THE EMPEROR HAS NO CLOTHES: MUSIC AS IT ACTUALLY IS ON THE PIANO KEYBOARD

R.J.A. Buhr (v17/19)

INTRODUCTION

I approached the piano as an adult beginner interested in learning to play jazz, which eventually led me to wonder how jazz pianists can improvise in terms of a music notation that seemed to me to be misleadingly complex for the piano. I thought improvisation must tap into deeper musical structures that are obscured by this notation. Music notation has stood the test of time, but the piano has also stood the test of time without needing variable-pitch piano keys to play notes exactly as specified by the sharps and flats of music notation. Music notation acts as "clothes" that obscure the simplicity of the relationship between what the eye sees on the keyboard and what the ear hears. In the words of the fairy tale, "the emperor has no clothes." Full music notation is required for composition and professional performance of fully-written-out pieces, and for communication among professional musicians, but written piano music is full of obscuring complexity.[1]

So called "fake books" identify a way to proceed to solve this problem, although they do not themselves solve it. They present melody and harmony by two lines of symbols, namely a line of note symbols on a staff and a line of chord symbols above the staff. This doesn't solve the problem because the obscuring complexity of the "clothes" of music notation remains, and new a kind of complexity emerges. The individual chord symbols are often complex, and the permutations and combinations of many different kinds of chord symbols in progressions with constantly changing roots are complex.[2] Experts learn to understand such progressions instinctively after thousands of hours at the keyboard. Piano teachers suggested to me that I could simplify sophisticated jazz chords by playing "straight" versions of them, but I didn't want to simplify the music, I wanted to simplify the notation. Jazz chords are often complex in music notation because chord symbols originate in key signature scales and jazz chords often don't. Their symbols have to be altered to fit the actual scales, which is like "banging square pegs into round holes" — the results tend to be messy. I thought that removing the "clothes" of music notation to represent how chords actually are on the keyboard might do the job.

I was encouraged to think that simplification might be possible by the simplicity of the way people with musical ears recognize and remember melodies by ear, as **skeleton melody lines** determined by a starting pitch and successive pitch intervals going up and down, independently of durations of notes and rests, of rhythm, and of how music notation represents the notes. Pitch intervals are measured in half tones, the intervals played by adjacent piano keys, so these lines are directly visible on the piano.

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[1] An example of misleading complexity is provided by one of the simplest and most distinctive changes in music to the ear, namely a change from major to minor tonality of the same tonic. The example is for the tonic provided by the black piano key immediately above C, variously known as C# or Db. The change is from 5-flats of Db major to 4-sharps of C# minor (Appendix B provides a summary of key-signature scales). The change naturalizes 5 notes and then sharps 4 notes — 9 symbol changes to move 3 notes down a half tone! The different symbols for the major tonic Db and the minor tonic C# seem, misleadingly, to imply slightly different pitches for the same black piano key. What they actually imply is slightly different pitches for the notes C and D when used as references for sharps or flats. These different pitches don't exist on the piano. This material in this document provides an end run around such complexity.

[2] The following chord progression for the haunting E*b* blues *Goodbye Porkpie Hat* written by Mingus as a tribute to Lester Young is a "poster child" for misleading chord complexity. The progression is E*b*7#9—B9(13)—EM9—A7#11—D*b*9sus—B9(13)—D*b*7sus—E*b*7—A*b*m11—B7(13)—Fm7*b*5—B*b*7#5#9—C13#11—F7(13)—B7—EM7—A7(13)—A*b*7—B*b*7—D*b*7—E*b*7♯9—B7—EM7#11—A7#11 (Appendix C provides a summary of chord symbols). There are 24 chords, an average of 2 per bar for 12 bars, only 5 of which (highlighted in blue) don't contain tritones. The tritone content is the basis of deep structure of startling simplicity that is the subject of this document (Chapter 4 provides this piece as an example).

The scope of this document is tonal music in which every piece has an unambiguous home tonic on the piano. The home tonic is normally easily recognized as the note to which the melody line resolves at the end, or at the beginning on a repeat set up by an ending. Strongly chromatic pieces may require a bit more digging, but a tonal piece of music must have a home tonic, otherwise it wouldn't be "tonal." Pieces may visit secondary tonics but the visits are easily understood relative to the home tonic because overlapped octaves use the same piano keys.

A 12-half-tone **chromatic scale** represents melody lines relative to a symbolic home tonic that may be assigned to any home tonic on the keyboard. Intervals I call **building blocks** that originate in the chromatic scale provide the chords of harmony. A 6-letter **DNA-like alphabet** provides symbolic representations for them. Words from the alphabet provide **mode signatures** that determine tonic scales Letters from the words identify building blocks. The two lines that represent melody and harmony in fake books are translated into corresponding melody and harmony lines represented in these notations. The notations are simple enough to annotate on the written music to provide guidance, but can also provide playable separate representations, such as are used in this document for explanations.

I call the result **PKP**, standing for **P**icturing **K**eyboard **P**atterns. PKP is not a replacement for music notation but a lightweight complement to it that combines simplicity and depth. PKP provides contextual cues to help in learning and remembering new pieces, knowing while playing where to go next from where you are (and how you got there), recovering from getting lost, experimenting with harmonic and melodic variations, and improvising. This turns the conventional relationship between practicing and understanding on its head: understanding guides practicing instead of only emerging from it.

PKP's combination of simplicity and depth is either a serendipitous side effect of the organization of the piano keyboard or a fundamental property of music that's obscured by music notation Either way, it works in practice. To discover it, I had to enter uncharted territory.

GENESIS OF PKP

I have been asked why, if the ideas are so good, they have not been discovered before by some talented young piano student? After all, any thoughtful person approaching the piano for first time can see that the "emperor has no clothes." Why not go from there? The answers are, music notation gets in the way, conventional wisdom is strongly against it, the central concepts are not intuitively obvious from music alone, and strong motivation is required to make giving up practicing time to experiment with unconventional concepts seem worthwhile.

I had, perhaps, an unusual combination of experience and motivation. Early exposure to the piano that did not "take," plus later experience as a youth playing trumpet in school bands, convinced me that music notation was more complex than it needed to be. I gave up trying to play music in early adulthood, for lack of time, but continued to enjoy listening to it, and to wonder about its notation. When I took up the piano as an adult beginner, I was a university professor of engineering engaged in developing notations for software design. I saw that some of the ideas I was working with could be the basis of an interval-based notation for piano music that would be simpler than music notation. My conviction that this was worth spending time on came from training in math and physics that exposed me to the concept of "dual" representations of complex things providing insight into their complexity (e.g., frequency-response/time-response duality in the physics of dynamic systems, or wave/particle duality in quantum physics). I was convinced that a "dual" representation of piano music based on intervals instead of notes must exist, and I had only to find it. My experience in developing notations for software design gave me confidence that I could find it. The final element was time becoming available to pursue my curiosity, exactly when I was ready to do so, by retirement from my job as a university professor.

I wanted to learn how music works, and be able explain what I learned in simple sentences that anyone with even a passing acquaintance with the piano could understand. I had many questions about music notation but one stands out: Given that scales are determined by key signatures, how can altering a particular note by a half tone not only tell the ear that the scale has changed but also what the new scale is? PKP's mode signatures provide the answer, explained in Chapter 2.

My admitted lack of musical credentials is reasonable cause for skepticism that I have anything useful to say, so the opinions of a couple of music professionals are worth quoting. Musical theorist Paul Steinbeck: "The hook ... , at least in my opinion, is that it's possible to attain a deep understanding of chords (and their constituent intervals) without recourse to Western notation. This has direct consequences for physical patterning, fingerings, etc. Essentially, your method combines the utility of a play-by-ear approach with the depth of a mathematically-informed theory of music." Jazz pianist/composer/teacher Taylor Eigsti: "… a fascinating and in-depth look at various ways that keyboard shapes can lead to a whole new way to look at notation and the piano."

GUIDE TO READERS

I wrote this for myself as a means of verifying the correctness and utility of the approach, but I see it as being of potential interest to others: novices like I was, pop and jazz musicians who are not pianists but want to explore harmony on the piano, "wannabe" expert pianists, and anyone with a stake in the piano and curiosity about these issues.

Chapter 2 develops the basic concepts and notation. Chapter 3 develops a mode hierarchy that provides the framework for understanding music in these terms, illustrated at every step by example pieces presented in the notation. Chapter 4 provides a smorgasbord of advanced pieces that I found difficult on first encounter (the first example is the piece with the footnoted chord progression on the opening page). Chapter 5 provides observations and conclusions. References, acknowledgements and comments from some readers of earlier drafts follow. Appendix A summarizes unfamiliar terminology, Appendices B-E are about the relations between conventional representations and PKP, for scales (B), chords (C), enriched parallel modes (D), and hidden symmetries (E).

There is no music notation in the form of notes on a staff in this document (except for one example at the end of Chapter 4), for two reasons: explaining a notation that avoids using the "clothes" of music notation in terms of music notation doesn't work; and the notation is more general in the sense that it avoids commitment to a home tonic. The notation doesn't resemble music notation, and so seems alien to anyone versed in it, but this is because it represents the essence of things in a dramatically simpler way. This way, once you "get it," is so directly related to how the ears hear music that it encourages the experimentation that's the source of all artistry.

The main things that have to be written down to use PKP are **melody lines** in chromatic scale notation (annotated on the staff or written separately), **harmony lines** in alphabet notation (annotated above the staff or written separately), and simple **mode tables** that provide a cross reference between them. The many Lego-like pictures of sequences of shapes formed from building blocks are mainly to illustrate in a graphic way how details are worked out at the keyboard.

CHAPTER 2: CONCEPTS & NOTATION

PKP concepts and notation enable probing deep and complex waters in music notation without becoming overwhelmed by details. Very little new notation is needed. The basic elements are a 12-symbol chromatic scale for skeleton melody lines and a 6-letter DNA-like alphabet for core harmony. The purpose of the skeleton melody line notation is to provide a basis for an integrated understanding of melody plus harmony, not to simplify melody lines per se. Melody lines cannot be represented purely in interval terms because that would require mentally accumulating intervals up and down to know where the melody actually is at any point. The chromatic scale is as close to this as is practically possible.

HIDDEN IN PLAIN SIGHT

The elements of PKP are hidden in plain sight in two places, namely the piano keyboard for the 12-half-tone chromatic scale, and the standard interpretation of chord symbols for the building blocks represented by the DNA-like alphabet. The latter is in terms of degree numbers in 7-note chord scales that identify chord notes by counting 1st-2nd-3rd-4th-5th-6th-7th going up from roots. In this notation, basic 4-note chords called seventh chords are root-3rd-5th-7th and basic 3-note chords called triads are root-3rd-5th. The intervals I call building blocks are conventionally understood to be root-5th and 3rd-7th, or their inversions 5th-root and 7th-3rd. These are either tritones (6 half tones) or fifths (a half tone larger) in the key-signature scales of music notation. (The interval sequences of these scales are determined by well known "classical modes" with names such as Ionian and Aeolian, so I will refer to them this way from now on.) Inversions of the chords (same notes in different orders) invert tritones into tritones and fifths into fourths (a half tone smaller than tritones). Tritones, fifths and fourths *are* the building blocks of PKP. The terms "fifth" and "fourth" refer to the number of notes of classical modes they contain (5 and 4, respectively), not the number of half tones (7 and 5, respectively).

In the standard interpretation, knowing the building blocks requires knowing the classical mode that determines the chord scale. This is true even for chords from scales that are not classical modes because basic chord symbols from classical modes provide templates for such chords, details of which must be adjusted to fit the actual scales. Such scales can be different in kind — adjacent half tones, multiple tritones, different numbers of notes than seven — so the adjustments can lead to considerable symbolic complexity (this is like "banging square pegs into round holes" — the results tend to be messy). Voicings of chords have to be figured out in terms of reorganized and altered degree numbers, including possible omissions of chord roots. The resulting representations are intricate, difficult to remember and, too cumbersome to be routinely notated next to chord symbols above the staff. Therefore knowing the building blocks of chords directly in keyboard terms is desirable, independently of the scales or chords in which they find themselves. This enables chords to be understood as determined by building blocks instead of by chord symbols, and their tonic scales of origin to be understood in terms of a DNA-like alphabet that represents building blocks.

I began to get a sense of these things after a couple of years of piano lessons as an adult beginner but the turning point was taking courses and talking to people at the Jazz School in Berkeley (now the Jazz Institute). I learned about "open" voicings of complex jazz chord progressions expressed in standard terms in a "piano comping" course given by jazz pianist Susan Muscarella. I learned about blues scales and chords in a blues piano workshop conducted by Aaron Blumenfeld. At the time, jazz pianist Taylor Eigsti was an artist in residence at the school who, I heard, was teaching a chord-symbol-free way of understanding and playing chord progressions. This resonated with my developing ideas about building blocks, so I contacted him to learn about his method. He told me that he recommends, to beginning jazz piano students, a practicing regime of moving constant scale shapes — determined by fixed sequences of counts of scale steps (not keyboard steps) between successive notes — to different positions in classical modes, without reference to chord symbols. The objective is developing the instinctive moves required of jazz pianists. However, the method deliberately has no notation and is learned from exercises.

