mode, with numerical counts and percentages (see the "Melodic Tendencies" tab under Mode Data). Stepwise motion is most common in all four modes, and descending stepwise is more common than ascending. Looking through further transitions on the companion website confirms that ascending skips are more common than descending ones.

[6.4] There is another perspective that differentiates the melodic tendencies of the modes more clearly. Rather than lining up all the two-note patterns in each mode, we can ask, "if I am on a given pitch in a given mode, where am I likely to go next?" This ends up being especially revealing for pitches that are not part of the tonic triad and hence unstable. In the remainder of this section,

we will show how alternatives for a given scale degree (e.g., A♭ vs. A♮ for scale degree $\hat{2}$) affect the melodic tendencies. We will also explore triadic skips involving scale degree $\hat{7}$ below the main tonic. This lower $\hat{7}$ tends to ascend as expected, but further melodic tendencies reveal implied harmonies including V (the dominant) and vii (the minor subtonic), as well as frequent shifts from minor to the relative major.(60)

[6.5] **Examples 36 and 37** show the probability for scale-degrees $\hat{4}$ and $\hat{2}$ to go up or down by step, in each of the main modes. These are register-specific: they document transition probabilities within the central octave. (The percentages do not add up to 100 because we have left out pitch repetition and skips to other scale degrees.) Consider Example 36 with transitions from $\hat{4}$ first. In the raised-fourth mode, $C\sharp_5$ moves up and down at about the same rate, whereas C_5 in the other modes has a stronger tendency to descend. The $\sharp\hat{4}$ of the raised fourth mode thus counters the general tendency of pitches to descend stepwise, pulling the melody back up to $\hat{5}$ 38% of the time. At the same time, $\sharp\hat{4}$ is an integral part of the scale that may descend or ascend; it is different from a temporary leading tone in classical styles. Now consider Example 37 with transitions from $\hat{2}$. In the freygish mode, $A\flat_4$ moves down 2.5 times as often as it moves up, whereas A_4 of the other modes moves up and down in a more balanced fashion (with a slightly stronger downward tendency). Thus, chromatic inflections of both scale-degrees $\hat{2}$ and $\hat{4}$ impact the melodic tendencies, with raised pitches receiving added impetus to rise and lowered pitches receiving added impetus to descend.(61)

[6.6] **Example 38** shows the same thing in intensified form for scale-degree $\hat{7}$ in the main octave. All four modes use both chromatic inflections for $\hat{7}$ in the upper octave, F_5 and $F\sharp_5$. The obvious and unsurprising story is that $F\sharp_5$ tends to resolve up and F_5 tends to go down. But the strength of the downward pull from F_5 is notable in all four modes. **Example 39** shows the tendencies from scale-degree $\hat{6}$ in the main octave. The tendency to return to the central pentachord (i.e., "regression to the mean") is strong on its own, and thus chromatic inflections (E_5 vs. $E\flat_5$) do not alter things very much.

[6.7] Melodic transitions from $\hat{7}$ below the main tonic (F_4 and $F\sharp_4$) reveal triadic implications. **Example 40** provides graphs for the transitions from F_4 in freygish and $F\sharp_4$ in the raised fourth, major, and minor modes. (We will consider F_4 in minor below.) The stepwise ascent to G_4 is strong in all four modes. But the graphs in raised fourth, major, and minor also reveal frequent skips down to D_4 and up to A_4, outlining the dominant triad.

[6.8] The freygish graph in Example 40 stands out in several ways. First, F in the freygish mode implies Fm (vii), not a dominant harmony. (Fm functions like a dominant in that it leads back to tonic, but it is not built on $\hat{5}$.) There are no skips down to D_4 in the graph, and in fact, none at all in the corpus. There are occasional skips up to $A\flat_4$, consistent with an Fm harmony. There are also occasional skips to C_4 and C_5, not shown in the graph; they occur 3% and 4% down and up respectively. The repetition of F_4 in freygish is also notable; it occurs 18% of the time compared with 7% or fewer repetitions from $F\sharp_4$ in the other modes. This correlates with the local stability of F in the context of Fm harmony.

