How MeloPresto™ Smartens-up the Teaching of Scales

Three Scales, One Definition, and Three Rules

The MeloPresto™ Music System teaches a musical novice three scales, one definition ("mode"), and three rules.

- **Three scales:** the pentatonic, the diatonic and the chromatic (section 3).
- **One definition:** a *mode* is a starting position in a scale, named after its tonic. That one definition gives every mode of all three scales.
- **The three Rules of "Ionian-ization":** the Dominant-ization, the Major-ization and the Fortification, each applied under specific circumstances (section 4). The name comes from the TiMS name for Do-mode ("Ionian"), because the three rules rebuilt the final cadence of the minor modes toward the cadence of Do-mode.

These are all **invariant** in MeloPresto, applying to every octave, in every key (using electronic transposition), and in every tuning of the **syntonic temperament** (the family of tunings built from a stack of more-or-less tempered fifths, among them 12-edo (the **e**qual **d**ivision of the **o**ctave into 12 steps), quarter-comma meantone, and Pythagorean tuning, with Thai & West African 7-edo tuning and Balinese 5-edo tuning as the endpoints of the syntonic tuning continuum).

MeloPresto calls the West's **T**raditional **i**ncoherent **M**usic **S**ystem "**TiMS**". TiMS' scale books set out hundreds of scales, and even thousands: 392 in *The Scale Omnibus*, and 2,048 in the twelve volumes of *The Universal Encyclopedia of Scales*, each scale written out in twelve keys. The MeloPresto Music System teaches an apprentice **only three scales**, and three are enough for the vast majority of Western music across the ages (the same body of music to which TiMS was designed to apply).

This is Occam's Razor applied to music education: *do not multiply entities beyond necessity*. Occam's razor is one of the rules that MeloPresto uses to **smarten-up** music (never dumb-down). Another is the maxim attributed to Einstein: *as simple as possible, but no simpler*. Three scales and three rules are as simple as the music allows; the few extra scales that are actually needed, after one's apprenticeship, are taught thereafter (timing: see Table 3).

What the learning is for. The MeloPresto Music System is not job training. Paid work in music is scarce the world over, and few who train for it make a living from it (a survey of United States musicians; a census of United Kingdom musicians). MeloPresto rapidly prepares a novice for a lifetime of satisfying, **knowledgeable** music-making in bands of like-minded amateurs, whose skills range from journeyman to master.

1. The finding

Table 1 (below). What the apprentice is given to learn in each of the two systems.

	What the apprentice is given
TiMS jazz teaching	67 named scales (listed here), each in twelve keys: 804 scale-and-key combinations
The MeloPresto Music System	3 scales, one definition, and 3 rules, each learned **once** then used forever

Three scales, one definition, and three rules explain 60 of the 67 scale names that jazz teaching lists. Of the other seven, five are artifacts of 12-edo tuning, and two are strays. One of the five, the diminished

scale, started mattering in jazz after the Swing Era, and it too is taught simply in MeloPresto (section 8; timing: see Table 3).

That is: MeloPresto teaches all of the same "jazz scales", over time, but at a higher and simplifying level of abstraction.

2. The journey

Table 2 (below). The four stages of a musician's journey, and the Researcher, with what the MeloPresto Music System changes for each.

Stage	What the stage is	What the MeloPresto Music System changes
Novice	The beginner	Starts on MeloPresto's button-field, where each interval has one invariant shape within and across octaves, keys, and syntonic tunings (because MeloPresto's button-field is isomorphic with the underlying syntonic temperament)
Apprentice	Learns the harmonic and melodic material of the craft: scales, modes and chords (along with other concepts & skills unrelated to this paper, such as rhythm)	Three scales and three rules in place of 804 scale-and-key combinations. **The duration of this stage is expected to be 60 dedicated hours, more or less.**
Journeyman	A competent performing musician	Leaves the apprenticeship able to add value to a band, with nothing to unlearn. **We expect that learning in this stage will also be materially accelerated, but not by as high a multiple.**
Master	New frontiers open: new tunings via Dynamic Tonality, and new expression via 9DoF electronic "jammer" music-controllers.	**True mastery is a journey, not a destination**.
Researcher	Researchers are artists, scientists, and entrepreneurs who seek to advance the State of the Art through complementary means: new works of art, new scientific discoveries, and new products & services, respectively.	Dynamic Tonality, as exposed by the MeloPresto Music System, enables a fertile new research program on which all three kinds of Researchers can collaborate productively (*The MeloPresto-enabled Research Program*).

A journeyman, in the guild sense, is someone who has learned the knowledge and skills imparted during a formal apprenticeship. In the MeloPresto Music System, a journeyman is defined likewise, with the clarification that a MeloPresto journeyman can reliably add value to a band of like-minded amateurs.