Before this, I had some half-baked ideas about building blocks. After this, I tried to develop these ideas into something more coherent that would cover both of these different ways of viewing chord progressions. I found PKP by "reverse engineering" pieces of music, written in the style of fake books, to extract the building-block structure of chords from the details. The deep result is that combined or split building blocks are generally sufficient to provide 3-part or 4-part harmony that captures the essence of any chord that can be played on the keyboard. Inversions of one or more building blocks yield different keyboard shapes that are the same chord, harmonically. The shapes don't necessarily satisfy the full chords "vertically" on the keyboard but generally satisfy them "horizontally" in the flow of the music. Chord symbols are not the determiners of chords understood this way, but follow from assigning chord roots to shapes formed from building blocks.

This chapter presents the ideas by following the same approach, except skipping over the written music by going directly to skeleton melody and harmony lines that would be extracted from it. This is necessary because ideas that aim at understanding music independently of the "clothes" of music notation cannot be successfully explained using it. Relationship to written music follow from interpreting the results.

BASIC NOTATION

The starting point is a simple but accurate conceptual representation of a home octave on the piano as a line divided into 12 equal parts identifying 12 half tones.

```
                          home tonic          pitch center      tonic of next octave
                                 |                  |            |
overlapping home octaves         @ . . . . . . . $ . . . . . @
                                   @ . . . . . . . $ . . . . . @
                                     @ . . . . . . . $ . . . . . @
                                                →|   |← 1/2 tone "h"
                           and so on
```

A half tone is the musical interval played by adjacent piano keys, so the 12 half tones identify 13 piano keys. The bottom **@** is the home tonic and the top **@** is the 13th piano key, which is at once the top note of the home octave and the tonic of the next octave up, which looks the same on the keyboard and is harmonically equivalent. The pitch center **$** splits the home octave into equal pitch intervals of different keyboard sizes, namely a fifth (7 half tones) on the bottom and a fourth (5 half tones) on top. The few scales without pitch centers are derivatives of ones with them. The two tonics and the pitch center form a fundamental keyboard shape **@-$-@** that warrants the term **scale frame** because it's the starting point for forming all tonic scales.

The asymmetry on the keyboard of the scale frame that identifies equal pitch halves is a sign of the fact that the pitch sizes of half tones increase within the octave to make the top pitch double that of the bottom one, providing the most fundamental form of consonance. If overlapped home octaves are to provide the same relative pitch increases, the dots cannot be exactly vertically aligned, making nominally equal half tones slightly unequal. The piano would have to provide variable pitch piano keys to capture this. It gets away with not providing them because half tones are dissonant intervals, small errors in the pitch sizes of which are unimportant to the ear. Equal temperament tuning compensates by providing a uniform sound for larger intervals across the board. The worldwide popularity of the piano as a general purpose musical instrument is evidence that this is good enough (see the book *How Equal Temperament Tuning Ruined Music* for an understanding of the difference).

The keyboard center of the home octave, a half tone below the pitch center, splits the octave symmetrically into two tritones (6 half tones) that are inversions of each other (same notes in the opposite order). This symmetric split, plus the asymmetric split that yield a fifth with fourth on top that are also opposite inversions of each other, introduce the **building blocks** of PKP. The fact that fifths invert into fourths, and vice versa, makes them the same kind of building block, warranting the unconventional term **fifo** as an umbrella term for the kind (standing for fifth or fourth). This simple naming convention is a cornerstone of PKP's combination of simplicity and depth because it opens the possibility of identifying a type of building block that comes in different sizes in different inversions (fifo) without committing to its size (fifth or fourth), leaving the size to context.

Two different conceptualizations of music follow from two different judgments of what's most important here, namely the perfect pitch sizes of half tones in individual octaves (music notation), or the alignment of half tones between overlapping octaves (the piano). PKP provides an interval-based view of the second kind that's general to the same extent that the piano is a general purpose musical instrument. The view is based on a chromatic scale and an alphabet.

A Home-Octave Chromatic Scale

The simple 12-symbol chromatic scale notation is **1-p2-2–p3-3-4–p5-5-p6-6-p7-7-1** (the black and grey symbols are only to help the eye, in this first introduction of the scale, and are not part of the notation). The scale numbers the piano keys of the Ionian mode (default major scale) of a key signature **1-2-3-4-5-6-7** and adds prefix **p** to numbers **2**, **3**, **5**, **6** and **7** to represent piano keys in its whole-tone intervals The prefix stands for "phlat" and means "next piano key down." The numbers are not "degree numbers" that count scale notes without regard to the intervals between them, but position indicators that imply intervals. The "phlat" prefix is not a conventional flat, but a position indicator: **p3** is both the next piano key down from **3** and up from **2**, independently of how the piano keys are represented by sharps or flats in pieces of music.

The chromatic scale and two parallel "classical modes" from it are shown next, to illustrate the way of understanding different kinds of scales by marking **x**s in the rows of a table with the chromatic scale as a header line.

home octave	@	.	.	.	.	.	.	$	.	.	.	.	@	
chromatic scale	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
Ionian mode	x	.	x	.	x	x	.	x	.	x	.	x	x	**default major scale of a key signature**
Aeolian mode	x	.	x	x	.	x	.	x	x	.	x	.	x	**parallel natural minor scale**

Classical modes define the scales of key signatures by interval sequences that are rotations of each other, meaning they start from different points and wrap around. The rotation that determines the

Aeolian mode starts a major sixth up (minor third down) from Ionian tonic. The parallel Aeolian mode starts this interval sequence on the Ionian tonic. I have come to use the term **mode** to identify any scale identified by an interval sequence. All scales are represented in PKP terms by **mode signatures** that determine interval sequences, and so are said to be "modes."

This chromatic scale notation has a number of things to recommend it.

1) It enables separating the interval forms of scales from the notes that provide the forms. Marking **x**s in the rows of a table with the chromatic scale as a header line does the job, as illustrated above by the way a tritone (red text) with associated half tones (highlighted) is seen to identify these classical modes (the rest of each mode is whole tones).

2) It provides a simple notation for skeleton melody lines that identifies notes independently of their durations (whole notes, half notes, quarter notes, eighth notes, and so on).

3) It mirrors the look of the C octave on the piano keyboard — numbered notes are white keys, "phlatted" notes are black keys — enabling the notes of any octave to be pictured in the mind's eye as functioning like the corresponding notes of the C octave.

4) It has intuitive meaning in terms of the solfege scales do-re-mi-fa-so-la-ti-do for the Ionian mode and la-ti-do-re-mi-fa-so-la for the Aeolian mode, which align with how people hear melody lines in terms of a starting pitch and successive pitch intervals.

5) It's use of pseudo-flat symbols to indicate notes lowered a half tone reflects the way parallel modes actually work. Minor and blues parallel modes "bend" important major notes down by half tones, independently of how the notes are represented in flat or sharp scales.

6) It's an adaption of Roman Numeral (RN) notation used for chord roots that's already understood by musicians and described by Mehegan in a jazz-piano instruction book. The adaption changes the number symbols from Roman Numerals and replaces the flat symbols meaning "next piano key down" by prefixes that mean the same thing but are visibly not the flat symbols of music notation. The RN root notation with this prefix is **I-pII-II-pIII-III-IV-pV-V-pVI-VI-pVII-VII.**

A DNA-Like Alphabet

The 6-letter alphabet **PORMIL** attaches labels to the six positions of the chromatic scale within the lower fifth of the scale frame. The origin of the alphabet in the classical modes that determine the scales of key signatures will be explained in a moment, but the meaning of the alphabet is independent of this origin. The special font (Arial black) identifies the letters as **anchors** of building blocks going up from the labeled positions — for all practical purposes, they *are* the building blocks, because color coding identifies sizes and underlining identifies inversions. This enables modes to be identified by anchor letters relative to a conceptual home tonic that can be assigned to any piano key. There are no anchors in the top fourth of the scale frame because they're not needed. Building blocks with bass notes in the top fourth are inversions of building blocks with anchors in the bottom fifth. The scale frame is outside the alphabet, so its symbols are anchors only of the building blocks it provides, namely a fifth and fourth anchored by **@** and **$**, which are never tritone anchors. The scale frame plus the alphabet may be said to provide a **conceptual home octave** that provides building-block representation of the home octave to complement the note-based representation of the chromatic scale. The combination of the two representations provides a simple way of cross-referencing them, as illustrated next (the entries in the table are in a different fixed-width font, Courier, that provides vertically aligned columns). The two tritones of the two classical modes seen earlier are anchored by **I** and **O** (red identifies tritone anchors). The inversions of them go down from these anchors into the next octave down, or down from the same anchors in the next octave up (the choice would be determined by context). The important benefit of this seemingly awkward way of knowing inversions is the simplicity of always knowing a building block by a single alphabet letter.

conceptual home octave	@	P	O	R	M	I	L	$	.	.	.	.	@
chromatic scale	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
tritone I	.	.	.	.	.	x	.	.	.	.	.	x	.
tritone O	.	.	x	.	.	.	.	.	x	.	.	.	.

The anchor concept is unconventional, so the alphabet could be anything. This particular alphabet links the notation to music notation via the **classical modes** that determine the interval sequences of key-signature scales. The letters identify the six primary parallel (same tonic) classical modes arranged in the unconventional order Phrygian-Aeolian-Dorian-Mixolydian-Ionian-Lydian. The idea was to use the first letters of the names as anchor letters for tritones, which is fine for all but letters **A** and **D** that are also letter notes of music notation. Including them causes endless confusion. Replacing them by the next available letters of the mode names, namely **O** and **R**, yields the following letters of the mode names as anchor symbols: **P**hrygian-Ae**O**lian-Do**R**ian-**M**ixolydian-**I**onian-**L**ydian. A seventh mode, **L**ocrian, is not a primary mode because it's derived from **L**ydian (the names, fortuitously, share the same first letter). The first letter of "Ionian" is also a symbol for the root of a home-tonic chord, but this causes no confusion because the home tonic is in the scale frame, not the alphabet.

The reverse order of the anchor letters going down from **L** is the order of the anchors of the single tritones of the parallel classical modes going down by half tones, which means the letters are anchors of these tritones. To be clear, this does not bind the tritones to classical modes, it only represents them in a way that connects them to classical modes. This order is useful for parallel modes in a very practical way: the parallel modes in this order differ from each other by one note, provided by the tritone of the next mode.

Although the alphabet's origin is identifying tritones, it also identifies all the possible building blocks beyond the ones provided by the scale frame. Color-coded anchor letters distinguish the building blocks: red for tritones (e.g., **M**), blue for fifths (e.g., **M**) and green for fourths (e.g., **M**). As said before, inversions are indicated by underlining. An underlined letter identifies, not the building block to be inverted, but the result of the inversion. inversions of tritones are tritones so the color doesn't change (<u>**M**</u> is the inversion of **M**); inversions of fifths are fourths, and vice versa, so the color changes (the fourth <u>**M**</u> is the inversion of the fifth **M**, and the fifth <u>**M**</u> is the inversion of the fourth **M**).

No other intervals are included in the building block menu because tritones and fifos are sufficient. Intervals smaller than fourths or larger than fifths enter the PKP picture routinely as inner or outer intervals of shapes formed of combinations of building blocks, or as the constituent intervals of split building blocks. It is sometimes useful to have a notation for inner or outer intervals of such shapes. A simple notation uses suffixes or prefixes on fourth or fifth anchors to indicate holding the anchor while expanding or shrinking the size by one or more half tones (e.g., **M**〈 is a major third, **M**〈〈 is a minor third, **M**〉 is an augmented fifth and **M**〉〉 is a major sixth): think of the triangular brackets as symbolizing pushing to the left to shrink the fourth and pulling to right to expand the fifth.

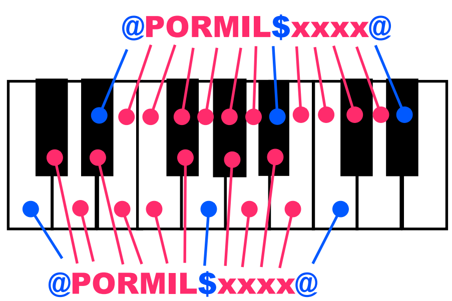
Here is a simple convention for pronouncing the anchor notation. Pronounce the alphabet letter with fi, tri or fo as a prefix or suffix to indicate the building block is below or above the anchor (for example, the fifth **M** is pronounced “em fi” and its inversion, the fourth <u>**M**</u>, is pronounced “fo em”).

The following relationship between anchor symbols and intervals of the chromatic scale is useful to keep in mind. This relationship brings forward the benefit of underlining anchor letters to represent inversions, namely tritones are always seen as tritones without any need to parse pairs of note symbols. The same goes for fifos.

