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THEORETICAL FRAMEWORKS FOR GEORGIAN-JAZZ FUSION

This paper presents ideas for integrating the core elements of Georgian traditional music with jazz. Through examining modal structures, harmonic principles, and original tuning of Georgian polyphony, I explore how Georgian musical thinking might interact meaningfully with Western functional harmony and jazz. My hope is to offer a thoughtful approach that honours the integrity of this rich musical culture while creating meaningful pathways for its expression within jazz contexts.

Understanding the relationship between these distinctive musical languages necessitates an examination of their underlying systems and methodological considerations. As a pianist and composer working primarily in 12-tone equal temperament (12-TET), my approach is rooted in a 12-TET interpretation of the folk and chanting tradition. The majority of material that has informed my understanding of Georgian music over the years has already been closer to tempered tuning than the original tuning system, as authentic tuning practices are quite limited in modern performance. My first Georgian instrument was a chromatic panduri, itself a Soviet-era adaptation of the traditional instrument to accommodate 12-TET scales. Combined with my musical upbringing and familiarity with Western theoretical frameworks, my initial approach to Georgian music wasn't a conscious decision to view it through a Western 12-TET lens, but rather the natural outcome of my musical background and the available resources.

It was only after later encountering historical recordings and developing an interest in the authentic tuning system that I realised how my 12-TET theoretical understanding was merely an elaborate metaphor for the inner workings of Georgian polyphony. The analytical strength of this approach, which ultimately enables the authentic fusion I seek to create, lies partly in the higher resolution of a 12-step division of the octave compared to a 7-step octave[1], allowing for subtle variations in tuning to be captured, adapted, and standardised into jazz contexts. This, combined with mathematical abstractions, geometry, and other music analysis techniques, acts as a magnifying glass, revealing numerous inner structures and symmetries encoded in this ancient music. Consequently, it not only forms the basis of my process for composing and interpreting jazz harmony but also shapes my understanding of the authentic tuning system itself.

While acknowledging that Western musical frameworks have historically functioned

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[1] By "a 7-step octave" I do not mean to suggest that the Georgian scale divides an octave into seven equal steps. Rather, I am simply stating that seven diatonic steps fit within an octave, as opposed to the twelve in 12-TET.

as tools of cultural dominance in various contexts, as scholars like Agawu (2016) and Yust (2024) have documented, in this case 12-TET is employed analytically with careful prioritisation of authenticity and accurate representation. In Georgia and the other former Soviet states, traditional tuning systems were systematically altered through Soviet cultural policies that privileged Russian musical paradigms (Fox, 2015). Despite this, I believe that in the case of Georgia, the skeleton of authentic practice remains detectable and intact. Working backwards from these transformed versions toward authentic origins allows for a fusion that respects both traditions; understanding Georgian musical thinking and translating it into jazz contexts without diminishing its distinctive characteristics.

It's crucial to acknowledge that we're dealing with a very different type of tonal organisation from that of Western tonality. The concepts of major, minor, tonic, subdominant, dominant, etc. don't apply to this music, and any attempts to assign such labels are purely aesthetic, devoid of functional significance. These kind of frameworks typically flatten musical diversity by often labelling non-Western-tonal systems as simply "modal," ignoring any potential functional properties, while associating symmetrical structures with atonality. This assumption is contradicted by the existence of equidistant scales in certain folk traditions that exhibit strong directional tendencies. Rather than imposing these vague, culturally-loaded terms onto Georgian music, my interest lies in objectively observing the organisation of pitches and identifying patterns that emerge naturally from analysis.

These shortcomings of Western tonal concepts are hardly surprising, given their relatively young age. Georgian polyphony, by contrast, has remarkably ancient roots, as evidenced by both archaeological and literary sources; among them, Ioane Petritsi's works as well as a 3,500-year-old depiction of a round dance on a bowl (Tsurtsumia, 2020, p.16) whose analogues persist to this day in similar round dances, accompanied by polyphonic song. While we cannot confidently assert that the musical-tonal organisation has remained unchanged, my attempt to trace Georgian polyphony back to its theoretical foundations, seeking the most authentic and pure understanding, and ultimately a meaningful fusion, led me to explore the ancient world for clues.