Mastery takes a lifetime in any system. MeloPresto's goal is to speed up the apprentice's progress to journeyman, and to do it without teaching anything that must later be unlearned within the MeloPresto Music System. *No training wheels.*

Table 3 (below). What is learned in the MeloPresto Music System, by whom, and why then.

What is learned	By whom	Why then
The three scales: pentatonic, diatonic and chromatic (section 3)	Apprentice	With the two rows below, they explain 60 of the 67 scale names of jazz teaching (section 6)
One definition of a mode (section 3)	Apprentice	It gives every mode of all three scales
The three Rules of "Ionian-ization" (section 4)	Apprentice	All three still operate in today's popular song and jazz (section 5)
The blues bends: Me, Te and Fi on the Blue Axis (section 8)	Apprentice	The blues is planned for the third month of the beginner course

What is learned	By whom	Why then
The double harmonic scale (section 7)	Journeyman	Where the repertoire calls for it. It is a real scale, but a rare scale in Western popular song: only 16 of 26,148 passages use it. Very common in Middle Eastern music, as is the schismatic tuning (& 53-edo), both of which are supported by Dynamic Tonality but not "vanilla" MeloPresto.
The diminished scale, as four dominant seventh chords (section 8)	Journeyman	For jazz. Jazz solos have used it since the Swing Era; in other music it is a rare scale
The whole-tone scale, as a dominant-chord effect (section 8)	Journeyman	For jazz. It is a rare scale even in jazz solos, and rarer elsewhere
The four other names the rules do not explain: "augmented", the "tritone scale", "Hungarian major" and "Enigmatic" (section 8)	Journeyman	On request. The augmented scale is a rare scale even in jazz solos (Table 8); the other three were not measured
Other tunings, through Dynamic Tonality, and the 9DoF expression that jammers add (sections 9 and 10)	Journeyman, Master, & Researcher	The same scales, rules and fingerings apply

Nothing learned later replaces anything learned as an apprentice. Each later item is added to the three scales, the one definition and the three rules.

The Apprenticeship phase is expected to use a free, fast-paced, digital, interactive courseware suite developed by MeloPresto LLC. Third-party developers are invited to develop genre-specific courseware, especially for the Journeyman phase and beyond. The MeloPresto Store is expected to offer these third-party courses at the prices set by their creators.

3. The three scales

Table 4 (below). The three scales: the number of notes, the segment of the stack of fifths and the step sizes of each.

Scale	Notes	Canonical segment of the Stack of Fifths	Step sizes
Pentatonic	5	Do So Re La Mi	M2, m3
Diatonic	7	Fa Do So Re La Mi Ti	M2, m2
Chromatic	12	[Le] Me Te Fa Do So Re La Mi Ti Fi Di [Si]	m2, A1

Each is a well-formed scale (Carey and Clampitt, "Aspects of Well-Formed Scales", 1989). Each is defined by the cyclic sequence of intervals within an octave. The canonical segment of a scale on the Stack of Fifths (shown in Table 4, above) is just one possible placement of that sequence. Every scale's canonical segment is centered — by MeloPresto convention — on Re. This convention shows that each lower-cardinality well-formed scale is symmetrical, and nestled into its next-higher-cardinality well-formed scale (pentatonic within diatonic; diatonic within chromatic; continuing on through higher cardinalities). It makes an otherwise obscure factoid of Diatonic Set Theory obvious by inspection and usage.