L	**p5-1**	<u>**L**</u>	**1-p5**
I	**4-7**	<u>**I**</u>	**7-4**
M	**3-p7**	<u>**M**</u>	**p7-3**
R	**p3-6**	<u>**R**</u>	**6-p3**
O	**2-p6**	<u>**O**</u>	**p6-2**
P	**p2-5**	<u>**P**</u>	**5-p2**

On the Keyboard

The alphabet-based conceptual home octave maps to the keyboard as illustrated next for two of the twelve possible home octaves (the blue text for the scale frame is only for contrast with black piano keys). The mix of black and white piano keys is visibly very different for different home octaves but the difference is manageable because the scale frame is simple, the alphabet is simple, and both are independent of any notation for notes. The only caveat is the necessity of keeping the home octave fixed in the mind, to avoid confusion with recently played pieces with different home octaves (this can be helped by, for example, putting a removable stick-on label for the piano key that’s the home tonic of a current piece).



CLASSICAL MODES

Summarized next are the six primary parallel classical modes and the six derived modes (all non-tritone notes different). The single altered note from one mode to the next is highlighted. The classical names are traditional but the mode signatures on the right are more useful because they tell how to form the modes by construction on the keyboard, in a way that generalizes directly to non-classical modes. The derived modes that don’t include the home tonic are not true parallel modes and so have no mode names relative to the home tonic. However, they have functions relative to the home tonic that make having handles useful: the **alt** signatures serve the purpose. Mode signatures are normally understood to be formed of tritone anchors, making showing their letters in red text normally optional.

This representation of classical modes makes tritones as structurally fundamental to PKP’s representation of piano music as key signatures are to music notation. This tends to be surprising to people savvy in music notation because tritones are conventionally regarded to be no more than one interval among many identified by pairs of notes. A few musicians have used tritones creatively — the composer Scriabin comes to mind — but they're not conventionally regarded as fundamental across the board.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
		@	P	O	R	M	Y	L	$	.	.	.	.	@		
primary modes	Lydian	x	.	x	.	x	.	x	x	.	x	.	x	x	//L	major
	Ionian	x	.	x	.	x	x	.	x	.	x	.	x	x	//I	major
	Mixolydian	x	.	x	.	x	x	.	x	.	x	x	.	x	//M	major
	doRian	x	.	x	x	.	x	.	x	.	x	x	.	x	//R	minor
	aeOlian	x	.	x	x	.	x	.	x	x	.	x	.	x	//O	minor
	Phrygian	x	x	.	x	.	x	.	x	x	.	x	.	x	//P	minor
derived modes	Locrian	x	x	.	x	.	x	x	.	x	.	x	.	x	alt-L	minor
	—	.	x	.	x	.	x	x	.	x	.	x	x	.	alt-I	minor
	—	.	x	.	x	x	.	x	.	x	.	x	x	.	alt-M	minor-major
	—	.	x	.	x	x	.	x	.	x	x	.	x	.	alt-R	minor-major
	—	.	x	x	.	x	.	x	.	x	x	.	x	.	alt-O	major
	—	.	x	x	.	x	.	x	x	.	x	.	x	.	alt-P	major

That tritones are fundamental not only to the structure of music but also to the sound of music becomes apparent as soon as you begin to look for tritones in written music. The sounds of tritones and fifths or fourths in harmony sliding to different keyboard positions and morphing into each other as the music moves forward are fundamental to much music. The sounds are of dissonance resolving into consonance or vice versa. The notes may be spread out in the music but the essence of their musical contribution is captured by their harmonically equivalent presence within the home octave. Chords containing tritones are signposts of important musical events such as resolving to the tonic of a mode, changing to a parallel mode (e.g., major to minor), changing to a different tonic for the same mode (e.g., the same major mode), or arriving at blues "turnarounds" (the final four bars of a 12 bar blues). "Tritone substitute" chords (same tritones in opposite inversions, all non-tritone notes different) are a staple of chord substitution in jazz. Many different kinds of chords containing tritones exist, as summarized in a table in Appendix C.

Octave Stacks

Octave stacks formed of a building block and its opposite inversion are the primitive elements of PKP.

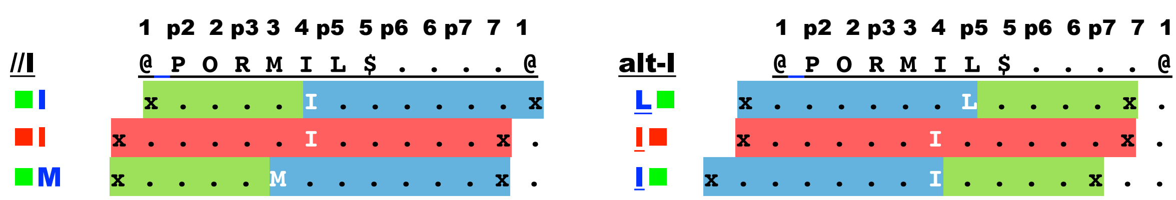
```
                          1  p2  2  p3 3   4 p5  5 p6  6 p7  7  1
                          @  P   O  R  M   I  L  $  .  .  .  .  @
secondary       ■$        .  .   x  .  .   .  .  $  .  .  .  .  .  .  x
frame           ■$        x  .   .  .  .   .  .  $  .  .  .  .  x
core            ■I        x  .   .  .  .   I  .  .  .  .  .  .  x
                ■I     x  .  .   .  .  .   I  .  .  .  .  .  x  .
                ■M     x  .  .   .  .  M   .  .  .  .  .  .  x  .
secondary       ■M  x  .  .  .   .  .  .   M  .  .  .  .  x  .  .  .  .
                ■O  x  .  .  .   .  O  .   .  .  .  .  .  x  .  .  .  .
```

The default form of an octave stack, illustrated above for the Ionian mode, is anchor-centered, just as the default direction of a building block is up from an anchor. Inversions, if needed, are simple, but having a standard default form provides a simple starting point. The meaning of the notation on the left is very simple: the anchor locates the building block going up from it and the color-coded box prefixes identify the size of the octave-completion building block going down (red completes red, blue completes green, green completes blue). The stacks share a central note (white text), which requires thinking of the building blocks as overlapped at these points, with the building block going up from the anchor on top of the one going down.

Octave stacks are the primitive elements of PKP for a number of reasons.

1) Octaves are the easiest intervals to find on the keyboard, their keyboard or pitch centers follow from them in a simple way, and individual tritones or fifos come for free. For example, tritone stacks have outer and inner notes of opposite kinds (white vs. black), with one easily remembered exception (the B-F-B stack is all white keys); there are no all-black-key tritones.
2) Octave stacks are fundamental to music because they are the simplest divisions of the most fundamental interval of music, the octave.
3) Tritone stacks morphing into fifo stacks identify fifos as morphed tritones. Given that tritones determine modes, this opens the possibility of leaving fifo details to context provided by the flow of harmony from the modes. This is important because it enables leaving fifo details in harmony to context established by tritones. The fourteen building blocks in this picture are determined by only four color-coded anchor symbols, one of which (**I**) determines the others via the simple anchor line that is itself determined by the tritone, namely **I-I-M**. Thus one tritone stack is the "seed" of twelve fifos.
4) Octave stacks in harmony are almost chords and so provide a simple starting point for forming chords.
5) Picturing music in terms of octave stacks is simple for single-tritone classical modes but is even simpler for multi-tritone modes used by much music, for the simple reason that more tritones provide more scale notes. This increasing simplicity is in stark contrast to the increasing complexity of music notation for the same thing.

The **core** consists of the tritone and two fifo stacks morphed directly from it in two possible ways, only one of which is shown above. The two ways are shown next. An **alt** mode is determined by the opposite morphing of the tritone.



These morphings answer a question in opening chapter: How can altering one particular note by a half tone not only tell the ear that the scale has changed but also identify the new scale? The answer emerges from the following picture, showing that the fifo-fifo morphs are symmetric from left to right. This means that all the notes of the opposite fifos are a half tone apart, making the modes mutually dissonant.

```
        left top                          left bottom
  x . . . . I . . . . . . x         x . . . . M . . . . . . x
x . . . . . . L . . . . x         x . . . . . . I . . . . x
        right top                         right bottom
```

Without knowing anything more than this, one would expect that the these morphs would determine **core** elements of mutually dissonant parallel modes. Given the establishment of a mode by one of these core sequences, moving one tritone note a half tone in the opposite direction from the one that established the mode will sound wrong to the ear, suggesting the opposite core. This answers the above question: Changing one tritone note by a half tone changes the mode.

The cores identified by **I-I-M** and **L-I-I** are **tritone substitutes** of each other that share the same tritone and have all non-tritone notes different. As shown next, the notes of each core combine on the keyboard to form a shape with two symmetrically disposed half tones, either both inside the tritone or both outside it, that provide the beginnings of a scale. The cores establish tonics a tritone apart. This is so because the tritone substitute core is the result of transposing the primary core by a tritone. Transposing a tritone by a tritone inverts it, so the result in the home octave is the same tritone with all non-tritone notes different. Cores of this form *become* classical modes when the blanks are filled in by whole tones, but the cores exist independently of the modes.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	O	A	R	M	Y	L	$	.	.	.	.	@	<— **tonics a tritone apart**
I-I-M	.	.	.	.	x	x	.	.	.	.	.	x	x	
L-I-I	.	.	.	.	.	x	x	.	.	.	x	x	.	

Knowing of the existence of primary and alt cores enables rejection of fifo possibilities that don't fit. For example, the establishment of an Ionian mode by **I-I-M** automatically excludes the fourths of its **alt** mode identified by **L-I-I** (harmonically equivalent to **L-I-I**).

The concept of a core determined by tritone-fifo morphs is independent of the details of particular modes. Classical modes follow from filling in the gaps in single-tritone cores with whole tones. Looking ahead, multi-tritone modes may include some of the same tritone-fifo morphs that determine single-tritone classical modes, except the classical modes are not completed because the other tritones introduce intervals that are not whole tones .

Inversions of tritones establish different harmonic contexts when mode changes are indicated by context (e.g., a change in a melody line) but otherwise are no more than harmonically equivalent building blocks within an established context.

Chromaticism

Chromaticism means departures from a written key signature, which means, for classical modes, departures from a single classical mode. Within the domain of classical modes, such departures may be purely ornamental or may go to one or more parallel modes. Parallel mode changes may be construed as tonic changes because any parallel mode has relative modes that imply different tonics for the same notes. We may say that "parallel mode changes and tonic changes are two sides of the same coin." A parallel mode change that alters notes plus a relative mode change that alters no notes combine to imply a tonic change. The new parallel mode supplies the harmony for any relative tonic. Given an established mode, a tonic change requires only a parallel mode change plus an identification of the new tonic by a “pointer” to its position in the home chromatic scale.

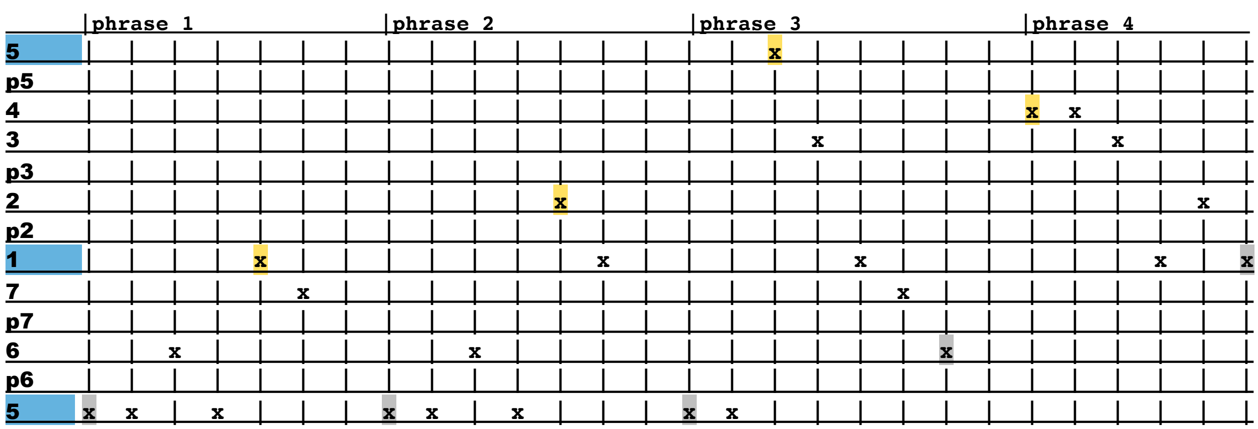
One of the simplest and most distinctive parallel mode changes to the ear is the Ionian-Aeolian change **//I-//O** shown next, in which only three highlighted notes change. This change may also be construed as a same-mode tonic change, say Ionian-to-Ionian up a minor third. The **//O** mode supplies the harmony scale for the new Ionian tonic, and a change of tonic pointer supplies the melody scale, which goes up from the indicated Ionian tonic and wraps around. There’s no need to do a complete shift to a new Ionian mode of a different home tonic. The contrast is stark between this uniform simplicity across the board, and the possible complexity of the same thing in music notation (illustrated for tonic C#/D*b* by a footnote on the first page of the first chapter).