[6.9] **Example 41** presents the transition probabilities for F_4 in minor alongside the freygish graph from Example 40. F_4 in minor occasionally resolves up to G_4, but the most common move is to $B\flat_4$, scale-degree $\hat{3}$ and the tonic of the relative major. Thus, as in Western European repertoires, the subtonic in minor commonly functions as a gateway to the relative major. There is also a common minor-mode cadence that includes the F–B♭ (or $\hat{7}$ up to $\hat{3}$); see **Example 42**.

Conclusion

[7.1] Leonard Meyer defines style as "a replication of patterning, whether in human behavior or in the artifacts produced by human behavior, that results from a series of choices made within some set of constraints" (1973, 3). To better understand the style of klezmer music (or any style), we must understand each of these aspects individually. What patterns are being replicated? What are the choices being made by musicians? What are the constraints that lead to these choices? Here, we begin to ask these questions by examining how the melodic patterns in klezmer are constrained in each of the modes.

[7.2] Beregovski grouped melodies in his instrumental volume in freygish, minor, raised-fourth, and major modes, and each of these have their own stylistic tendencies and behaviors. The individual modes generate distinct pitch-to-pitch and modulatory expectations. Similarly, we identified an "inward tilt" for pitches in specific modes, with pitches below the main tonic inflected upward and pitches above the main tonic inflected downward (e.g., E♮$_4$ and E♭$_5$ in freygish). Our study of transition probabilities correlates this "tilt" with a melodic behavior that returns from outer parts of the range back toward the center.

[7.3] It's worth noting that all the music analyzed here is an encoding of a transcription, and each of the steps contains an opportunity for bias. In his discussion of transcription, Jairazbhoy writes: "if a recording is transcribed by an automatic device, it may make a more or less objective statement (within its own technical limitation), but only about a subjective recorded impression of an exceedingly complex original" (1977, 264). In fact, Ellingson points out that Frances Densmore explicitly trained singers how to sing for the phonograph, which would therefore capture a mode of performance that might be distinct from one performed without the phonograph (Ellingson 1992, 132). We might think of our use of the corpus in a similar way. Klezmer is a fluid and living musical genre, and Beregovski's transcriptions are snapshots in time. Here, we've made use of this snapshot for the close study of mode and melody. But while we provide seemingly objective "data," it should be noted that there are always subjective points of interpretation. Just as the concept of mode is not discrete or categorical, aspects of stress, form, timing, embellishment, and melody all vary with specific performances. Our modal analyses include subjective decisions documented here and in the accompanying website. Beregovski's choices of what to include or not were influenced by his own interests as well as the complex and dangerous politics of the Soviet Union in the 1930s and '40s. Nevertheless, by studying mode through the lens of a single collection, and one that is deeply valued by the community of klezmer musicians, we gain a perspective that can lead to further dialogue, comparative study, close analysis, and creative endeavors.