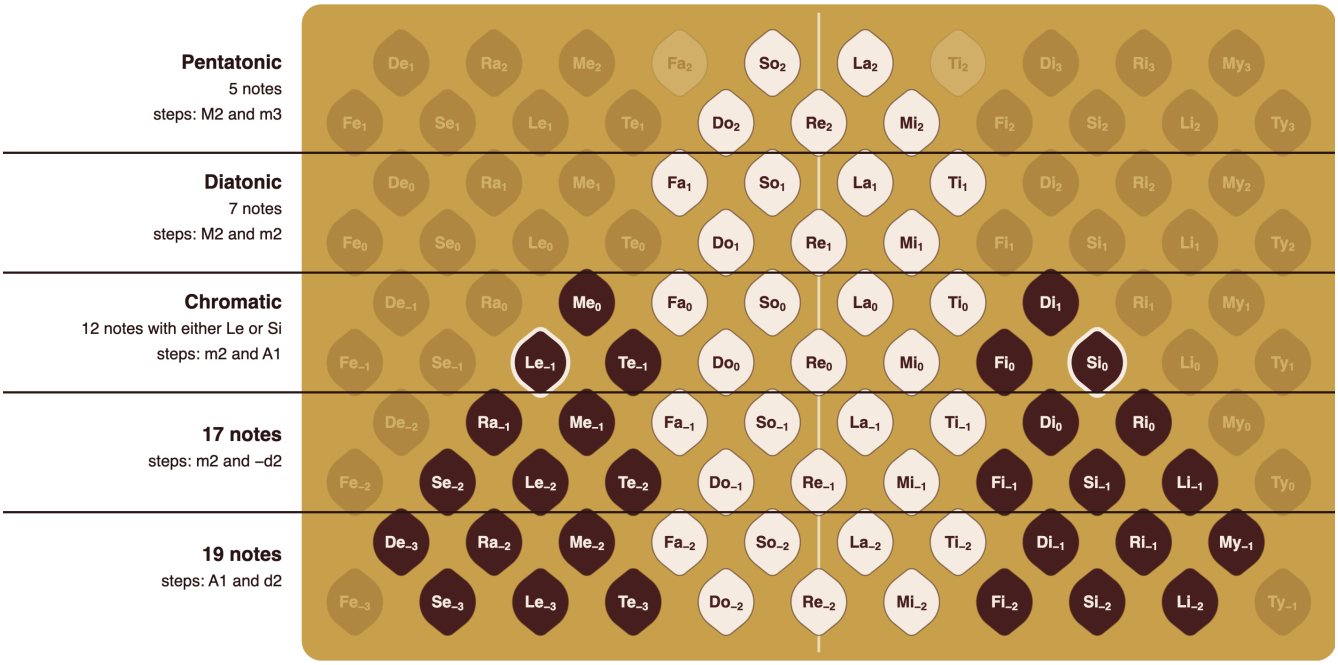


Figure 1 (above). The well-formed scales of fewer than 21 notes, on MeloPresto's button-field. In the figure, each scale has its own section: a row-pair of 21 note-buttons. From the top: the pentatonic scale, the diatonic scale, the chromatic scale, the 17-note scale and the 19-note scale. In each section the note-buttons outside the scale are dimmed. Every scale is centered on the column of Re, marked by the vertical line, and each is nestled inside the scale below it. The chromatic section shows thirteen note-buttons: the two variants of the twelve-note scale differ only in the ringed pair, one having Le and the other Si. The 17-note scale is well-formed where the fifth is wider than 700 cents, and the 19-note scale where it is narrower. Beside each scale are its two step sizes: any two notes that are next to each other (by rising pitch) in the scale are separated by one of these two intervals. This is Myhill's Property. Only the top three scales are taught in the Apprentice phase.

A "**mode**" is a starting position in a scale. In MeloPresto, modes are named after their tonic (in La-minor Movable Do): Do-mode, La-mode, and so on. *A mode is not another scale.*

The chromatic scale has two variants, one that includes Si and one that includes Le. In 12-edo Si and Le sound the same pitch. In meantone tuning they differ, and keyboards with separate keys for G♯ and A ♭ were built from the fifteenth century to the eighteenth, and concertinas into the nineteenth.

Quarter-comma meantone is not ancient history. Wheatstone's English concertina, in meantone temperament until about 1860, had fourteen notes to the octave, with separate buttons for G♯ and A ♭ and for D♯ and E ♭ . English church organs kept meantone tuning well into the nineteenth century, and some could still be heard in the 1880s. It was an excellent tuning, given up grudgingly for the sake of free modulation and because keyboards with more than twelve notes to the octave were judged "cumbersome" (Isacoff 2009). MeloPresto enables free modulation by electronic transposition, on a two-dimensional button-field that is compact and on which no wolf interval arises in any syntonic tuning. Same with Pythagorean tuning, 31-edo, Just Intonation ("**JI**", up to the 11-limit), etc. *In MeloPresto, everything old is new again.* Apprentices are introduced to JI for ear training, and are briefly introduced to the syntonic temperament's tuning continuum late in the Apprenticeship, but the rest of the Apprenticeship is taught in 12-edo.

Therefore, every new MeloPresto journeyman will know what "Just Intonation" and the "syntonic tuning continuum" is and how to access it within the MeloPresto Music System, but the details of their general use are left for the Journeyman phase of their instruction. Likewise, they will understand the relationships among three well-formed scales, which they can extend to higher-cardinality scales.

4. The three rules for "minor"

Table 5 (below). The three rules: what each one changes in La-mode, the chord in which it applies, and the date by which it was in use.

Rule	What changes, in La-mode	Where	In use
The Dominant-ization	Si in place of So; and Fi in place of Fa where Fa would stand directly beside Si	The chord before the final tonic	By the fourteenth century
The Major-ization	Di in place of Do	The final tonic chord	Complete by about 1565
The Fortification	Ri, the A6 (augmented sixth) above Fa	The chord before the Dominant-ized chord	By about 1740

The three rules are history, not invention. *A Cadence of Change* dates each of them in about 32,000 encoded works, from the fourteenth century to modern popular song. Together they rebuilt the final cadence of the three minor modes (Re-mode, La-mode, Mi-mode) toward Do-mode's cadence. All three still operate in today's pop and jazz (section 5). The "harmonic minor scale" and the "melodic minor scale" entered teaching as keyboard drills: the melodic form in the treatises from C. P. E. Bach (1753) to Czerny (1839), the harmonic form in the piano manuals of Beyer (1850) and Hanon (1878), where the two names seem first to appear. Drilling the scales took the place of learning when to apply the three rules. That may have been a practical trade-off for TiMS, but it would be an extremely bad trade-off for MeloPresto — so MeloPresto teaches the Three Rules instead of the Harmonic Minor and Melodic Minor pseudo-scales (a term defined in section 7).