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	@	P	O	R	M	I	L	$	.	.	.	.	@
//I	x	.	x	.	x	x	.	x	.	x	.	x	@
//O	x	.	x	x	.	x	.	x	x	.	x	.	x

↑ **Ionian tonic up a minor third**

REPRESENTING MELODY LINES

The starting point for understanding melody lines in chromatic scale notation is annotating chromatic scale symbols of the home octave next to melody notes on a staff. The annotation may be pictured on a grid that identifies piano keys vertically and melody steps horizontally, as shown next for the familiar piece *Happy Birthday to You* (this is not a proposed notation, only a step towards one).



The grid illustrates a common melody line pattern going up and down around a home tonic, to which it eventually resolves. Yellow and grey highlighting mark **pivot notes** that identify the ends of the large arcs of the melody line trending upwards (grey to yellow) or downwards (yellow to grey). Pivot points are properties of a sequence of notes, not of the notes themselves, so they’re best identified by highlighting instead of by color coding note symbols. Think of yellow as peaks illuminated by sunlight and grey as valleys in shadow. Local zig-zags within the large arcs are not highlighted (e.g., **5 6 5** in the first phrase).

The notation for skeleton melody lines follows from collapsing the grid into a single line, as shown next. Commas mark the ends of phrases. Yellow and grey highlighting enables the overall shape of a line to be grasped at a glance, almost as it would on the staff, without parsing all the steps along the way. The steps between pivot points are understood to be the smallest ones possible (e.g., **5 6 5** in the first two phrases could be interpreted as a zig-zag up and down a whole tone, or down and up a minor seventh, and the default interpretation is the former).

5 5 6 5 1 7, 5 5 6 5 2 1, 5 5 5 3 1 7 6, 4 4 3 1 2 1

This does not look like music notation, but is both simpler and more general than it: simpler because there are only twelve symbols; more general because the twelve symbols represent the same melody line the same way anywhere on the keyboard, exactly the way people with musical ears remember melody lines.

Adding bar lines and representing repeated notes by asterisks yields the following easy-to-read skeleton melody line for a typical written version of this piece.

5* | 6 5 1 | 7, 5* | 6 5 2 | 1, 5* | 5 3 1 | 7 6, 4* | 3 1 2 | 1

Showing timing is often unnecessary for melody lines already understood by ear or by reference to music notation, but is very simple if necessary. Instead of representing timing, as music notation does, by different durations of notes and rests within a bar, it's represented by a line of downbeat markers (**^**) under the melody line, as illustrated next.

```
5* | 6 5  1 | 7,      5* | 6  5  2 | 1,      5* | 5  3  1 | 7  6,      4* | 3  1  2 | 1
^    ^ ^  ^   ^  ^    ^    ^  ^  ^   ^  ^    ^    ^  ^  ^   ^  ^       ^    ^  ^  ^  ^
```

The choice between a rest and an extended note for a downbeat marker between melody notes is left open. Common downbeat patterns are 2 beats per bar, 3 beats per bar (here) and 4 beats per bar. Showing downbeat markers identifies rhythm independently of anything else, which means using a different rhythm requires only ignoring or changing the downbeat markers (or avoiding using them in the first place).

EXAMPLE: ONE CLASSICAL MODE FOR EVERYTHING

The piece *Happy Birthday* provides an example of the use of one classical mode (Ionian) for everything. The relevance of this example goes beyond classical modes because the same concepts and notations apply across the board to all possible modes of all possible tonics. The skeleton melody line identified here by ♫ was seen earlier. It would follow from annotating chromatic symbols for an identified home tonic next to melody notes on a staff.

♫ **5* | 6 5 1 | 7, 5* | 6 5 2 | 1, 5* | 5 3 1 | 7 6, 4* | 3 1 2 | 1**

The melody mode is identified from entries in a mode table transcribed from chromatic scale symbols annotated next to melody notes on a staff. A key point is that this *identification* is, in general, independent of note symbols. It's easy to recognize **1-2-3-4-5-6-7** as Ionian when that's all there is, but there's often more, requiring sorting out.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	@	P	O	R	M	I	L	$	.	.	.	.	@
//I	x	.	x	.	x	x	.	x	.	x	.	x	x

A First Pass at Harmony

The harmony for this melody line is developed in steps (a)-(d) (⚓ identifies a harmony line).

(a) ⚓ + I I + + + I + I +

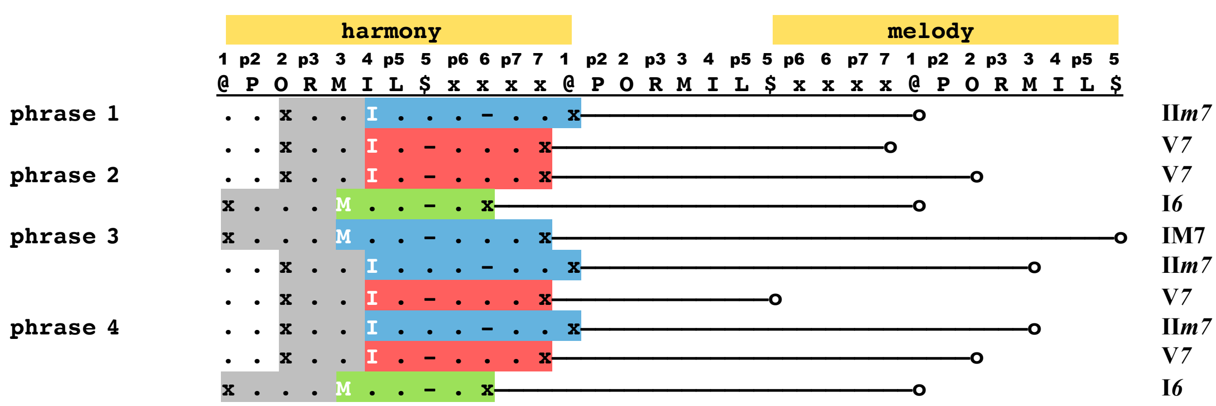
(b) ⚓ I I I M M I I I I M

(c) ⚓ I I I M M I I I I M

(d) ⚓ I I I M M I I I I M

♫ **5* | 6 5 1 | 7, 5* | 6 5 2 | 1, 5* | 5 3 1 | 7 6, 4* | 3 1 2 | 1**

The steps are best understood by reference to the following picture, which shows the (d) result. Notice the simplicity of the anchor sequence (white text) on the keyboard.



This particular harmony is worked out without reference to the melody line except to put the harmony far enough below it so there's no possible overlap (indicated by the long horizontal lines). The steps are as follows:

(a) Determine the harmony mode from tritone content determined by anchor symbols derived from the written chords and the identified home tonic. Harmony fifos come later and so need only be identified by placeholder symbols (**+**). The repetition of the single tritone identifies the same mode (Ionian) as the melody. This example doesn't start from chords, but the logic of the tritone placement can be understood without reference to them. The tritones identify resolution in the mode and so are placed just before ends of melody phrases that resolve to the tonic, or at the ends of melody phrases that don't resolve, anticipating future resolution. The tritones establish a flow pattern — very simple here but not this simple in general — that, with the known mode, constrains the choice of fifos.

(b) Identify anchor-line fifos of the identified mode by eye and ear, *ignoring the chord symbols*. The ability to build fifo chords from the bottom up without reference to chord symbols is a general, powerful feature of PKP that dramatically simplifies understanding and voicing chord progressions. The anchor-line fifos are morphed from the tritone in a way that determines either **//I** or **alt-I** and the former is the only choice that fits the melody line. Choosing fifos that morph directly from the tritone restricts the **+-I** sequences to **I-I** and the **I-+** sequences to **I-M** or **I-M** of **//I**. Choosing sequence **I-M** decides **M-M-I** for the placeholder sequence **+-+-+** in the middle. These decisions about anchor-line fifos determine the usual written chords shown on the right because completion of the chords is direct and simple. Consonant substitutions for these fifos are also possible, yielding voicings of substitute chords, examples of which will emerge as we go along.

(c) Play anchor-centered octave stacks for the harmony. The octaves stacks here are within the home octave and the melody notes they harmonize are within an inversion of the home octave a fifth up, so there's no overlap.

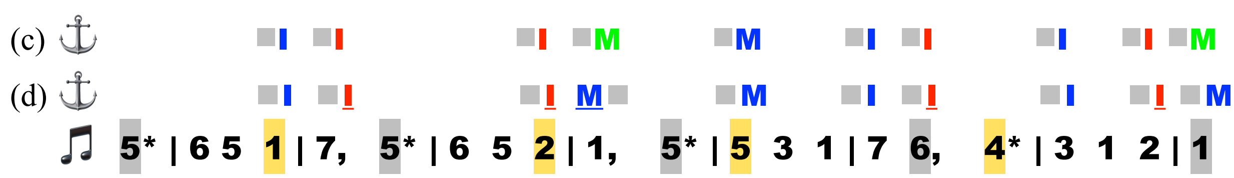
(d) Shrink the bottom half of the octave stacks towards the anchor line to provide a bass line one or two scale steps below the anchor line. The octave completion fifo-box symbols become neutral box symbols (■) that leave the fifo size to context, which is fine because a major or minor third fits the scales, and the choice is determined by context. The missing notes that complete the overlapped fifos, identified by dashes, are visibly obvious (the pitch center of the mode and the note a whole tone above it).

The lego-like picture shows the details worked out at the keyboard in a strikingly graphic way. Such details are easily worked out on paper for any piece, if desired, by marking symbols on a graph paper grid; the fancy Lego-like look is only for explanation. Chord symbols on the right are interpreted results, not starting points. Variations that don't alter anything harmonically follow from inverting building blocks. Additional variations that don't alter the chord substance may substitute selected fifos by other mode fifos. The number of different chord symbols that may be represented by these simple variations is startling (see Appendix C).

Transitions in anchor-line harmony are generally **slides** (e.g., **M-I**), **morphs** (e.g., **I-I**), or **wiggly slides** that combine the two (e.g., **I-M**). A slide moves a building block to a different keyboard position while holding its size. A morph changes its size while holding one end fixed. A wiggly slide changes both position and size in one step. This unusual term represents the hand movements exactly — slide the hand while moving the fingers (“wiggling” them) for the size change. The wiggly slide **I-M** may be understood as a contraction of **I-M-M** (a tritone slides down a half tone to go outside the mode and then morphs into a fourth in the mode).

A Second Pass: Constant-Shape Harmony

Both **constant-scale-shape** harmony and **constant-keyboard shape** harmony appear in written music and in jazz improvisation (“constant” means the set of inter-note intervals is the same). For constant-scale-shape harmony, inter-note intervals are measured in scale steps; for constant-keyboard-shape harmony, intervals are measured in half tones. The first-pass harmony for this example is tweaked next to provide an example of constant-scale-shape harmony in which all inter-note intervals are two scale steps (the intervals of basic seventh chords going up from roots). This kind of harmony is not restricted to all inter-note intervals being the same number of scale steps, but this is sufficient to give a sense of the general case. Assume the same (a)-(c) steps as earlier with the (c) steps tweaked by inverting selected building blocks. The voicing intervals ( ) are understood here to be all two scale steps.



Here’s how this looks on the keyboard. The anchor line is the same as before except with selected anchors transposed up an octave by inversions. The result is — no surprise — the chords exactly as determined by the chord symbols, namely sequences of 2-scale-step intervals going up from the roots. The harmony, developed independently of the melody, remains below it.