Petritsi's works provide the earliest literary evidence of an already existing and deeply rooted three-part polyphonic tradition in Georgia in the 11th-12th century, suggesting a far older root (Pirtskhalava, 2002, p. 124). While one might look to contemporaneous Western European music for parallels, the oldest surviving Western pieces from this period, such as the Winchester Troper, contained no more than two voices, making them an unsuitable comparison to Georgia's three-part tradition. More intriguing connections appear in Galpin's *The Music of the Sumerians, Babylonians and Assyrians*, which examines parallels between ancient Sumerian instruments and Georgian ones like the Changi and Panduri, suggesting possible ancient roots (Galpin, 1937). This musical connection is reinforced by broader cultural and linguistic similarities between ancient Sumerians and Georgians.

Though the specifics of Sumerian music remain speculative, my interest in this topic

broadened into an exploration of ancient knowledge and thought. One strikingly consistent theme across early civilisations is the primacy of mathematics. For the Sumerians, mathematics and sacred geometry shaped both religious practice and their understanding of the universe. This is exemplified by Gudea's temple, built by the Sumerian king Gudea according to precise instructions allegedly revealed by the god Ningirsu in a dream, guiding the structure's design through mathematical blueprints (Rey, 2024). This emphasis on geometry and mathematics was not unique to the Sumerians; ancient Egyptians and Greeks exhibited a similar focus. Figures such as Pythagoras and Plato, who spent years studying in Egypt, wove mathematics into their frameworks for music, astronomy, and philosophy, reinforcing its role as a universal organising principle.

Exploring this ancient mathematical route further yields some interesting results and parallels. Plato's Timaeus is a dialogue that explores the creation and structure of the universe, the physical world, and human beings. In this work, Plato details the mathematical construction of the World Soul; a cosmic entity that animates and organises the universe, much like the human soul animates and organises the body. This mathematical construction is effectively given as a series of ratios, part of which simplify to a cycle of 4:3, 9:8, and 4:3, as demonstrated in fig.1 (Horan, 2021, p. 10). When converted to musical intervals, these ratios produce a repeating 1-4-5 shape. Plato's account of the universe's fundamental structure corresponding to a 1-4-5 shape serves as a striking metaphor for the fundamental structure of Georgian music, which also relies on this 1-4-5 shape. The importance of this shape is paramount; it manifests at every level of abstraction, serving as a consistent wellspring of balance and symmetry that makes the music function the way it should. The eeriness of these parallels between the ancient understanding of the universe and the 12-TET understanding of Georgian music extends further in the Timaeus. Here, Plato describes the 5 classical elements of the universe in terms of the five possible regular, convex polyhedra, now known as the Platonic solids. These solids can be represented on a tonnetz (triangle tiling), where the triangles form a tiled 1-4-5 shape. Some of the resulting Platonic solid nets beautifully demonstrate the modal building blocks of Georgian polyphony seen through a 12-TET lens. An illustration of an example of this can be found in fig.2.

The significance of the 1-4-5 shape is widely recognised by scholars and singers of traditional Georgian music, including Vladimer Gogotishvili, who first proposed a non-octave model for the Georgian modal system (Jordania, 2023, p. 119). His fifth diatonic principle closely aligns with the foundations of my 12-TET understanding. Gogotishvili also identifies a fourth diatonic scale and a mixed scale, but I have found that the fifth diatonic principle alone provides a sufficient foundation for understanding the Georgian modal system of western Georgia. My research primarily focuses on western Georgia, while the other scales Gogotishvili mentions may play a role in eastern Georgia, particularly Kakheti; a region I have yet to explore in the same depth (Gogotishvili, 2009).

That said, in Gogotishvili's theory, the fourth diatonic principle in eastern Georgia

seems to indicate less about modal structure and more about cadence patterns, harmonic and bass movements, and a 12-TET vertical interpretation of chordal structures. In other words, various factors could explain the "fourth diatonic principle", without necessarily implying a fourth-based periodicity within the modal framework of eastern Georgia. However, since these details fall outside the scope of this paper, I will simply note that my analysis focuses on western Georgian polyphony and modal structure.

I conceptualise the 12-TET translation of the modal structure as follows: We begin with a centre, say C. From there, we symmetrically expand outwards by two perfect fifths, one above and one below, creating a spread-out 1-4-5 shape, with the fourth on the bottom, resulting in the notes F, C, and G. I refer to these notes as "stations", as they represent a sense of resolution or home for each of the three voices. From each of these stations, we uniformly build a tetrachord. There are three primary tetrachord modes: Major, Minor, and Phrygian. Although the Lydian tetrachord occasionally appears as a division of a single perfect fifth, I have not observed it functioning as a complete three-tetrachord mode. In essence, each mode is founded on a core of perfect fifths, with its structure defined by a distinct approach to partitioning these fifths through a specific tetrachord.