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Footnotes

* Malin began the exploration of mode in klezmer music with the klezmer violinist Alicia Svigals at an artist-scholar residency at the University of Colorado Boulder (May 2018). Svigals contributed especially to Malin's understanding of modal ambiguity and klezmer schemata (see Malin forthcoming). Earlier versions of this work were presented at a meeting of the Rocky Mountain Society for Music Theory (March 2022); the Seventh International Conference on Analytical Approaches to World Music (June 2022); a joint meeting of the Society for Music Theory, the American Musicological Society, and the Society for Ethnomusicology (November 2022); and an annual meeting of the Association for Jewish Studies (December 2024). We thank Joshua Horowitz, Mitchell Ohriner, John Roeder, Craig Sapp, Alicia Svigals, and an anonymous reviewer for their valuable input.
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1. The term *klezmer* derives from the Hebrew *kley zemer*, or vessels of song. Historically, a *klezmer* was a person who played the music professionally. The Yiddish term *klezmer musik* was in circulation in New York in the 1920s; Beregovski used terms such as *klezmerishe musik* in the 1930s; and the English "klezmer music" became popular starting with the klezmer revitalization in the 1970s (Rubin 2020, 5–7).
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2. Similar critiques are implied, but not stated as directly, in the New Grove article on mode (1980, 423; 2001, V.1).
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3. The notion of melodic "behavior" echoes Blum's formulation: "*Mode* serves as a rubric covering terms in multiple languages that designate different ways to act musically" (Blum 2023, 90). Tarsi describes the Jewish prayer modes as "manners by which music (and other phenomena with which it interacts) 'conducts itself'" (2020, 198).
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4. Jason Yust (2024, 73) notes how the assumption of octave equivalence misrepresents Arabic *maqām*-based music; see also Farraj and Shumays 2019.
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5. Beregovski [1946] 1982 and Slobin 1980 discuss semantic meanings of Jewish modes in the context of Yiddish folksong and theatre. Ashkenazi Jewish prayer modes—which align in certain respects with klezmer modes (see paragraph [0.6])—are loosely associated with affect and liturgical cycles; see Levine 1989, Bernard 2005, and Seroussi 2020, III.2. This especially becomes the case when prayer modes are discussed in connection with the concept of *nusah*, which refers more broadly to the manner of traditional prayer for individual prayer services, texts, times of day, holidays, and local or regional customs. In the Ashkenazi tradition, Biblical cantillation has sets of melodic formulae or *ta'amim*, which vary based the type of text and liturgical context; see Jacobson 2002 and Malin 2016. See also further details on mode and genre in section 1.
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6. The liturgical and para-liturgical music of Jews from North Africa and the Middle East is entirely different from that of Ashkenazi Jews from Eastern Europe. Mark Kligman (2001, 2009) provides a valuable discussion of the use of Arabic *maqām* in the liturgical chant of Syrian Jews in Brooklyn.
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7. See Frigyesi 1993 for a nuanced and perceptive analysis that emphasizes the rhythmic aspects of Jewish prayer and does not rely on a prior theory of modes.
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8. Most of the music comes from Ukraine; the volume provides a list of tunes by place or origin or occurrence (Beregovski 2015, III-16). For further information on Beregovski's biography and ethnographic expeditions, see Sholokhova 2013 and 2017.
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9. *Jewish Instrumental Folk Music* is the third volume in a planned five-volume work of Jewish Musical Folklore. The other volumes included workers' and revolutionary songs, lyrical and family songs, tunes without words, and material from Jewish folk theater. Beregovski presented and defended *Jewish Instrumental Folk Music* with accompanying essays for his doctoral degree at the Moscow Conservatory in 1944—a remarkable side note to the history of Soviet culture during World War II (Yakovleva 2013, 22). Excerpts from the transcript of the dissertation defense are available in Beregovskaia 1994.
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10. There are five pieces without a regular meter: the *Dobranoch* no. 9, the *Kale-bazetsns* nos. 13 and 14, and the *Ava rabos* nos. 17 and 18. There are also four pieces that begin without a regular meter and have metric sections at the end: the *Khtsos* no. 19, the *Taksim* no. 20, and the *Doinas* nos. 21 and 22. The metric sections at the ends of these are included in the corpus.
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11. The corpus was digitized by Rebecca Hamel and Izzy Fincher with funding from the Center for Humanities & the Arts and Program in Jewish Studies at the University of Colorado Boulder. Laine Gruver and Kim Kawczinski assisted with data processing for the website. Beregovski occasionally provides variants of phrases and tunes. For the computational analysis below, we took a single version of each tune (the first notated version), as adding variants would skew the data toward the modes and melodic shapes of those tunes that include variants. For instance, we included the Freylekhs no. 132 but not the variant of this numbered 132a. We did include multiple versions of tunes that Beregovski notated separately with substantial differences, as in the Skotshnes nos. 26 and 93. Bjorling provides helpful cross-references for this and other sets of variants that span across the volume in Beregovski 2015.
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12. For additional information on Beregovski and his work, see Braun 1987, Beregovskaia 1994, Zemtsovsky 2001, Yakovleva 2013, and Sholokhova 2017. Recordings from and notes about the earlier expeditions of Kiselgof, Engel, and Ansky can be found in vols. 1–5 and 10–11 of Vernadsky National Library 2001–2020. See also Veidlinger 2016.
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13. See Malin et al. 2022 for an overview of the KMDMP corpus and the community-based project to digitize the corpus.
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14. Malin (2025a) compares our findings here with a subset of the KMDMP corpus. The present study contributes to the growing fields of corpus studies in music and computational ethnomusicology. For corpus studies, see two special issues in the journal *Music Perception* (2013, volumes 31.1 and 31.2), edited by David Temperley and Leigh VanHandel, and the *Oxford Handbook of Music and Corpus Studies*, edited by Daniel Shanahan, Ashley Bergoyne, and Ian Quinn (2022). Works that outline and represent the field of computational ethnomusicology include Tzanetakis et al. 2007, Tzanetakis 2014, and Gómez et al. 2013. A notable early use of computers for the analysis of Israeli folk song can be found in Cohen and Katz 1977.
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15. Cohen and Katz (1977) similarly group their corpus of Israeli folksongs based on mode.
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16. Ohriner (2019, xxxiii–xxxv) provides valuable commentary on reproducible research in the humanities.
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17. A backup of our data is preserved using the Open Science Foundation's data storage program. See here: https://osf.io/enhak/.
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18. Beregovski's instrumental volume (2015) provides melodies only, without chords or ensemble arrangements. This limitation of the collection was discussed already in the dissertation defense in 1944; see Feldman 2016, 134–36. In some cases, the melodies outline triadic harmonies; examples are discussed below.
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19. Manuel 1989 situates klezmer melody harmonization in the broader context of Andalusian, Eastern European, and Turkish Syncretic musics.
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20. Notes for each tune indicate the source, and frequently the transcriber as well. See Beregovski 2015, III-1 to III-13.
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21. The tunes are the Dobriden no. 1 and Dobranoch no. 9, available on Vernadsky National Library of Ukraine 2013, tracks 40 and 24 respectively. Historical and more recent recordings are documented in a crowdsourced project initiated by Ilya Shneyveys on the Beregovski Online