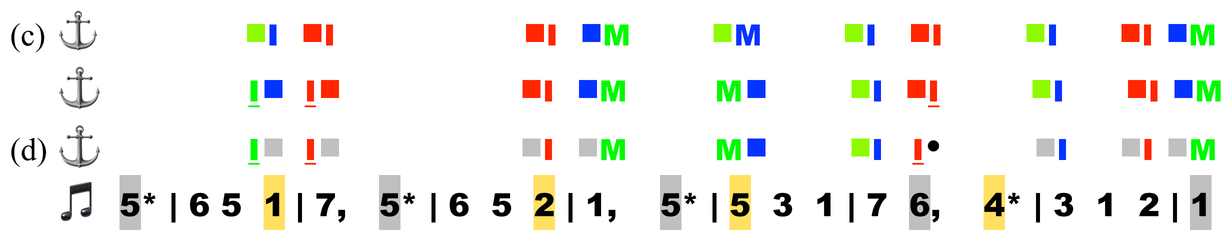
```
            1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5
            @ P  O R  M I L  $ x  x x  x @ P  O R  M I L  $
phrase 1    . .  x .  . I .  . .  x .  . x .  . .  . . .  .    IIm7
            . .  . .  . . .  x .  . .  . x .  . x  . . I  . .  V7
       2    . .  . .  . . .  x .  . .  . x .  . x  . . I  . .  V7
            . .  . .  . . .  . .  x .  . x .  . .  M . .  x    VIm7
       3    x .  . .  M . .  x .  . .  x . .  . .  . . .  .    IM7
            . .  x .  . I .  . .  x .  . x .  . .  . . .  .    IIm7
            . .  . .  . . .  x .  . .  . x .  . x  . . I  . .  V7
       4    . .  x .  . I .  . .  x .  . x .  . .  . . .  .    IIm7
            . .  . .  . . .  x .  . .  . x .  . x  . . I  . .  V7
            x .  . .  M . .  x .  . .  x . .  . .  . . .  .    IM7
```

This is conceptually simple but its big jumps around the keyboard require considerable pianistic skill to navigate. The jumps are “wiggly” slides because the whole hand must be lifted and moved while wiggling the fingers to fit the different keyboard sizes (minor or major thirds) of two scale steps at different points in the scale. The PKP contribution is providing a notation that enables such voicings to be written down in a simple way, independently of note symbols, chord symbols, or degree numbers in chord scales..

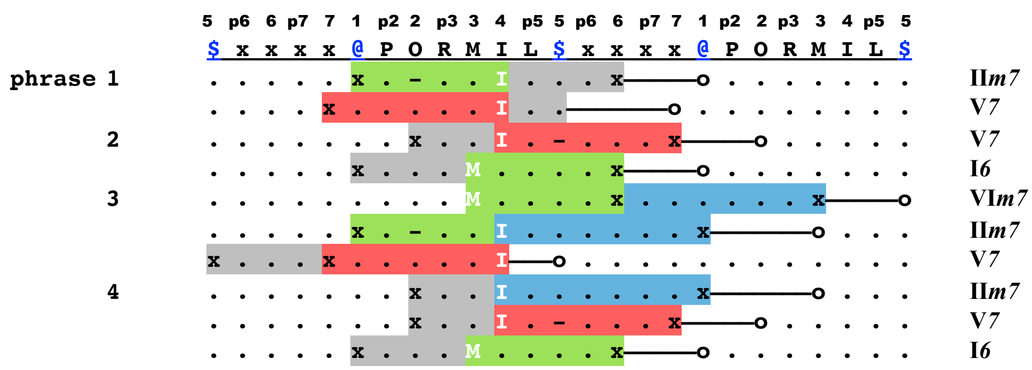
Constant-keyboard-shape harmony is different in kind. It’s almost always chromatic. It may be ornamental or from a single multi-tritone mode. Examples will appear later.

A Third Pass: Voice-Leading Harmony

Voice-leading harmony is different in kind again because it puts the harmony as close to the melody line as possible. Assume the same (a)-(b) steps as earlier with the (c) step tweaked by inverting selected building blocks.



The adjusted result in (d) is the overlapped melody and harmony shown next. The same anchor line is transposed up an octave, with building blocks going up or down from it, determined by the melody line. The shapes in the opening steps of phrase 3 fits the chords shown but the chords are completed in the flow rather than in place.



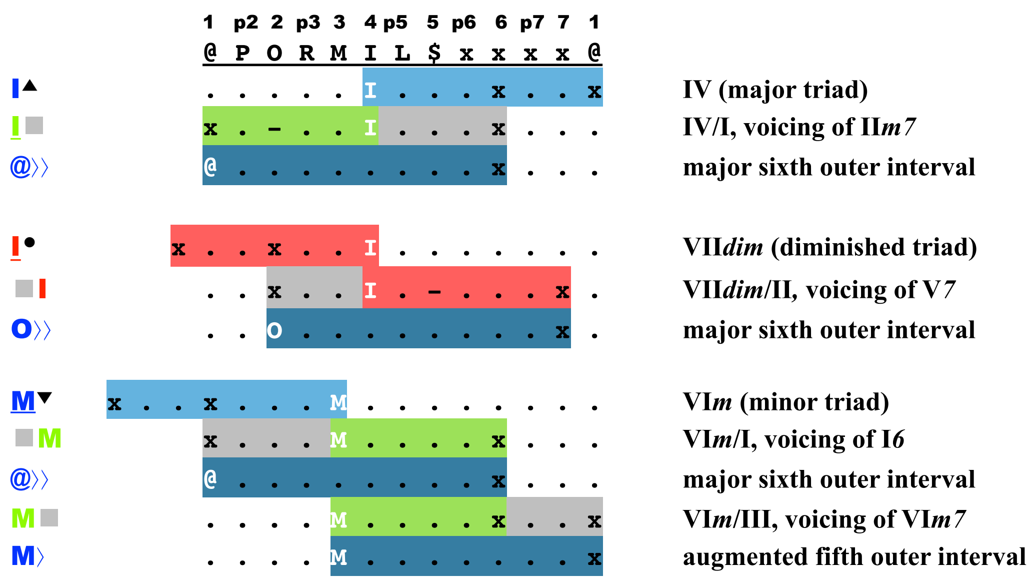
Different Kinds of Chords

A digression is appropriate here to explore chord types. This can be skipped without loss of continuity, and returned to later when needed. The important takeaway from this is the way the chords are determined by building blocks. The chords illustrated by the above examples are 4-note shapes formed of pairs of overlapped building blocks, that are either 4-note seventh and sixth chords or inversions of them. All possible inversions of a shape formed of a combination of building blocks are the same chord, harmonically. Inversions in PKP are indicated by underlining anchor symbols, thus preserving the visibility of the constituent building blocks.

Chord symbols of music notation can be complex for a number of reasons. One reason is some inversions are given different chord symbols and some are not.   For example, **I*6*/VI** is **VI*m7*** and **II*m7*/IV** is **IV*M6*,** but **V*7*/II** is not normally given a separate chord symbol because it doesn't have the shape of a basic seventh or sixth chord. See Appendix C for more examples of inversions assigned different chord symbols. A second reason is the addition of a chord type to the mix that's not a combination of building blocks, namely triad chords (3 notes). Triad chords are building blocks split into pairs of thirds (major or minor). They're unlike chords formed of combinations of building blocks in that inversions are not of the same form as the original. An inversion of a split building block is not a split building block. A third reason is “banging square pegs into round holes” — altering chord symbols originating in classical modes to fit non-classical modes that are different in kind. Details will emerge as we go along.

Before describing a notation for triad chords, it will be helpful to notice that triad chords are often subsets of seven or or sixth chords: the bottom three notes of **I*6*** or **I*M7*** form a **major triad** consisting of a major third with a minor third on top; the bottom three notes of **II*m7*** form a **minor triad** consisting of a minor third with a major third on top; the top three notes of **V*7*** form a **diminished triad** consisting of a tritone split into two minor thirds.

The PKP notation for triad chords continues the practice of preserving the visibility of building blocks. The notation is an anchor symbol with a superscript indicating the type of split. Asymmetric splits of fifths are symbolized by superscript “▲” indicating the larger interval on the bottom, or superscript “▼” indicating the larger interval is on top. Symmetric splits of tritones are symbolized by superscript “●”). Fourths enter the triad picture only via inversions, which may also be interpreted as voicings of seventh or sixth chords.



The grey-box prefixes or suffixes (■) that identify voicing intervals leave sizes to context. If sizes must be specified precisely, this is easily done by replacing the grey boxes with successions of vertical lines representing successive half tones (e.g., ■I-■I-■M becomes ||||I-|||I-||||M).

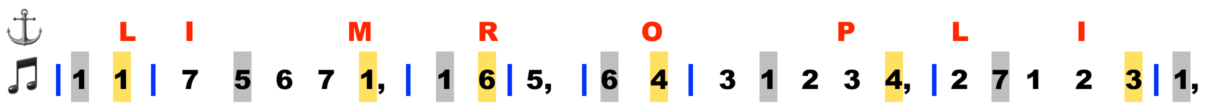
A different approach is to notate only the outer intervals of inverted triads, which are generally augmented fifths or major sixths An elegant symmetry enters the picture: triads are split building blocks; inverted triads are split outer intervals of inversions. The same superscript notation can be used for these splits, but this is often unnecessary because the splits are determined by context (see *Traumerai* in Chapter 3 and *Afternoon of a Faun* in Chapter 4).

Triad chords that look misleadingly simple in chord notation actually increase the complexity of chord progressions if they’re used for more than just resolution, by increasing the number of different notations for essentially the same underlying harmony.

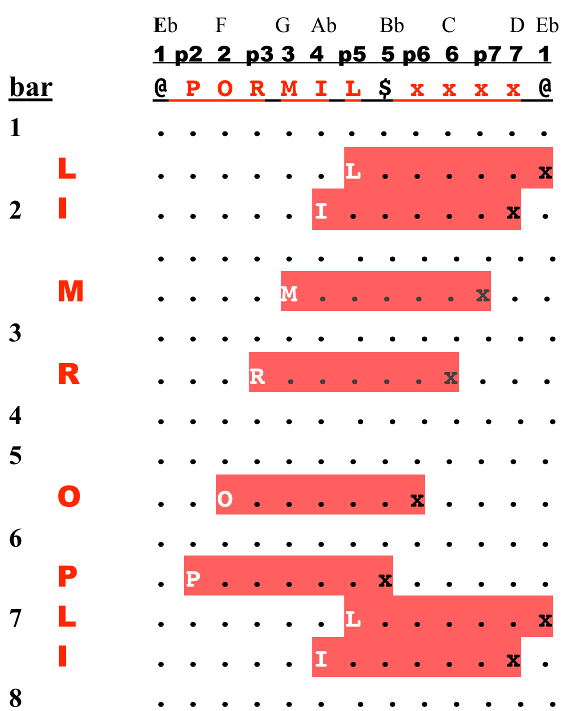
EXAMPLE: ORNAMENTAL CHROMATICISM

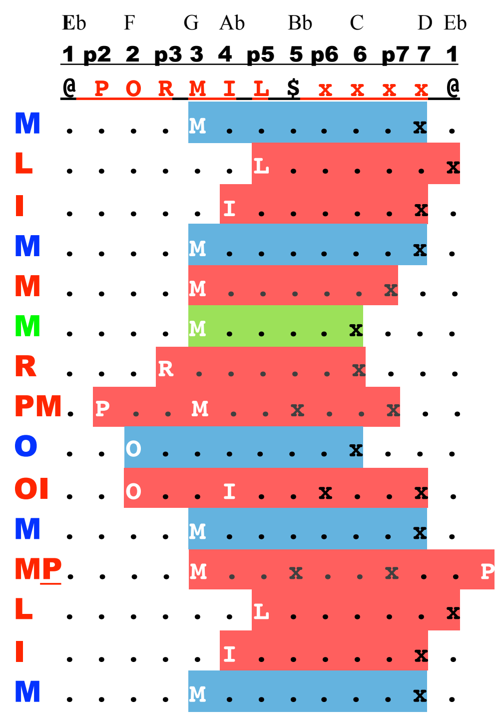
This example develops strongly chromatic ornamental harmony for the opening melody phrase of the well known piece *Over the Rainbow*. The purpose is to illustrate that written harmony may be just harmony, without any other purpose than to sound good with melody. It need not originate in the melody scale and may not have any meaning as a harmony scale. The first eight bars of this piece are sufficient for the purpose, which are so well known that there's no need for a reference. The melody line is straight Ionian, trending downwards in zig-zags over an octave range.

The downward trending melody line is given a downward trending tritone anchor line consisting of the alphabet in reverse order starting on **L** and wrapping around: **L-I-M-R-O-P-L-I**. This line is, by itself, an example of constant-keyboard-shape harmony: the same keyboard shape (a tritone) moves to different positions in the chromatic scale.



The tritones provide a framework for adding core fifos and some other variations. The double tritones provide elegant symmetric relationships between successive shapes (e.g., **PM-O** shrinks the outer notes of the double tritone inwards a half tone; and **O-OI-M** moves a fifth aligned with the bottom note of **OI** to a fifth aligned with the top note).





Here follows the new harmony with the original melody. The harmony could but doesn’t imply parallel mode changes, or tonic changes that are the other side of the same coin.

⚓ M L I M M M R PM O OI M MP L I M

🎵 | 1 1 | 7 5 6 7 1, | 1 6 | 5, | 6 4 | 3 1 2 3 4, | 2 7 1 2 3 | 1, |

EXAMPLE: "RHYTHM CHANGES"

The Gershwin piece *I Got Rhythm* (*The Standards Real Book*, Sher Music (2000), p191) is the origin of widely copied chord changes called "Rhythm Changes" by jazz musicians. Dealing with these changes can be challenging in music notation, depending on the key signatures involved. In the following skeleton summary, parallel mode changes occur at points marked " ⌐ ."