Having highlighted the limitations of Western theoretical terminology, I should clarify that my use of terms like "major," "minor," and "phrygian" when describing tetrachords serves merely as convenient placeholders to describe different divisions of the pure perfect fifth. The validity of this approach for Western Georgian polyphony finds substantial support in computational research. Scherbaum et al.'s analysis of the Erkomaishvili recordings supports the central importance of the fifth diatonic principle, demonstrating that the fifth scale degree consistently emerges as the most salient pitch degree (Scherbaum et al., 2020, p. 56). Their data presents a revealing histogram (Fig.3) showing harmonically adjusted intervals, with a heavily dominating peak around the 700-cent mark (perfect fifth). This research also identifies a "deviation-compensation mechanism" (p. 7-8) whereby Erkomaishvili maintains the structural fifth pillars whilst flexibly expanding and compressing intermediate melodic intervals; precisely mirroring the tetrachordal division of perfect fifths found in the fifth diatonic principle. The role of the fourth, though significant, requires further nuance, particularly in distinguishing between the fourth scale degree and fourth intervals in practice. The Erkomaishvili database reveals a tendency toward sharpened harmonic fourth intervals (p. 48, 55), while the melodic fourth degree remains pure (p. 39). The explanation is straightforward: the fourth interval between degrees one and four is just one example of a diatonic fourth, whereas the many other possible diatonic fourths in the Georgian scale do not necessarily exhibit a consistent tendency toward a pure fourth. This evidence reinforces that while fourths play a significant role, it is the perfect fifth that serves as the primary structural pillar in Georgian polyphonic organisation, with other intervals, including fourths, exhibiting greater flexibility within this framework.

Of course, the variations documented in the Erkomaishvili dataset reflect considerably

more fine and subtle adjustments than my described 12-TET tetrachords, making it unlikely that any similar elaborate theoretical system governed these miniscule tuning choices. Nevertheless, certain intervals in Georgian tuning, such as neutral thirds, cannot be accurately reproduced within 12-TET, necessitating a different kind of theoretical compromise when working within Western frameworks, my solution being these tetrachords.

Continuing with our example of the mode centered on C, let's use the minor tetrachord to illustrate. We derive the notes F, G, A♭, B♭, C, D, E♭, F, G, A, B♭, C. As shown in fig.4, these notes can be further divided into two component octave modes: F Dorian and C Dorian. These two modes contain almost identical notes, differing only by A♭ and A. This semitone discrepancy is not accidental; the same feature appears in every mode with this three-tetrachord structure, regardless of the specific tetrachord (excluding lydian). This introduces a central concept to this 12-TET theory: sub-centres. While a mode's centre represents 'home' and the omnidirectional gravitational pull toward it, a mode's sub-centres (identified by the method demonstrated above) represent the colour and character of the mode.

This concept of sub-centres appears to correspond directly to the neutral intervals found in Georgian tuning, such as thirds and sevenths. Notably, these same intervals display the highest standard deviation in Scherbaum et al.'s analysis of the Erkomaishvili dataset (Scherbaum et al., 2020, p. 53), suggesting a potential origin for this 'semitone discrepancy'. However, the placement of these sub-centres does not always align with the third and seventh degrees of the scale when viewed from the root upwards in 12TET modes. Rather, it is more closely related to the division of an individual fifth unit within the fifth diatonic scale. In the more tempered version of the Georgian modal system in modern practice, the actual third degrees rarely shift freely between major and minor, which is more indicative of the entrenched influence of Western major-minor tonality than a fundamental characteristic of the modes themselves. Instead, it is the outer fifth units within the fifth diatonic modes that exhibit greater fluidity and form these sub-centres, as they are less constrained by the dominance of major-minor polarity. Apart from this explanation, it must also be said that thinking too deeply about degrees from the root upwards in the Georgian modal system can be misleading and should be approached with caution; some even argue that Georgian musical thinking in fact operates from a top-down perspective (Erkvanidze, 2016).

The suggestion of sub-centres representing colouring and character in my theoretical framework finds a parallel in how neutral intervals function in practice. Stuart Gelzer's fieldwork in Svaneti provides a compelling illustration of this phenomenon. He recounts how whilst practicing the chuniri (an unfretted string instrument) in the village of Lenjeri, his host's sister Natela Pilpani corrected his neutral tuning of a seventh, making it slightly more minor. She explained, "This is how we do it in Lenjeri, more sweetly. The other way, more cutting, is how they do it in Latali"; a village merely three kilometres away along the

main road (Gelzer, 2003, p. 186-200).