5. The Three Rules in music today

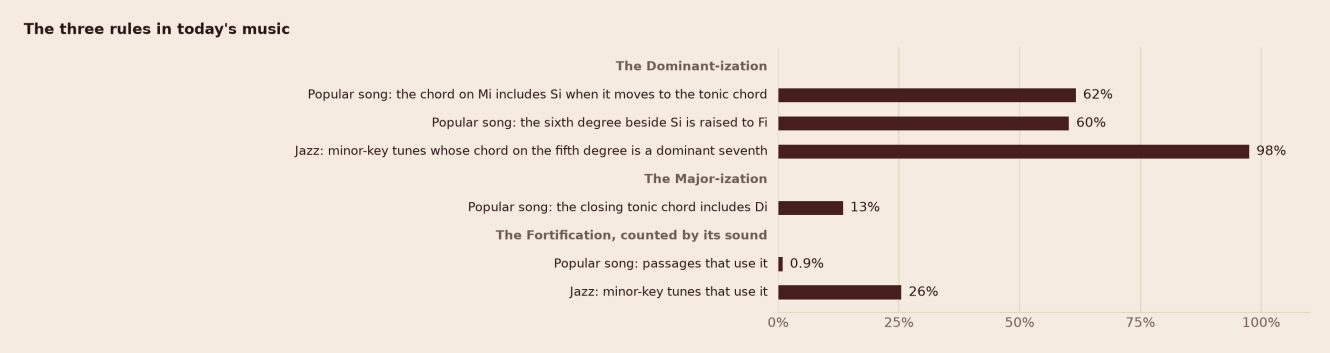


Figure 2 (above). How often each of the Three Rules is applied in today's music, as a percentage: three measures of the Dominant-ization, one of the Major-ization and two of the Fortification, in popular song and in jazz.

Table 6 (below). How often each of the Three Rules is applied in today's popular song and in jazz. Figure 2 (above) draws six of these measurements.

Rule	Popular song: 10,354 transcribed passages labelled La-mode	Jazz: the written chords of 295 tunes
The Dominant-ization	The chord on Mi includes Si, not So, 62% of the time when it moves to the tonic chord. In the melody, the sixth degree directly beside Si is raised to Fi 60% of the time.	48% of all chords are dominant sevenths. A third of all chord arrivals are approached by a dominant seventh a fifth above or an m2 above. In minor-key tunes the chord on the fifth degree is a dominant seventh in 39 tunes of 40.
The Major-ization	13% of closing tonic chords include Di	Not measurable: the data has solo choruses, not endings

Rule	Popular song: 10,354 transcribed passages labelled La-mode	Jazz: the written chords of 295 tunes
The Fortification, counted by its sound	0.9% of passages	25% of minor-key tunes; 10% of major-key tunes

- **The Dominant-ization is the living rule.** It governs the chord before the tonic in most La-mode passages of popular song, and jazz applies it to chord after chord. In popular melody Si is 13.1% of seventh-degree notes, inside the 12.3% to 15.3% band that *A Cadence of Change* reports for 1560 to 1649.
- **The Major-ization is a steady minority choice.** It closes about one La-mode passage in seven, the level it has stayed at since the middle of the nineteenth century.
- **The Fortification lives mostly in jazz.** Both corpora record chords by sound, not by spelling, so the count is of a chord on the sixth degree that sounds as Fa La Do Ri and moves to the chord on the fifth degree.