Forum on Facebook, May 19, 2020,
https://www.facebook.com/groups/682669652488243/posts/704778413610700/.
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22. Measure numbers in this and subsequent examples are counted through first and second endings. This matches the numbering of measures in the kern files used for the computational analysis below.
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23. There are also recordings of the tune by Dave Tarras, Ray Musiker, Kapelye, and others; see "Mitsve Tants Mit Der Kale" in the KlezmerGuide (Lutins 2024).
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24. The fanfare in Example 1 begins with a skip from B to D; such triadic skips are also common. See Malin (forthcoming) for more details on the fanfare and its variable attributes.
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25. Rubin (2020, 129–37) provides an overview of cadential formulas in the repertoire of the New York clarinetists Naftule Brandwein and Dave Tarras.
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26. Rubin (2020, 124–26) avoids prior modal terminology so as not to imply direct parallels with repertoires or traditions outside of klezmer. He uses a system of letters with numerical subscripts.
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27. Feldman (2016, 379–80) notes the influence of Turkish makam on cantors and Jewish instrumentalists in Ukraine and Moldova in the nineteenth century.
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28. See Rubin (2020, 126) regarding the use of the term *freygish* among American-Jewish musicians in the early twentieth century.
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29. The B section in the recordings with Example 1 emphasize F major even more, in both the melody and harmony.
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30. In the introduction to his volume *Jewish Instrumental Folk Music*, Beregovski discusses the four modes outlined here and provides scalar representations and cadential figures for the freygish and altered Dorian (raised fourth) modes (2015, I-23 to I-28). Rubin starts with tetrachords rather than full scales, but he ends up with four "synthetic octave scales," which correspond with Beregovski's four modes (2020, 125–26). He goes on to observe, "These four synthetic octave scales . . . may then be viewed as the basic building blocks for klezmer melodies based on the tonic" (126). Feldman focuses most of his analyses on motives and shifting tonal centers, but he also acknowledges that at least two and possibly three of the commonly discussed prayer modes "constitute structures that can be readily related to the existing klezmer music" (382), and other melodies can be modeled using minor scales. Feldman provides scalar representations and characteristic motives for the modes, drawing on Beregovski (2015), Cohon (1950), and Avenary (1971).
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31. Klezmer musicians often use spellings that reflect traditional Ashkenazi pronunciation; for instance, "Adonoi Molokh" (Sokolow 1987) and "Ahava Rabboh" (Horowitz 1993).
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32. Beregovski (2015) provides the original keys as well in his notes.
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33. These chromatic alternatives will be confirmed by corpus-wide data in section 5. Some of them are notated (by hand) in the pdf of Horowitz 1993; some are given with accidentals in parentheses in Sokolow 1987; and pitch variability is discussed with melodic context in Rubin 2020, 137–40.