These sub-centers possess numerous features that can be depicted through theoretical and mathematical abstractions utilising geometric tilings, Tonnetz, pitch axis reflections, and more. For example, When investigating sub-centres through pitch axis reflection[2], an interesting pattern emerges. As shown in fig. 5 and fig. 6, While reflecting our three-tetrachord modes around most axes creates unrelated note collections, reflecting around the sub-centres produces the following: the lower sub-centre yields an identical mode exactly a semitone below the original and the upper sub-centre produces one a semitone above. However, most remarkably, using both sub-centres together as the axis, generates a mode completely identical to the original and in the same key (fig. 7), indicating that these sub-centres represent the mode's fundamental axis of symmetry. Not only does this reveal intriguing properties of the sub-centres, but it also offers valuable insight into a phenomenon like modulation, and the complexities of 12-TET interpretation that are inherently connected to it.

Now onto the practical application of these ideas in my work as a performer and composer. The main challenge in integrating Georgian and jazz idioms lies in reconciling their fundamentally different approaches to tonal organisation and functionality. A simple approach might be to focus solely on modal jazz, placing Georgian modes over independent harmonic structures. However, the more compelling challenge, and my primary focus, is navigating chord changes; the movement from one chord to another following functional harmonic relationships that create tension and release. Unlike modal frameworks where a single tonal centre remains stable, these progressions constantly shift the tonal foundation, requiring adaptive strategies.

Modal centres in Georgian music share conceptual similarities with Western tonal centres but function distinctly, without the major/minor framework and complex functional relationships of Western harmony. The structural priorities of these systems are fundamentally different: jazz harmony builds primarily on thirds, with stacked thirds forming upper extensions that provide most harmonic colouring, while Georgian music prioritises perfect fifths and fourths as primary structural intervals, with significantly less consideration given to thirds. Georgian music organises around central tones that serve as gravitational focal points for melodic movement and expansion rather than vertical harmonic progressions. My approach therefore identifies the most functionally significant "chord-tone" or "guide tone"[3] notes in jazz chords (typically thirds and sevenths) and establishes these as modal

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[2] This refers to a mathematical operation where musical pitches are reflected around either a single pitch or a semitone pair (the axis). With a single axis pitch A, if pitch P_1 is n semitones above A, its reflection P_2 will be n semitones below A. With a semitone axis (e.g., Eb-E), if P_1 is at interval i below the lower pitch (Eb), its reflection P_2 will be at interval i above the upper pitch (E). Example: with C as axis, E (4 semitones up) reflects to A♭ (4 semitones down); with axis Eb-E, G above Eb reflects to C below E.

[3] In jazz theory, guide tones are the chord members that most clearly define a chord's function and quality. These tones create strong voice-leading pathways between chords, often moving by step and providing harmonic continuity

centres, consequently constructing the corresponding modes, preserving the chord's functional role while overlaying Georgian colours and melodic thinking. An example of this on the jazz standard "Fly Me to The Moon" can be found in Fig.8.

However, treating every individual chord as a separate entity, assigning centres to the 3rd and 7ths and hence a corresponding mode per chord is insufficient by itself. This part becomes particularly difficult to address in detail without going deep into jazz theory, but to summarise, there are certain harmonic paths in jazz chord changes, particularly on progressions like 2-5-1s and turnarounds that we can apply to create a more streamlined approach rather than viewing each chord vertically.

This approach to navigating changes bears some resemblance to George Russell's "Lydian Chromatic Concept of Tonal Organization" and its practical applications (Russell, 2001). His system of progressively adding notes to gradually increase tension also parallels my method of expanding Georgian modes through added tetrachords via continuation of the 5th diatonic principle, expanding symmetrically outwards from the modal centre.

Another approach to expanding and enriching the modes involves axis-based motion or spiral patterns, based on concepts I briefly introduced earlier in the paper. By using our sub-centres as axes of symmetry within the fifth units, we create dynamic decorative movement that interacts fluidly with the modal structure. This technique bears similarities to methods employed by Bartók (Lendvai, 1991) as well as Jazz saxophonists Steve Williamson and Steve Coleman (Coleman, 2024) yet remains distinct in its emphasis on the fifth periodicity and sub-centre principles derived from our Georgian roots.