6. What the three scales and three rules replace

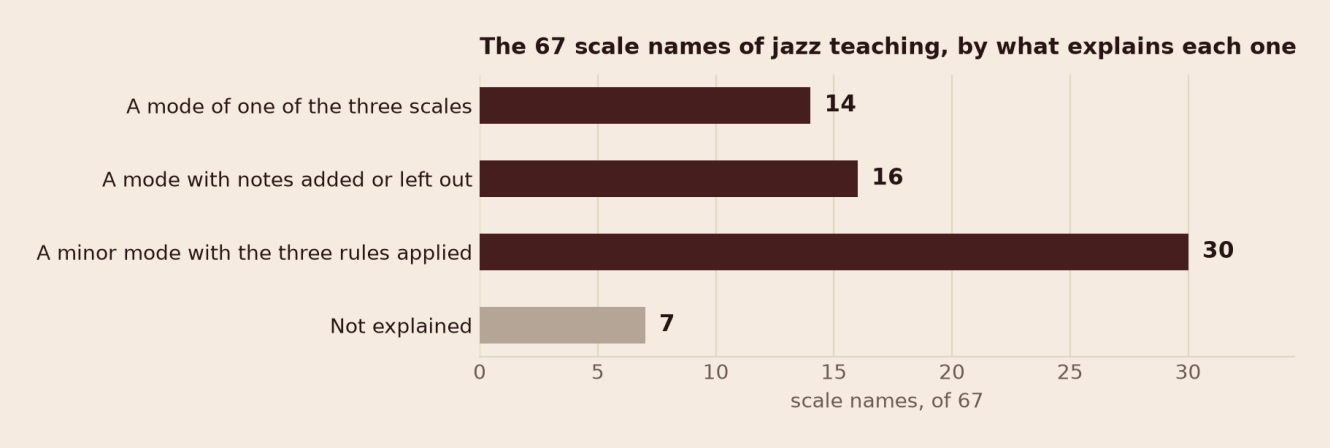


Figure 3 (above). The 67 scale names of jazz teaching, counted by what explains each one: a mode of one of the three scales (14), a mode with notes added or left out (16), a minor mode with the three rules applied (30), and not explained (7).

Table 7 (below). Nine of the 67 scale names of jazz teaching, and what each one is.

The name jazz teaching uses	What it is
"Harmonic minor"	La-mode with the Dominant-ization: Si for So
"Melodic minor"	La-mode with the Dominant-ization and its Fi
"Altered scale"	The Si-mode of "melodic minor": the same notes, with Si as the tonic
"Lydian dominant"	The Re-mode of "melodic minor": the same notes, with Re as the tonic
"Mixolydian ♭6"	La-mode with the Major-ization: Di for Do
"Harmonic major"	La-mode with the Dominant-ization and the Major-ization
"Hungarian minor"	La-mode with the Dominant-ization and the Fortification
"Bebop dominant"	So-mode plus Fi

The name jazz teaching uses	What it is
"Blues scale"	A pentatonic La-mode whose third, fifth and seventh are optionally bent; the six-note form is a pedagogical pseudo-scale (section 8)

- **Names against cycles.** The modes of one cycle are one scale, so the 67 names are 26 cycles. Seven of the 26 are a minor mode with rules applied, and those seven explain 30 of the names.
- **The rules do not explain every possible scale.** With one note per degree, 46 seven-note cycles are possible. The rules explain 12 of them. Jazz teaching names 10 of the 46, and the rules explain 8 of those 10.
- **Popular song.** Hooktheory's users labelled the scale of each of 26,148 transcribed passages, from 15,187 songs. 99.8% of the labels are a mode of the diatonic scale. The other 0.2% are "harmonic minor" or its Mi-mode.
- **Jazz teaching's own critics.** Salley (2007) reaches a like conclusion from the solos of Charlie Parker and Clifford Brown: teaching one scale for each chord leads to "cumbersome taxonomies of scale types and overly specified chord categories", and the notes outside the chord are better taught as neighbors of the chord's root, third, fifth and seventh.