⌐ **//I**

⚓ **I I I I I M D O I I M I**

♫ **| — 5 6 | 1 2, | 2 1 | 6 5 , | 5 6 | 1 2 4 2, | 3* 2 3 2 | 1, — |**

⌐ **altA** ⌐ **altP** ⌐ **//L** ⌐ **//I**

⚓ **O O O P $ L I I**

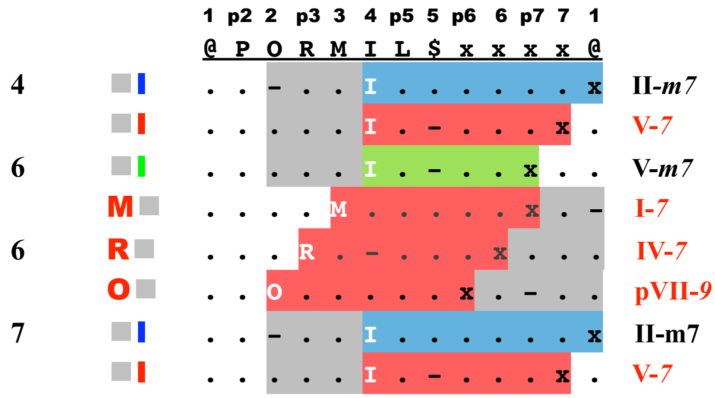
♫ **| 3 3 | 3 p5 , | 3 3 | 3 6 , | 2 2 | 2 3 , | 2 2 | 5 , |**

The tritone changes in bars 1-8 are purely ornamental because the melody line stays in the Ionian mode of the home tonic. The melody line in bar 10 goes to chromatic note **p5** that's visibly and audibly not a passing note, identifying a mode change determined by the **O** tritone. The mode is not **//O** because it's a minor mode and the melody line in bars 10-11 is major: the mode can only be **altO** (same tritone, all non-tritone notes different). The same goes for tritone **P** in bars 12-13: the mode can only be **altP**. The mode in bars 14-15 is **//L** and bar 16 returns to **//I**. These are very simple mode changes: in bars 10-16, one note changes from one mode to the next, supplied by the tritone. The only big change (4 notes) is **//I-altO** in bars 8-10.

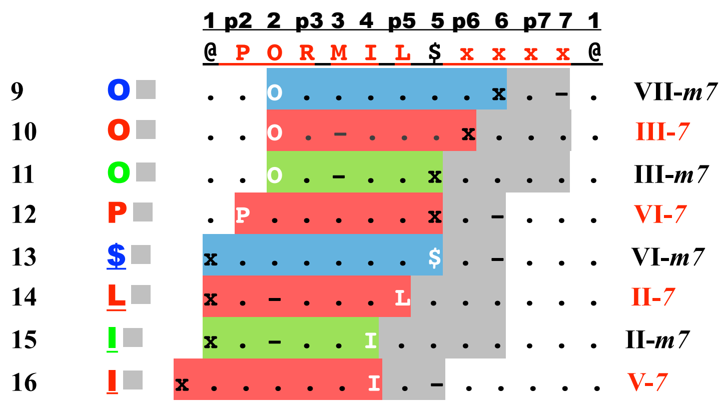
The parallel mode changes are shown next (altered notes highlighted). The other side of the coin of parallel mode changes is Ionian tonic changes shown on the right (up a major sixth and then down by fifths). The parallel modes provide the notes. The secondary Ionian tonics are possible resolution targets for improvisations.

		Bb		C		D	Eb		F		G		A	Bb	<—written key
		1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	
		@	P	O	R	M	I	L	$	x	x	x	x	@	
bar 1-8	**//I**	x	.	x	.	x	x	.	x	.	x	.	x	x	**Ionian@1**
bars 9-10	**altO**	.	x	x	.	x	.	x	.	x	x	.	x	.	**Ionian@6**
bars 11-12	**altP**	.	x	x	.	x	.	x	x	.	x	.	x	.	**Ionian@2**
bars 13-14	**//L**	x	.	x	.	x	.	x	x	.	x	.	x	x	**Ionian@5**
bar 15-16	**//I**	x	.	x	.	x	x	.	x	.	x	.	x	x	**Ionian@1**

Here follows a look at bars 4-7. The grey box prefixes and suffixes on the left indicate voicing intervals of unspecified size less than a fourth that are left to context. This notation could be shown in the anchor line. The boxes do two useful things, namely identify the need for a voicing interval, and indicate its side. Dashes identify the roots of the chords shown on the right.



The harmonic sequence for bars 9-16 where the mode changes occur is shown next.



The VIIm7 chord in bar 9 includes note **p5**, of the **alt-O** mode. After that, the only notes that go outside the Ionian home tonic mode are one note from each of the three non-Ionian tritones, which is no different from the first eight bars. The parallel modes provide more differences than this, which could be reflected in the harmony or in improvised melody lines.

OBSERVATIONS

The examples graphically illustrate that harmony anchor lines follow by starting from all-tritone anchor lines and then fairing in mode fifos for smooth flow. If some of the tritones are ornamental (no scale implications) then the mode (or modes) that supply the faired-in fifos is determined by the other tritones. Four-part harmony to voice seventh or sixth chords (or alterations or extensions of them with more notes) is completed by adding a bass or treble line in the mode that implies overlapped fifos.

CHAPTER 3: A HIERARCHY OF MODES

The many different approaches to chromaticism may be organized into the following hierarchy of modes determined by words from the alphabet. The reason for presenting classical modes before presenting this hierarchy is they provide the alphabet, which provides a link to music notation, thus grounding this unconventional view in something familiar to anyone who studies the piano. This hierarchy is comprehensive enough to cover all the modes and beyond in scale dictionaries such as *The Source* What's more it goes beyond scale dictionaries by covering the modes for all possible key signatures and tonics, by construction on the keyboard from mode signatures. The hierarchy is comprehensive but not exhaustive; there's room for identifying more modes, if anyone sees the need.

```
                 atonal scales
                  /          \
minor & major               blues family
families     |  \  enriched  /  |
             |     classical    |
             |      modes       |
             |                  |
 classical modes                |
             |              simple blues
             |                  |
              pentatonic modes
```

The hierarchy provides the framework for developing and understanding chromaticism in a systematic way, bottom up, starting from simple pentatonic modes. Classical modes (e.g., minor Aeolian and major Ionian) are defined independently of this hierarchy because they're the scales of key signatures, but in this view of them, they're enrichments of pentatonic modes. Simple blues is an enrichment of a different kind. Classical modes and simple blues are at different levels because they're different in kind. Modes higher up in the two sides of the hierarchy are **mashups** of modes lower down, identified by words with more letters. Steps from pentatonic modes to basic blues and from pentatonic modes to classical modes yield scales that are different in kind, and the steps from there to family modes widens the difference. The family modes are similar in kind. Enriched classical modes (e.g., melodic minor, harmonic minor, harmonic major) are sub-modes of these that provide a bridge between the two sides of the hierarchy. These modes share with classical modes the properties of seven notes and no adjacent half tones; they differ from them by one note altered by a half tone that introduces a second tritone.

At the top of the hierarchy are atonal modes compatible with multiple tonics (e.g., diminished, whole tone) that can often be understood as parents of modes lower down (or as departures that go outside these modes).

PENTATONIC MODES

Pentatonic modes with five notes and no half tones or tritones are the foundation of "folk" music in cultures worldwide, so called because anyone with a musical ear can sing or harmonize tunes from them. They're sub-modes of classical modes that omit their tritones and half tones, but the idea here is see classical modes as enrichments of pentatonic modes. Simple blues modes are enrichments of a different kind.

The scale frame provides three notes, one more note results from specifying major or minor tonality, and a final note follows from splitting a remaining major third into whole tones (the only way of splitting it that doesn't introduce half tones). This yields scales with inter-note intervals of whole tones and minor thirds. The latter are made to stand out to the eye by joining their notes by horizontal lines that say "no notes here." The signature for these modes is, exceptionally, a single fifo anchor. It establishes the tonality in the lower fifth of the scale frame and adds a characteristic note in the upper fourth.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	.	.	.	.	@	
pentatonic major	x	.	x	.	x	—	—	x	.	x	—	—	x	**//M**
pentatonic minor	x	—	—	x	.	x	.	x	—	—	x	.	x	**//R**

The most visible instances of pentatonic modes on the piano are the clusters of 5 black piano keys (the major mode starts on the bottom black key of the 3-tritone cluster, and the relative minor mode on the next black key down). A lot of fun can be had and insight gained by experimenting with these black-key modes. They lead directly to simple, 6-note blues modes that are taught to beginners as "the" blues modes.

BLUES FAMILY

This development comes before moving up from classical modes on the left side of the hierarchy because it's simpler. I once heard a jazz musician say in an interview that learning the blues before learning music notation paved the way for understanding everything that music notation later threw at him. I thought this sounded right. I started with pentatonic modes because this gives deep insight into the difference between classical modes and blues modes, which otherwise can seem somewhat arbitrary. This view of blues seems to be unconventional because no one I talked to and nothing I read explained things this way. It's a useful view because it gives the blues a coherence that's obscured by music notation, and highlights the difference in kind between the two sides of the hierarchy.

Simple blues modes are 6-note enrichments of pentatonic modes identified by **//RM** and **//RL** that add a tritone. These modes are generally taught to beginners as "the" blues modes. The blues family mode is a 9-note mashup of these two modes identified by mode signature **//RM.L**.

These modes are very simple in PKP terms, as summarized next. Think of the major mode as following from a singer "bending" major note **3** down a half tone to **p3** to give a happy-sad effect. The minor mode is determined by a rotation of this interval sequence. The adjacent half tones in the simple modes make them different in kind from classical modes. The 9-note family mode increases the difference from classical modes. This mode is not my invention, only this representation of it is. I first learned of this mode in conventional terms in a blues piano workshop given by Aaron Blumenfeld at the then Jazz School in Berkeley.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	.	.	.	.	@	
//RL	x	—	—	x	.	x	+	x	—	—	x	.	x	**6-note extension of pentatonic minor**
//RM	x	.	x	+	x	—	—	x	.	x	—	—	x	**6-note extension of pentatonic major**
//DRM.L	x	.	x	x	x	x	x	x	.	x	x	.	x	**9-note mashup**

A complementary development gives a slightly different perspective on the same thing. A mashup of the parallel pentatonic modes yields an intermediate 8-note blues scale identified by **//DM** with a visibly simple interval sequence. A one-note extension — the famous "flatted 5th" (meaning the 5th note of a classical mode) — yields the family mode.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	.	.	.	.	@	
//R	x	—	—	x	.	x	.	x	—	—	x	.	x	**5-note pentatonic minor**
//M	x	.	x	.	x	—	—	x	.	x	—	—	x	**5-note pentatonic major**
//RM	x	.	x	x	x	x	.	x	.	x	x	.	x	**8-note mashup**
//RM.L	x	.	x	x	x	.	+	x	.	x	x	.	x	**9-note extension**

These viewss of blues have an elegant simplicity. The family mode signature captures characteristic features of blues that distinguish it from the scales of key signatures, namely mixed minor-major tonality, adjacent half tones, more scale notes and the addition of three "bent" notes of the master major classical mode (Ionian), namely flatted 3rd, 5th and 7th.

Enriched classical modes called "melodic" and "harmonic" that are sub-modes of these modes will be covered later.

EXAMPLE: BACKWATER BLUES

This is a simple, 3-chord, 12-bar blues, which I learned in the blues piano workshop mentioned earlier, as representative of "probably half the blues pieces played by pop and jazz musicians." It's a simple piece but exploring it plumbs musical depths. The simple melody line establishes the home tonic by resolving to it in several places. Commas at the ends of phrases only identify the last note of the phrase, leaving open whether it's sustained or not. Timing is left open. Swing-feel 4/4 time would be appropriate and could be notated by an extra downbeat line, but none is shown because it's easy to add. The harmony is all tritone-based, which is not uncommon in blues.

⚓ M R M M
♫ | 5 4 p3 1, | 5 4 p3 1, |—— |—— |

⚓ R R M M
♫ | 5 4 p3 1, | 5 4 p3 1, |——| — 5 p7 5 |

⚓ I R M M
♫ | p7 p7, 5 | 1 p7 5 p5 4 p3 1, |—— |—— |

The first bar illustrates a feature of many blues pieces that helps in establishing both the fact of a blues and identifying the home tonic, namely opposite tonality of melody (minor) and harmony (major). As shown next, this bar implies, all by itself, the shared blues scale **//RM**. The melody in bar 10 adds tritone **L**, rounding out the shared mode to **//RM.L**. The actual melody scale in all but bar 10 is pentatonic minor, and in bar 10 is the 6-note blues extension of it identified by **//RL**, but all of the melody and harmony originates in the family scale.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	x	x	x	x	@	
major harmony in bar 1	.	.	.	.	x	.	.	.	.	.	x	.	.	
minor melody in bar 1	x	.	.	x	.	x	.	x	.	.	.	.	x	
implied shared blues scale	x	.	+	x	x	x	.	x	.	x	x	.	x	**//RM**

All the tritones appearing in the piece are summarized next.