Other theoretical abstractions from the modal structures described in this paper, importantly "Z chords" or "Z-cells", also found extensively in the music of Bartók (Nelson, 1987, p. 105), are highly symmetrical voicings (1-4-b5-7 in its primary inversion) that can function as harmonic identifiers of the three-tetrachord Georgian mode. These compact four-note structures capture the essential colour of the mode and can be effectively used as substitutes for the entire mode. Another concept emerging from these modal structures are 1-4-5 pairs, which parallel the concept of triad pairs[4] commonly employed in jazz improvisation, and feature two 1-4-5 shapes either a major or minor third apart, depending on context.

Having established these general frameworks and examples of specific conceptual abstractions, I should note that the practical application of these ideas doesn't necessarily produce music that aesthetically resembles or "sounds like" Georgian traditional music to the casual listener, nor is this my objective. My priorities lie in creating a deeper-rooted fusion at the level of musical thinking and construction, both tracing back my own musical

with minimal information.

[4] An improvisation technique using two different triads played alternately over a single harmony. These pairs create a hexatonic pitch collection that provides coherent melodic options outside standard scales

lineage and searching for universal musical truths encoded in this ancient polyphony. One of my musical idols, Béla Bartók, achieved this kind of profound integration. I believe that Bartók's distinctive and captivating harmonic language is firmly rooted in Hungarian folk music and his ethnomusicological research, yet his more explorative and abstract compositions don't always bear obvious aesthetic resemblance to it. Still, they remain inseparable from those origins. Similarly, I believe that the essence of successful fusion and integration of musical worlds lies beyond what merely meets the eye.

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Figure 1. Illustration of the mathematical sequences described in Plato's Timaeus

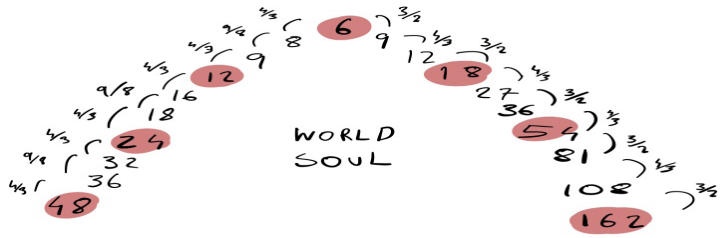

Figure 2. Net of an octahedron (platonic solid) cut out from a tonnetz grid. Each complete triangle represents a "1-4-5 shape"; three pitches forming a root, perfect fourth, and perfect fifth relationship. Moving horizontally right corresponds to ascending by whole tones, diagonally right upward corresponds to ascending by perfect fifths, and diagonally left upward corresponds to ascending by perfect fourths.

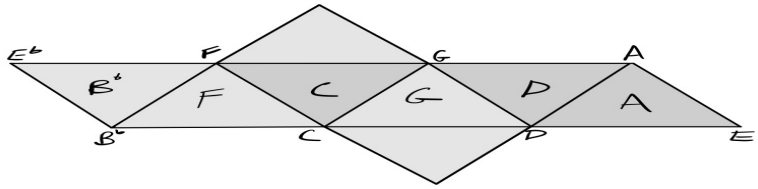

Figure 3. Histogram of the number of occurrences for those dynamically adjusted harmonic intervals in the complete dataset which consist of notes longer than 0.5 seconds and for which the variance reduction of the interval variance was at least 50 percent. Source: Scherbaum et al., Tonal Organization of the Erkomaishvili Dataset: Pitches, Scales, Melodies and Harmonies (Potsdam: Universitätsverlag Potsdam, 2020), 53.

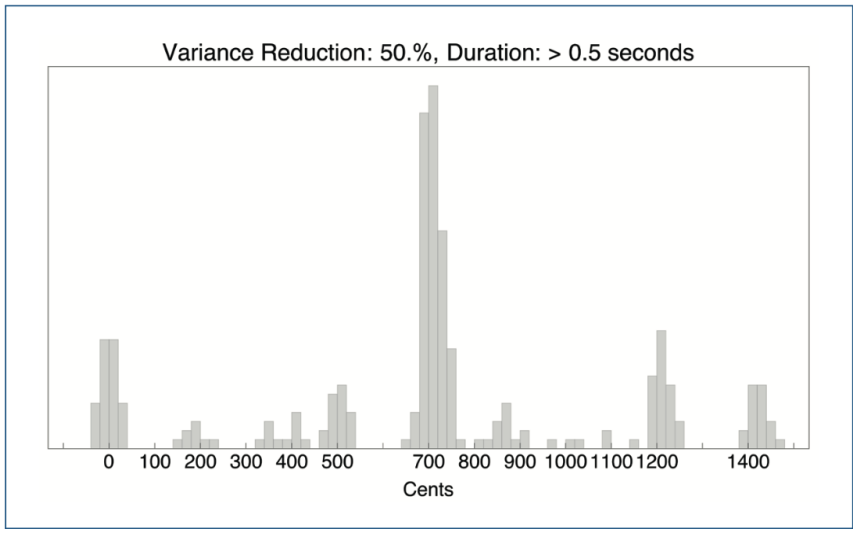

Figure 4. Illustration of the 1-4-5 + tetrachord example split into two component modes, with Venn diagram showing overlapping notes.