7. How to tell a scale from a rule: count the steps

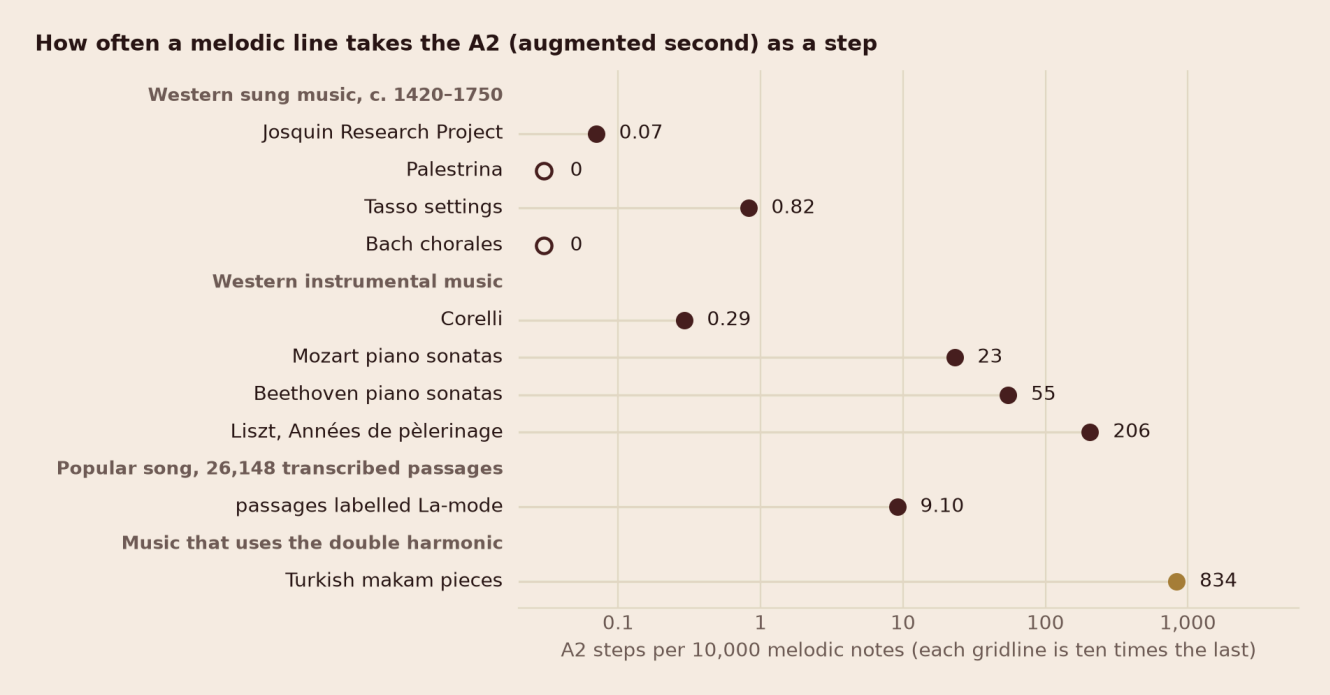


Figure 4 (above). How many times in every 10,000 melodic notes a line takes the A2 (augmented second) as a step, in Western sung music from about 1420 to 1750, in Western instrumental music, in popular song, and in music that uses the double harmonic. Each gridline is ten times the one before it, and an open circle marks a count of zero.

A scale is something a line moves along by step. So the test of a scale is whether lines take its characteristic step. For "harmonic minor" and for the double harmonic, that step is the A2 (augmented second).

A scale also supplies the notes of a whole passage, whatever chord is sounding. A **pseudo-scale** is a set of notes that TiMS names and drills as a scale, but that a given body of music does not use as one: its notes are a mode's notes with a rule applied, and the added notes sound only while that rule is in force. In

Western music the pseudo-scales are "harmonic minor", "melodic minor" and their modes. The six-note "blues scale" is a pseudo-scale of a second kind: its added note is a bend written down as a note (section 8).

- **"Harmonic minor" was never, and is not now, a scale in Western music.** In Western sung music from 1420 to 1750, lines almost never take the A2: once in 341,005 notes in the La-mode and Mi-mode pieces of the Josquin Research Project. The raised seventh and the sixth below it belong to two different chords. **"Harmonic minor" is the Dominant-ization written out as though it were a scale**...and that's still true today, as shown in Section 5 above.
- **In popular song the Dominant-ization is still a rule.** In the 10,190 La-mode sections of Hooktheory's transcribed passages that have a melody, lines step between Fa and Si 9 times in every 10,000 notes. Users labelled only 34 passages "harmonic minor", and too few of those are real songs to measure.
- **The double harmonic *is* a scale.** In 396 Turkish makam pieces that use it, lines take the A2 834 times in every 10,000 notes. It is a real melodic scale, and the MeloPresto Music System teaches it as one where the repertoire calls for it (timing: see Table 3). The popular-song corpus has only 16 passages that use it, too few to measure.

TiMS teaches all of these as being "scales". The MeloPresto Music System teaches a rule as a rule, a mode as a mode, and a scale as a scale, because the music shows which is which. The instrumental counts in the figure include arpeggios of diminished seventh chords, which include an A2.

8. The exceptions

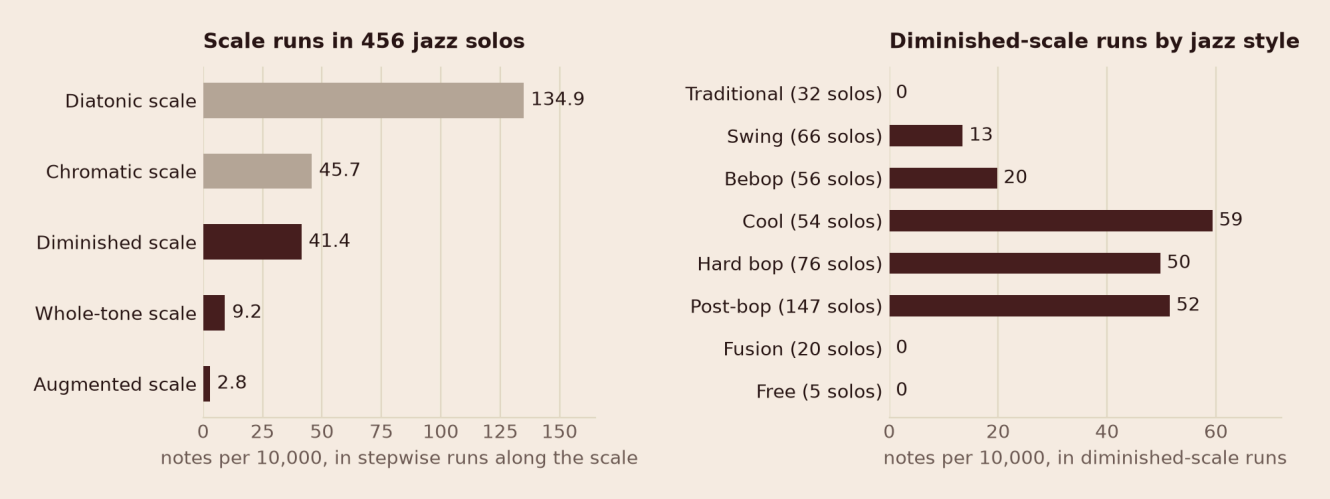


Figure 5 (above). Left: the notes in every 10,000 that lie in stepwise runs along each of five scales, in 456 jazz solos. Right: the same count for the diminished scale alone, in each of eight jazz styles.