1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
@	P	O	R	M	I	L	$	x	x	x	x	@	
.	.	.	.	.	.	L	.	.	.	.	.	x	
.	.	.	.	.	I	.	.	.	.	.	x	.	**substitute for L**
.	.	.	.	M	.	.	.	.	.	x	.	.	
.	.	.	R	.	.	.	.	.	x	.	.	.	

The lone tritone **I** in the harmony in bar 10 is not in the family mode. The tritone is a "turnaround" marker that identifies the beginning of the last four bars of a 12-bar blues. Blues tritone **L** would seem to be a natural turnaround marker but is substituted by **I** for reasons explained under the heading “Blues Chords.” Harmony based on un-inverted and inverted tritone cores is shown next. It’s easy to see how these simple voicing lines follow from altering tritone-based octave shapes. Grey box prefixes and suffixes could be used to suggest these shapes in anchor lines. The simple voicing lines are sufficient because the tritones provide sufficient harmonic variety. The omitted roots of the identified chords are are marked by dashes.

```
F     G     A  Bb    C     D  Eb    F
1  p2 2  p3 3  4  p5 5  p6 6  p7 7  1
@  .  O  R  M  I  L  $  .  x  x  .  @
.  .  .  .  M  .  .  .  .  .  x  .  .     I7
.  .  .  R  .  -  .  .  .  x  .  .  .     IV7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7

.  .  .  R  .  -  .  .  .  x  .  .  .     IV7
.  .  .  R  .  -  .  .  .  x  .  .  .     IV7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7

.  .  .  .  .  I  .  -  .  .  .  x  .     V7
.  .  .  R  .  -  .  .  .  x  .  .  .     IV7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7
.  .  .  .  M  .  .  .  .  .  x  .  .     I7
```

```
F     G     A  Bb    C     D  Eb    F
5  p6 6  p7 7  1  p2 2  p3 3  4  p5 5
$  .  x  x  .  @  .  O  R  M  I  L  $
.  .  .  x  .  -  .  .  .  M  .  .  .     I7
.  .  x  .  .  .  .  .  R  .  -  .  .     IV9
.  .  .  x  .  -  .  .  .  M  .  .  .     I7
.  .  .  x  .  -  .  .  .  M  .  .  .     I7

.  .  x  .  .  .  .  .  R  .  -  .  .     IV9
.  .  x  .  .  .  .  .  R  .  -  .  .     IV9
.  .  .  x  .  -  .  .  .  M  .  .  .     I7
.  .  .  x  .  -  .  .  .  M  .  .  .     I7

.  .  .  .  x  .  .  .  .  .  I  .  .     V7
.  .  x  .  .  .  .  .  R  .  -  .  .     IV9
.  .  .  x  .  -  .  .  .  M  .  .  .     I7
.  .  .  x  .  -  .  .  .  M  .  .  .     I7
```

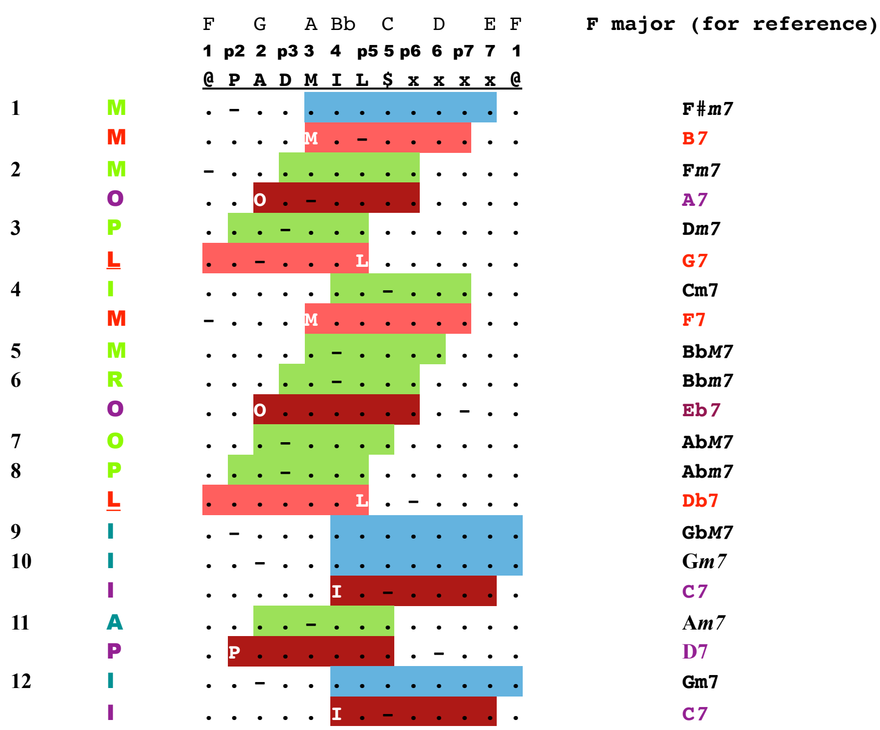
Blues Chord Progressions

Simple 3-chord blues pieces such as this often use dominant-7 chords **I***7*, **IV***7* and **V***7* containing tritones **M**, **R** and **I**, the last of which is not actually in the family scale represented by the mode signature **//RM.L**. The **V***7* chord containing tritone **I** is such a familiar feature of music that it tends to be borrowed for blues to round out a trio of chords of the same kind (the **V** chord containing tritone **L** is different in kind, namely **V***M7#4*). This is so common that many musicians understand basic blues to be defined by this chord trio. This is unhelpful because blues pieces in general use chords of too many different kinds for chord content to be a useful characterizing feature. Tritone content is more helpful and the **//RM.L** signature is particularly helpful because it captures fundamental features of the blues in a compact and intuitive way.

The following table digs deep, to reveal underlying simplicity of chromatic blues chord progressions that are forbiddingly complex even though they use only basic seventh chords. This is a representation of a table of chord progressions handed out in the blues piano workshop mentioned earlier. The table vividly illustrates the simplicity of developing voicings of notationally complex chord progressions from very simple information. Tritone chords are represented by their anchors (red text, darker text for ones not in the blues family mode) and fifo anchors are represented by placeholder plus signs, leaving fifos to be faired in from context. The highlighted anchor lines are representative of the two parts of the table: the anchor line of *Backwater Blues* in the top part (using segments from different lines); and a representative anchor line of a bebop blues progression in the bottom part.

									turnaround			
1	M	M	M	M	R	R	M	M	I	I	M	M
2	M	M	M	M	R	R	M	M	I	R	M	I
3	M	R	M	M	R	R	M	M	L	I	M	I
4	M	R	M	M	R	R	M	P	L	I	M	I
5	M	R	M	M	R	R	M	P	+	I	M	+ I
6	M	R	M	M	R	O	M	P	L	I	M	+ I
7	M	R	M	+ M	R	O	M	+ P	+	I	+ P	+ I
8	M	R	M	+ M	R	O	+	P	+	I	+ P	+ I
9	M	R	M	+ M	R	+ R	M R	O P	+	I	+ P	+ I
10	+	+ O	+ L	+ M	R	R	+	+ L	+ I	+ I	+ P	+ P
11	+	+ +	+ +	+ M	+	+	+	+	+	I	+ +	+ P
12	+	+	+ +	+ M	+ +	+	+	+	+	I	+ +	+
13	+	+	+ +	+ M	+	+ O	+	+ L	+	+ I	+ P	+ P
14	+	+ O	+ L	+ M	+	+ O	+	+ L	+	I	+ P	+ I
15	+	+ O	+ L	+ M	+	+ R	+	+ L	+	I R	+ P	+ I
16	+ M	+ O	+ L	+ M	+	+ O	+	+ L	+	+ I	+ P	+ I
17	+	+ M	+ +	+ +	+ +	+ R	+	+ P	+	+ +	+ +	+

Here follows the development of the highlighted bebop blues line for home tonic F. Fifos are faired in between tritones. Dashes indicate positions of assigned roots that yield conventional root-3rd-7th voicings of the seventh chords on the right.



The notational complexity of the chord progression on the right above follows from the use of tritone substitute chords (same tritone, all non-tritone notes different) that determine different parallel modes for the same tritone in different places in the progression. The tritones of all possible dominant seventh chords and their tritone substitutes for any home tonic are easily determined from a table of the following form, the top line of which is the actual scale frame of the home tonic on the keyboard (F-C-F here). The chord roots are the **X** entries in the table. All possible chords are listed on the right for home tonic F, with strikethroughs identifying unused chords. This particular chord progression is doubly chromatic because each pair of tritone substitute chords determines two different implied key signatures, for a total here of eight different key signatures, which is complex by any measure. This table is good for any progression of dominant seventh chords from any home tonic by replacing the top line by the scale frame for that tonic.

	F							C					F		
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
	@	P	O	R	M	I	L	$	x	x	x	x	@		
L	.	.	X	.	.	.	L	.	X	.	.	.	.	G7	Db7
I	.	X	.	.	.	I	.	X	.	.	.	.	.	~~Gb7~~	C7
M	X	.	.	.	M	.	X	.	.	.	.	.	X	F7	B7
R	.	.	.	R	.	X	.	.	.	.	.	X	.	~~E7~~	~~Bb7~~
O	.	.	O	.	X	.	.	.	.	.	X	.	.	A7	Eb7
P	.	P	.	X	.	.	.	.	.	X	.	.	.	~~Ab7~~	D7

Complex as such bebop blues chord progressions are, the chords themselves are plain seventh chords, which is not representative of blues in general. In fact, the bebop progressions don't sound like blues by themselves: they rely on a melody line to provide a blues sound. To give a blues sound to the harmony, the non-tritone harmony notes should stick to the blues family mode of the home tonic or a sub-mode of it, which isn't the case here. I have always wondered why some jazz pieces described as "blues" don't sound like blues to my ears; this offers an explanation.

Blues Chords

Blues modes are different in kind from the classical modes that determine the symbols for seventh chords (different numbers of notes, adjacent half tones, multiple tritones). Blue chords that are basic chords altered to fit a blues mode are often notationally complex. The alterations are like "banging square pegs into round holes" — the results tend to be messy. A sampling of such chords is provided next. The chord symbols on the right are intended only to illustrate this complexity: knowing them is not required to read on. The takeaway here is that the combinations of building blocks *are* the chords.

The grey box prefixes and suffixes (■) in the anchor line on the left are ambiguous in isolation but tend to be unambiguous in context, suggesting specific add-on fifos. Specifying the full add-on fifos tends to over-specify chords because the internal notes of the tritones are often implied by context. An amazing amount of chord complexity can be introduced by holding the tritone and changing the add-on fifo (or vice-versa).

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
	@	.	O	R	M	I	L	$	.	x	x	.	@	.	O	R	M	I	L	$	**examples**
■M	x	.	.	.	M	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	I7, IIIm7b5#5, IIIm7b5b13
M■	.	.	.	.	M	.	.	.	.	.	x	.	–	.	.	x	.	.	.	.	rootless I7#9
R■	.	.	.	R	.	x	.	.	.	x	.	.	x	.	.	.	.	.	.	.	IV7
	.	.	.	R	.	.	x	.	.	x	.	x	.	.	.	.	.	.	.	.	tritone substitute VII7 for IV7
R■	.	.	.	R	.	–	.	.	.	x	.	.	.	.	x	.	.	.	.	.	. rootless IV13
■L	.	.	x	.	.	.	M	.	.	x	.	.	x	.	.	.	.	.	.	.	II7
■I	.	.	x	.	.	I	.	x	.	.	.	x	.	.	.	.	.	.	.	.	V7
I■	.	.	.	.	.	I	.	x	.	.	.	x	.	.	x	.	.	.	.	.	V7
L■	.	.	.	.	.	.	L	x	.	.	.	.	x	.	x	.	.	.	.	.	VM7#4 or VM7(11)
■L	.	x	.	.	.	.	L	.	.	.	.	.	x	.	.	.	.	.	.	.	tritone substitute pIIM7(11) for VM7(11)
L■	.	.	.	.	.	.	L	.	.	.	.	.	x	.	–	.	.	x	.	.	rootless II7#9
ML	.	.	.	.	M	.	L	.	.	.	x	.	x	.	.	.	.	.	.	.	I7b5, pV7b5
RM	.	.	.	R	M	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	I7#9(13), III7b9b5
RL	.	.	.	R	.	.	L	.	.	x	.	.	x	.	.	.	.	.	.	.	Idim7, IV7b9

MAJOR AND MINOR FAMILIES

Classical modes, already explained, follow from enriching the pentatonic modes by splitting their minor third intervals in different ways. The minor and major families follow from a mashup of modes **//O** and **//I** that's analogous to the mashup of minor and major pentatonic modes on the blues side of the hierarchy. As shown below, the mashup yields a 10-note minor-major mode identified by the mode signature **//ORMI** that sometimes appears as a melody mode in strongly chromatic pieces (e.g., *Lush Life*), but that is mainly a parent of 9-note minor and major family modes that differ by one note in the lower fifth of the scale frame (grey shading). The 9-note modes follow from omitting tritone anchor **R** or **M** while leaving its upper note untouched (marked **+**). The plus suffix on the mode signatures indicates filling in the top fourth by inclusion of this note. The modes shown all have visibly simple asymmetric forms.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	.	.	.	.	@	
//ORMI	x	.	x	x	x	x	.	x	x	x	x	x	x	**10-note mashup of //O & //I**
//OR.I$^+$	x	.	x	x	.	x	.	x	x	x	+	x	x	**9-note minor family**
//O.MI$^+$	x	.	x	.	x	x	.	x	x	+	x	x	x	**9-note major family**

These modes are close to the chromatic scale but are unambiguously tonal because of the whole tones above the home tonic and below the pitch center. One other whole tone establishes major or minor tonality.

