

SCALEMAKING - Analysis, Synthesis, and Coding

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You may think of scalemaking as some sort of esoteric musical alchemy. This is near the truth, for as with alchemy the intent may be to transmute something of little value into gold. This may be in the form of a valuable piece of music. The process, like chemistry, may be approached from two opposite directions: starting from an existing scale and by analysis breaking it down to its constituent parts to discover how it works, or by synthesis constructing a scale using some form of recipe.

First a few definitions:

A scale is a series of notes which are used in a piece of music. These may be identified by their musical names using the letters A through G. Each of these letters may also be followed by any number of sharp or flat symbols. For example the notes D-E-F-G-A-B-C-D make a minor scale from D.

Any scale may be transposed by changing the starting note which will change the other note names and the key signature. If we flatten all the notes of this minor scale from D by one Large interval from D to C, we create a minor scale from C [C-D-Eb-F-G-A-Bb-C] and the key signature now has two flats (Bb and Eb). Our two examples here have shown us two minor scales, from D and from C minor, which both use the same mode.

This mode of L-s-L-L-L-s-L is known as the Dorian or Kafi mode. (The name is dependent upon whether you are using the English, Greek or Indian names for the mode).

A mode is a sequence of intervals, which may be defined by Large and small intervals. The sequence for the two minor scales used in the examples above are both L-s-L-L-L-s-L, which we described as the minor mode. This sequence of intervals added together gives a total of five Large and two small intervals, which gives us one octave.

We can therefore consider this pattern as circular. That is it ends on the octave note above where it started. Using this same circular sequence we could start it at any point and each of the seven starting points gives us another mode. In this case we can make all the Greek modes using this sequence, which are the basis of Western music and harmony. These seven different notes are contiguous on the spiral of fourths and fifths, and arranged in pitch ascending order, give us a megamode. This is the circular pattern from which the seven Greek modes are derived.

A megamode is a circular sequence of intervals from which modes are derived. The megamode of seven contiguous positions on the spiral of fourths and fifths produce all the Greek modes. We could describe this as an expanse of six steps which contains seven notes. There is a comparable megamode of four steps which produces five contiguous notes and generates five pentatonic scales.

To analyse a collection of notes.

1. List all the different notes which are used in the piece regardless of octave.

2. Arrange the note names in order of fourths (flats) in one direction and fifths (sharps) in the other, leaving blank spaces where notes are missing. [Sequence ascending in fifths is: Bbb Fb Cb Gb Db Ab Eb Bb F C G D A E B F# C# G# D# A# E# B# F## C## etc.] The fifth may be considered as the dominant, and the fourth as the sub-dominant.

3. Count the total number of steps between the fourthmost (flat) and fifthmost (sharp) note. This is the extent of the string, or chain of fourths/fifths (x).

4. List the missing notes. Identify them by numbering the flatmost as 1 and the following as ascending numbers moving through fifths. Each of the missing notes may be defined as between 2 and x.

5. The megamode may now be defined by the number of steps and the position of the missing notes (m1, m2, etc.). Eg. x=12 m1=2; m2=5; m3=9; and m4=11. Therefore there are four notes missing in the sequence. The extent is (x)=12. So there are thirteen notes of which four (m1 to m4) are missing leaving 13-4 = 9 notes. In this case numbers 1, 3, 4, 6, 7, 8, 9, 10, and 12. 6.

6. The mode is determined by which of the notes is chosen as the start of a sequence of ascending frequencies. This starting note may be identified by stating its position on the chain of fifths. For example, if the notes were six consecutive steps (Eg. F C G D A E B); these pitches could be arranged in seven modes of different ascending pitch orders.

	I	bII	II	bIII	III	IV	#IV	bV	V	bVI	VI	bVII	VII	Name
1	F	-	G	-	A	-	B	-	C	-	D	-	E	Lydian
2	C	-	D	-	E	F	-	-	G	-	A	-	B	Ionian
3	G	-	A	-	B	C	-	-	D	-	E	-	F	Mixolydian
4	D	-	E	F	-	G	-	-	A	-	B	C	-	Dorian
5	A	-	B	C	-	D	-	-	E	F	-	G	-	Aeolian
6	E	F	-	G	-	A	-	-	B	C	-	D	-	Phrygian
7	B	C	-	D	-	E	-	F	-	G	-	A	-	Locrian
	I	bII	II	bIII	III	IV	#IV	bV	V	bVI	VI	bVII	VII	Name

L = Large interval

S = small interval

(F) 1 (first note in chain) (Lydian) I-**L**-II-**L**-III-**L**-#IV-**s**-V-**L**-VI-**L**-VII-**s**

(C) 2 (2nd in chain) (Major or Ionian) I-**L**-II-**L**-III-**s**-IV-**L**-V-**L**-VI-**L**-VII-**s**

(G) 3 (Mixolydian) I-**L**-II-**L**-III-**s**-IV-**L**-V-**L**-VI-**s**-bVII-**L**

(D) 4 (Dorian) I-**L**-II-**s**-bIII-**L**-IV-**L**-V-**L**-VI-**s**-bVII-**L**

(A) 5 (Aeolian) I-**L**-II-**s**-bIII-**L**-IV-**L**-V-**s**-bVI-**L**-bVII-**L**

(E) 6 (Phrygian) I-**s**-bII-**L**-bIII-**L**-IV-**L**-V-**s**-bVI-**L**-bVII-**L**

(B) 7 (Locrian) I-**s**-bII-**L**-bIII-**L**-IV-**s**-bV-**L**-bVI-**L**- bVII-**L**

7. The key of the scale and scale is determined by the tonal center, which may be defined as C,D,E,F,G,A, or B with the appropriate sharps or flats. The scale may then be listed in ascending frequency order by note name.

8. A scale or mode may therefore be defined as: Number of steps in chain (x)/position(s) of missing notes (counted from fourths towards fifths)/Position of tonic (counted from fourths towards fifths). Eg. The scale and mode described as 5/25/3 could give the notes F-G-D-E from the chain F-C-G-D-A-E. Using the third note of the chain (G) as the starting note giving a scale of G-D-E-F or the mode of I-V-VI-bVII.