Table 8 (below). The notes in every 10,000 that lie in stepwise runs along the diminished, whole-tone and augmented scales, in art music and popular song and in jazz solos.

Scale	Art music and popular song, 5.1 million notes	Jazz solos, 200,809 notes
Diminished	0.36	41.4
Whole-tone	0.15	9.2
Augmented	0.04	2.8

- **These are rare scales.** A **rare scale**, within a given body of music, is a scale that the music seldom uses. The whole-tone and augmented scales are rare in every body of music measured here. A

few art-music works, Debussy's "Voiles" the best known, use the whole-tone scale for a whole passage; there it is a scale, and a rare one. The diminished scale is rare everywhere except jazz after the Swing Era. The double harmonic is rare in Western popular song but common in Middle Eastern music (section 7).

- **Rare outside jazz.** Runs along the scales that jazz calls "whole-tone", "diminished" and "augmented" are absent from sung music and from everything before the middle of the eighteenth century.
- **The diminished scale became real in jazz after the Swing Era.** Its runs are about a third as common as diatonic runs of the same length, and occur in one solo in seven.
- **MeloPresto describes it simply.** In 12-edo the diminished scale is exactly the notes of four dominant seventh chords (the shape of So7: M3, m3, m3) whose roots lie an m3 apart. The four roots make one diminished seventh chord (m3, m3, m3), and the thirds, fifths and sevenths of the four chords make another. For each of the four, another of the four is its substitute dominant, which jazz calls "tritone substitution". So, MeloPresto can teach it as it really is... and does (timing: see Table 3).
- **Jazz solos support that description in part.** Over a dominant seventh chord, a diminished run uses the collection that includes that chord 65% of the time, where chance gives 33%. On the tunes' written chords, 46% of diminished-run notes lie in a collection that includes a dominant seventh chord under or just ahead of them, where chance gives 24%. Written chords do not show a dominant that the soloist adds, so 46% is a floor.
- **Whole-tone runs are a dominant-chord effect.** The whole-tone scale that a run uses includes the root of the chord under it 92% of the time, where chance gives 50%.... So MeloPresto teaches it that way (timing: see Table 3).
- **The six-note "blues scale" is a pedagogical pseudo-scale.** The blues is a pentatonic La-mode whose third, fifth and seventh are optionally bent. Titon (1994) transcribed early blues singers and found those three notes sung across ranges of pitch, not at fixed pitches; Cutting (2019) measured 1,101 sung notes in fifteen early recordings and found the same three regions, with the tonic, the fourth and the fifth stable. Hähnel (2019) and Pfleiderer (2019), commenting on Cutting, hold that many blue notes are glides through a range of pitch. Kubik (2008) derives the blues from a pentatonic scale of the west-central Sudan: the tonic, a low third, the fourth, the fifth and a low seventh, which is the pattern of a pentatonic La-mode. He treats the third as one area of pitch, from 267 to 386 cents above the tonic, and the seventh as a note that singers reach with slurs, near 969 cents. He adds that not every blues melody is pentatonic. Jazz teaching wrote one bend down as a fixed added note, Ri or Me. That six-note scale is first known in print in Jamey Aebersold's method book of 1970, and Chodos (2018) calls it "a pedagogical tool" that "fails as an approximation of that idiom". Jazz solos agree. In 96 solos on blues tunes, 41% of the notes are outside the six-note scale, and the M3 above the tonic (9.0% of notes) is more common than the m3 (8.3%). The added note is as common in the other 333 solos (5.1% of notes) as in the blues solos (5.2%). After it the line steps up 27% of the time and down 24%, so the data favor neither Ri nor Me. MeloPresto teaches the bends as bends. The Blue Axis bends three chromatic notes (Me, Te and Fi) and leaves every other note still, so a jammist can play some of those intervals bent and the others not bent.

9. Nothing to unlearn, and new frontiers of mastery

- **Every statement taught is a fact.** The three scales are properties of the stack of fifths. The three rules are derived from data. Each exception is taught as what the music shows it to be.
- **TiMS *does* require unlearning.** Its learner is taught "harmonic minor" as a scale, and later that its defining step is avoided. The same learner is taught that "melodic minor" changes with direction,

when what governs the raised sixth is whether it stands beside the raised seventh (whether ascending or descending).