Also see the alternative categorizations of modes discussed below.
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34. See Seroussi 1989 for a history of Turkish makam in the musical culture of Ottoman Jews. Signell 2001 compares intonation in Turkish makam theory with equal temperament.
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35. Manuel 1989 likewise adopts the term "raised-fourth scale." The names "altered Dorian" and "mi sheberakh" are not as common as "freygish" among klezmer musicians. Furthermore, "altered Dorian" implies a direct connection with the Church modes (which is not relevant here), and "mi sheberakh" is not a full prayer mode like the others (see Bernard 2005). Some sources also use the term "Ukrainian Dorian" following Idelsohn ([1929] 1967, 185); see Slobin 1980, 314.
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36. Netsky (2015, 102–4) differentiates between forms of major scale at this level, and also forms of the minor scale. Netsky also observes, "The klezmorim I interviewed used only two terms to refer to the tonal language of their dance tunes: major and minor, occasionally mentioning what they called 'Jewish minor'" (102).
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37. There is room for further study of correlations between mode and genre. The corpus can be sorted by both elements together on the companion website.
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38. The Doyne (Doina) no. 22 in Beregovski's volume (2015) is a good example. We have not included Beregvoski's *doinas* in our study because they don't have a regular meter (see paragraph 0.8 above).
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39. Numbers and percentages are given based on the 249 tunes in the present corpus (see paragraph 0.8 above). Beregovski provides similar percentages in his own analysis (2015, I-26). Beregovski also compares the modal makeup of the instrumental music with that of Yiddish folksongs and nigunim (melodies that are typically wordless, associated with Hasidic traditions). Slobin 1980 provides comments on the presence of these modes in other regional folk traditions.
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40. There are additional tunes where the first section begins in a non-primary mode but cadences in the primary mode—i.e., the one designated here as the overall mode for the tune.
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41. No. 101 is an exception; it begins in major and shifts to minor, but it is grouped with other tunes in the freygish mode. It also seems to have been added as an afterthought. The manuscript in Beregovski 2013 provides a different tune for no. 101, but that is the same as no. 81. It seems that Beregovski or another editor realized the duplication and substituted the new no. 101. In the manuscript from Beregovski 2013, tune no. 101 is in the freygish mode, which matches the mode of nos. 85–104.
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42. Ezekiel's Wheels Klezmer Band repeats section A; the audio excerpt with Example 8 begins 32 seconds in, with the second iteration.
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43. The diminished fourth outlined in mm. 15, 17, and 19, <C♯-D-E-F>, is common to both the raised fourth and the major modes, with the raised fourth as a common pitch in major. This facilitates modulations between the two modes, as Rubin observes (2020, 166–67). The diminished fourth, however, is more common as a melodic descent in the figure <F-E-D-C♯-D> (Rubin 2020, 140–41). Netsky (2015, 102–3) includes this tetrachord in his "Maj2," which he relates to Romanian pitch groupings and the cantorial mode adonai malakh.
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44. Rubin (2020, 143) uses "juxtaposition" for changes of tonal center and "interchange" for changes of mode with the same tonic. See also Horowitz 1993, 38–46. The term "interchange" is from Walter Piston (see Rubin 2020, 368n52).
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45. The recording by the Joel Rubin Ensemble (1997) harmonizes the tune in accordance with these mode labels; dominants are added in the first two bars of the C minor section (mm. 17–18) and the B♭ section (mm. 21–22).
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46. There are often ambiguities between G minor and G raised fourth. In this case, we have chosen to tag the passage as G minor with C♯ as a local inflection. Beregvoski places this tune in a section of minor-mode tunes and we have chosen to follow suit. Further instances of ambiguity, and our choices, are documented on the companion website.
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47. Horowitz (1993) and Rubin (2020) do identify modal shifts at these very local levels. Rubin writes, "For the purposes of this discussion . . . the criterion I have employed for modulation has been whether or not the variable tone necessitates a change in the underlying chordal accompaniment" (2020, 138). One could employ similar methods for the Beregovski volume as well, but it is more challenging because the chordal accompaniment is not indicated as such.
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48. Example 18 confirms and provides empirical data for observations made by Beregovski in his introduction to the volume; see Beregovski 2015, I-28. The only exception is that Beregovski mentions occasional moves from G fregyish (identified as "altered Phrygian") to D major (V). We have not found this as an option.
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49. The term "tonality" has been used to identify and study this major-minor key system. Historical accounts by Christensen (2019) and Hyer (2002) and a critique by Yust (2024) identify the racist origins of the term and its detrimental effects on theory scholarship and pedagogy.
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50. Horowitz (1993) uses the liturgical terms "Ahava Rabboh" for freygish, "Adonoy Moloch" for major, "mi sheberach" for altered Dorian, and "Mogen Ovos" for minor. The more recent preface to the paper suggests using Turkish makam terminology instead.
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51. Rubin provides a detailed classificatory scheme for modal movement within sections (2020, 144–59 and 2001, chap. 7). There are patterns in common with the pathways identified here, especially the movement from minor to III major and back. A more detailed comparison will require a separate study.
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52. Sources include publications by Pinchas Spiro (1922–2008), Gershon Ephros (1890–1978), Adolph Katchko (1888–1958), and Israel Alter (1901–1979). See the List of Musical Examples in Bernard 2005, 186–95.
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53. Bernard 2005 identifies freygish as "Ahavah Rabbah," minor as "Magein Avot," and major as either major or "Adonai Malach" depending on context.
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54. In Bernard's terms, this modulation is specifically from "Adonai Malach," which includes a lowered 7^{th} and 10^{th}. In Tarsi's theory of the adonai malach mode, the raised fourth ("Ukrainian-Dorian") pentachord appears in one of the idiomatic motif-types (Tarsi 2020, 213 and 217–18). Tarsi also observes, "In some settings . . . Ukrainian-Dorian can be used in and of itself as a target for modulations, or at times, as a pivot of sorts for other modulations," and he cites several examples