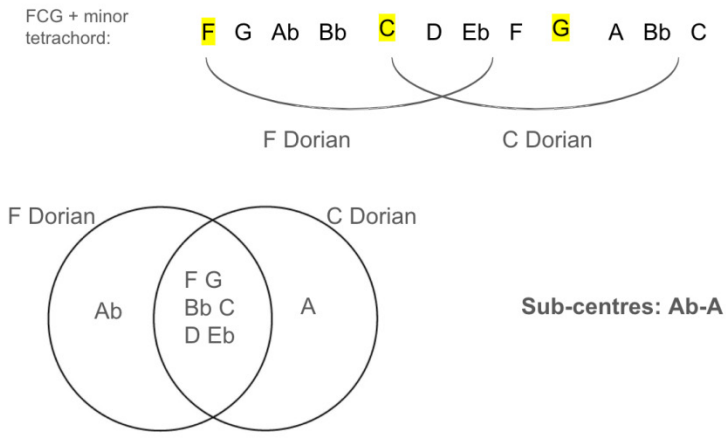

Figure 5. Pitch axis reflection of a mode around it's upper sub-centre (E) resulting in a mode exactly a semitone above

Pitch Axis Reflection Around the Upper Sub-Centre

Original Note	Reflected Note	Explanation
E	B♭	E maps to its tritone equivalent B♭
F	E♭	F is 1 semitone above E, so its reflection is 1 semitone below E
G	D♭	G is 3 semitones above E, so its reflection is 3 semitones below E
A	B	A is 5 semitones above E, so its reflection is 5 semitones below E
B♭	E	B♭ maps to its tritone equivalent E
C	A♭	C is 8 semitones above E, so its reflection is 8 semitones below E
D	G♭	D is 10 semitones above E, so its reflection is 10 semitones below E
E♭	F	E♭ is 1 semitone below E, so its reflection is 1 semitone above E

New Modal Sub-Centres: E-F (a semitone above the original mode)

Figure 6. Pitch axis reflection of a mode around it's lower sub-centre (Eb), resulting in a mode exactly a semitone below.

Pitch Axis Reflection Around the Lower Sub-Centre

Original Note	Reflected Note	Explanation
E	D	E is 1 semitone above E♭, so its reflection is 1 semitone below E♭
F	D♭	F is 2 semitones above E♭, so its reflection is 2 semitones below E♭
G	B	G is 4 semitones above E♭, so its reflection is 4 semitones below E♭
A	E♭	A maps to its tritone equivalent E♭
B♭	A♭	B♭ is 7 semitones above E♭, so its reflection is 7 semitones below E♭
C	F♯	C is 9 semitones above E♭, so its reflection is 9 semitones below E♭
D	E	D is 1 semitone below E♭, so its reflection is 1 semitone above E♭
E♭	A	E♭ maps to its tritone equivalent A

New Modal Sub-Centres: D-E♭ (a semitone below the original mode)

Figure 7. Pitch axis reflection of a mode around both of its sub-centres, resulting in the identical mode

Pitch Axis Reflection Around Both Sub-Centres

Original Note	Reflected Note	Explanation
E	E♭	E maps to the other sub-centre E♭
F	D	F is 1 semitone above E, so its reflection is 1 semitone below E♭
G	C	G is 3 semitones above E, so its reflection is 3 semitones below E♭
A	B♭	A is 5 semitones above E, so its reflection is 5 semitones below E♭
B♭	A	B♭ is 5 semitones below E♭, so its reflection is 5 semitones above E
C	G	C is 3 semitones below E♭, so its reflection is 3 semitones above E
D	F	D is 1 semitone below E♭, so its reflection is 1 semitone above E
E♭	E	E♭ maps to the other sub-centre E

New Modal Sub-Centres: E♭-E (same as the original mode)

Figure 8. Lead sheet of jazz standard ‘Fly Me to the Moon’, with Georgian three-tetrachord modes assigned to each bar.