- **MeloPresto's teaching applies within and across every octave, key, and syntonic tuning.** On the button-field any given scale has an invariant shape (although enharmonic equivalence can provide handy alternative fingerings in some tunings).
- **Dynamic Tonality makes alternative tunings easy.** The Pentatonic and Diatonic scales are well-formed across the entire syntonic temperament's valid tuning range. The Chromatic scale has two variants, one for each side of 12-edo on the syntonic tuning continuum, but this can be ignored for 12-edo and tunings close to 12-edo, which is what the Apprenticeship emphasizes. What the apprentice learned in one tuning is played with the same fingering in the others.
- **Physical jammers enable new musical expression.** With internal motion sensors and thumb-operated joysticks, future electronic jammers will enable jammists (i.e., jammer-players) to control more continuous degrees of freedom than any other polyphonic instrument.

10. The MeloPresto-enabled Research Program

The Researcher is the fourth learner in Table 3. The research that the MeloPresto Music System makes possible is set out in a companion paper, *The MeloPresto-enabled Research Program*.

This paper shows the method on a small scale. It reasons from First Principles: what is a scale? What is a mode? What pseudo-scales can be collapsed to a smaller number of scales, through the application of a few rules? What does the data show? How can we use these facts to smarten-up MeloPresto?

This paper leaves these questions open:

- **How much shorter is the apprenticeship?** That it is shorter at all is a claim to test (section 11).
- **Where do the other diminished-scale runs in jazz come from?** The written chords of the tunes explain 46% of them (section 8), less than half. What about the other half?
- **Ri or Me in the blues?** The two are one pitch in 12-edo and two different notes in every other tuning. In jazz solos the data favor neither (section 8). For early blues singing the sources differ. Titon heard the third bent note fuse with the fifth above the tonic; Cutting measured it clustering with the fourth, while the fifth stood in a cluster of its own (Pfleiderer 2019 stresses the point). Kubik (2008) calls the name "flatted fifth" a misnomer, writes the note as a fourth raised, and reports Evans's view that it serves sometimes as an alternative fifth and sometimes as an alternative fourth. Cutting's measurement and Kubik's account favor Ri. Or, does it matter, so long as they are easily bent for expressive effect?
- **What changes in other tunings?** This paper counts notes, not tunings. Dynamic Tonality lets the same scales and rules be played, and studied, in tunings other than 12-edo.

11. What was measured and what was not

- **Measured:** how much there is to learn, and how often each scale and each rule occurs in 29,304 pieces and transcribed passages and 5.3 million melodic notes of sung, instrumental, popular, classical, and jazz music, with 2,200 Turkish *makam* scores beside them. 27 entries with nonsense names were left out of the popular-song corpus.
- **Not measured:** how fast anyone learns it. That the apprenticeship is shorter follows from there being far less to learn; it is a claim to test.
- **Fewer names is not less skill.** The learner must still apply a rule at the right moment. The claim is that three rules learned once serve better than 67 tables learned by rote.
- **The list of 67 is not the ceiling.** Any scale can be added and explained the same way.

12. References

MeloPresto's own terms

- MeloPresto Nomenclature, https://melopresto.com/nomenclature/. Every MeloPresto term linked in this paper is defined there.

The MeloPresto papers

- *A Cadence of Change: The Rise and Fall of the "Ionian-ization" of Minor*. The dates and the measured history of the three rules. https://melopresto.com/papers/a-cadence-of-change/
- *Two Scales That Are Not Scales*. The A2 test of "harmonic minor" and "melodic minor". https://melopresto.com/papers/two-scales-that-are-not-scales/
- *Minor Scales in MeloPresto*. The three rules as taught.
- *Jazz in MeloPresto*. The Dominant-ization in jazz.
- *The MeloPresto-enabled Research Program*. https://melopresto.com/papers/melopresto-research-program/

Scales and tuning

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- Hooktheory: 26,148 transcribed passages from 15,187 popular songs, in the release that accompanies Sheet Sage. https://www.hooktheory.com/theorytab; https://github.com/chrisdonahue/sheetsage
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- "The Median U.S. Musician Is Still Making Under $25,000 a Year", *Rolling Stone*. https://www.rollingstone.com/pro/news/the-median-u-s-musician-is-still-making-under-25000-a-year-666833/
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The measurements

- In this paper's folder, `research/three_scales_three_rules/` of the `melopresto` repository: `symmetric_and_a2_measures.py`, `makam_a2_and_jazz_measures.py`, `jazz_diminished_by_chord.py`, `three_rules_today.py`, `a2_by_song.py`, `hooktheory_nonsense_names.py` and `blues_scale_in_jazz_solos.py`, each with its saved output beside it. The figures are drawn by `three_scales_figures.py` and, for Figure 1, by `nested_scales_figure.mjs` from the Kernel's own button-field.