(2020, 218).
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55. Frigyesi 1982 provides an alternative concept of modulation in Jewish cantorial music. Modulation for Frigyesi is based on shifting modal nuclei, smaller groups of pitches with formal functions and degrees of emphasis. This form of detailed modal analysis can also be relevant to klezmer music, especially for pieces that derive from religious contexts. Feldman applies the method with selected tunes identified as "moralishe niggunim," or melodies of high moral character (2016, 225–29).
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56. Nos. 90 and 180 are variants of the same tune, as Bjorling observes (see annotations above the tunes in Beregovski 2015).
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57. Additional recordings include Kapar*одл* (Karagodl) (State Ensemble of Jewish Folk Musicians of the Ukrainian SSR ca. 1937) and Freilacher Bulgar (Art Shreyer's Modern Jewish Orchestra ca. 1928). See Lutins 2024 for additional sources.
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58. For the purposes of clarity, we excluded pitches that fell outside of the standard range in our bar plots, which we considered outliers. The resulting images show the pitches that fall within the range between G_3 and D_6.
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59. A manuscript and transcription of this tune are also available on the KMDMP website (Klezmer Institute n.d.; KMDMP Mak 3-95-181).
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60. We are intentionally not conducting any specific statistical tests with this data. This is an exploratory study with no specific hypotheses about practice, and we feel that it is bad practice to impose inferential statistics on exploratory work (see Müllensiefen and Frieler 2022; Albrecht 2022).
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61. One could model the tendencies of $\sharp\hat{4}$ and $\flat\hat{2}$ in klezmer in terms of Larson's notion of "melodic magnetism" (Larson 2011, 88–96). This also aligns with work that has shown how smaller intervallic motion might facilitate a feeling of stability or "anchoring." See, for example, Deutsch 1978 and Bharucha and Krumhansl 1983.
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