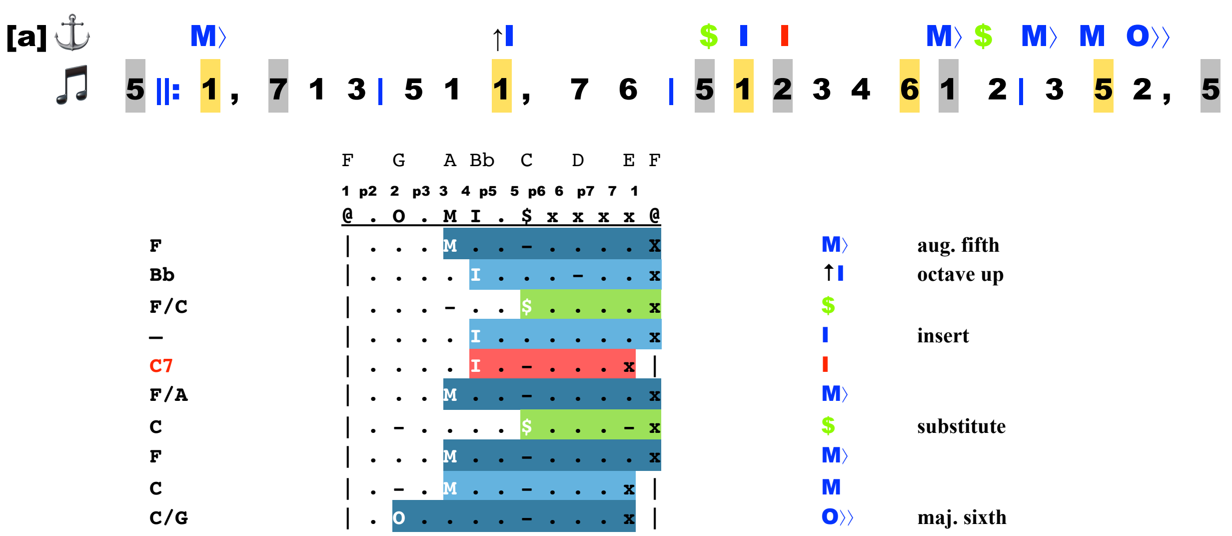
Here follows a summary of important 8-note sub-modes. This makes logical sense of modes that can seem very ad hoc in conventional terms.

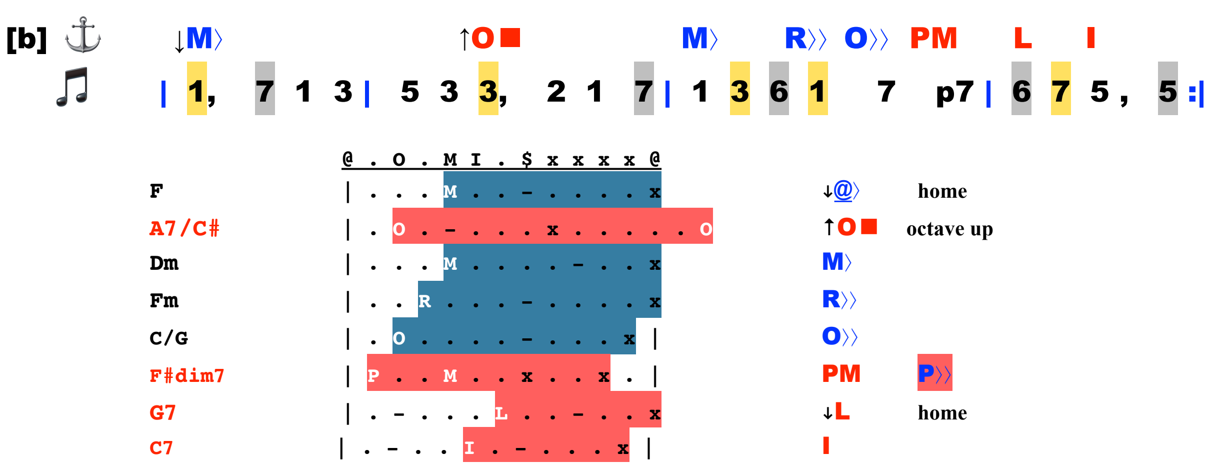
	1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1	
	@ P O R M I L $ . . . . @	
//OR.I	x . x x . x . x x x . x x	8-note sub-mode: bebop melodic minor
//O.MI	x . x . x x . x x . x x x	8-note sub-mode: (bebop melodic major?)
//O.MI	x . x . x x . x x x . x x	8-note sub-mode: bebop major

Some enriched classical modes are sub-modes of these family modes, prompting the development of full sets of enriched classical modes from the simple forms of these sub-modes. However, that's best left for after a couple of examples of the family modes.

EXAMPLE: TRAUMERAI

The example is Schumann's beautiful *Traumerai* (*Classical Fake Book*, 2nd Edition, Hal Leonard (2013), in F major (1 flat). I first learned this piece by rote from the original written score on the grand staff (no chord symbols). This interpretation is simpler without actually simplifying the music, only making a few fifo substitutions that fit the context. The melody line is straight **//I** for all but [b]-[c], which are mashups of **//I** and **//M** that differ by one note (**7** vs. **p7**). The harmony lines replaces a jumpy chord root line that implies an intricate variety of chords (or inversions) by a smoother anchor line, the tritones of which imply — in the context of the assumed major family mode **//O.MI⁺** — faired-in fifos (or expansions of them) that are cued by eye and ear. The harmony tritones **P** and **L** are ornamental substitutes for **O** and **I**. Most of the harmony shapes are voicings of the written chords and the rest imply valid substitutes in this context. Missing notes of the written chords are indicated by dashes (many of them are either the pitch center or the tonic). This example demonstrates once again that written fifo chords can largely be ignored except for identifying where they appear relative to the melody line. This harmony goes part way to being voice leading because the ups and downs roughly follow the ups and downs of the melody line, but it doesn't go all the way.





```
[c] ⚓     ↓M〉                      ↑I   M         O         PM  O〉 M   O  P O M〉
    ♫    | 1,   7  1  3 | 5  p7 p7,  6  5 | 4  6  2   3   4   3 | 2  6       , 1 |
```

```
                   @ . O . M I . $ x x x x @
F                  | . . . M . . - . . . . . x          M〉
Cm7                | . . . . I . - . . . x . |          ↑I      octave up
D                  | . . . M . . . . . . x . -          M       tritone implied by sequence
Gm                 | . O . . - . . . . x . . |          O
F#dim7             | P . . M . . x . . . x . |          PM      P〉〉
Gm/D               | . O . . - . . . . . x . |          O〉      substitute
Adim/Eb            | . . . M . . x . . . x . |          M
Gm/D               | . O . . - . . . . x . . |          O
D7                 | P . . . . . . x . - . . |          P
Gm                 | . - . . I . . . . - . . x          ↓I      home
F                  | . . . M . . - . . . . . x          M〉
```

```
[d] ⚓     I                     ↑O  O          O          IO  I   I  M〉 O  ↓I  I
    ♫    | 4,   3  4  6 | 1  4  4,  3  2 | 1  3   6  7  1   7 | 6  3    2 ,  5 |
```

```
                   @ . O . M I . $ x x x x @
Bb                 | . . . . I . . . x . . x            I       home
Gm                 | . . . . - . | . x . . . . O        ↑O      octave up
A                  | . . . - . . | x . . . . . O        O       tritone implied by sequence
Dm                 | . . . . . . x . - . . - . O        O
C#dim7 | . . . . I . . x . . x . . O                    IO      〈〈O
Dm/A               | . . . . I . . . - . . x            I
Edim               | . - . . I . . . . . x |            I
Dm/A               | . . . M . . . . - . . x            M〉
A7                 | . O . - . . . . x . . . . |        O
Dm                 | . . . . I . . . - . . x            ↓I      home
C7                 | . . . . I . - . . . . x |          I
```

```
[e] ⚓    M〉                        ↑L            M〉     I          O P〉  O    ↓I     M〉
    ♫   | 4,   7  1  3 | 5  3  3 , 2  1  6 | 5   1  2  3  4  6  2  3 | 4  6  6  7  1 |
```

```
                   @ . O . M I . $ x x x x @
F                  | . . . M . . - . . . . . x          M〉
G7                 | . - . . . L . . . . . x            ↑L      octave up
F/C                | . . . M . . - . . . . . x          M〉
C7                 | . . . . I . - . . . x |            I
Gm                 | . O . . - . . . . x . . |          O
D                  | P . . - . . . . x . . |            P〉
Gm                 | . O . . - . . . . x . . |          O
C7                 | . . . . I . - . . . x |            ↓I      home
F                  | . . . M . . - . . . . . x          M〉
```

EXAMPLE: SUMMERTIME

I learned this version of this well known minor piece by Gershwin some years ago in a piano comping course given by Susan Muscarella at the then Jazz School in Berkeley (now the Jazz Institute). As presented there, the home tonic is D and the key signature is one flat, but the piece departs significantly from the nominal Aeolian mode of D. In the following summary, the anchor line is from a chord progression that will be presented later as a result. The only reference I have for this version of the piece is my course notes. Like *Backwater Blues*, it's a simple piece, the exploring of which plumbs musical depths.

The 6-note melody line is pentatonic minor with one added note (**2** in bar 8) that's in most minor scales. The harmony is strongly chromatic but is more than ornamental because, with the exception of bar 5, the tritone core identifies a succession of sub-modes of the minor family mode **//O.RI⁺** (recall that the plus superscript means fill in the top fourth). This is a minor context in which the **//OI** mode is the altered classical mode called the harmonic minor (Aeolian-#7).

⚓ R I R M R O OI

♫ | — **5** p3 | 5 | — , 4 p3 4 5 p3 | 1 **5** | — , **5** p3 | 4* — | — , p3 1 p3 1 p3 | **2** , |

⚓ O O OI $

♫ | ——————— same ——————— | **5** p7 5 p7 1 p3, | **5** 4 p3 — | **5** , |

The modes are summarized next. The arrows at the right indicate some possibilities for inter-mode segues that are exploited in the above anchor line.

	D		E	F		G		A	Bb		C		D	
	1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	
	@	P	R	O	M	I	L	$	x	x	x	x	@	
6 melody notes	x	.	x	x	.	x	.	x	—	—	x	.	x	
family //OR.I⁺	x	.	x	x	.	x	.	x	x	x	+	x	x	
melodic minor //R.I	x	.	x	x	.	x	.	x	.	x	.	x	x	↓ **Ionian-*b3***
harmonic minor //O..I	x	.	x	x	.	x	.	x	x	—	—	x	x	↓ **Aeolian-*#7***
Aeolian //O	x	.	x	x	.	x	.	x	x	.	x	.	x	↕
ornamental //RM	x	.	x	x	x	x	.	x	.	x	x	.	x	↑ **8-note blues**

The skeleton melody line and the anchor line shown above are sufficient to play the melody with 3-note octave shapes for the harmony. The result has depth because of the three notes, and variety because of the tritones.

Adjusting the harmony to provide more shape variety is easy, as illustrated next for bars 1-8 plus the resolution bar 16. The numeric suffixes or prefixes on anchor symbols indicate offsets of voicing notes above or below the core, measured in half tones. These could be added to the above anchor symbols to indicate desired voicings. These shapes voice the chords on the right, if not always in place then in the flow (omitted chord roots are identified by dashes). All the voicings except for the **II** chord are rootless, demonstrating once again that chord roots are not inherently fundamental to the sound of a chord progression.

The prefixes or suffixes for the offsets down or up of voicing notes have the useful property of telling the size of a shape directly: it's the size if the building block plus the size of voicing interval. For example, a tritone with a fourth on top (often called "all fourths" because a tritone is an augmented fourth) has a size of 6+5=11 half tones, a half tone less than an octave. This makes finding the shape on the keyboard easy — find the treble note a half tone below the bass note an octave up, and complete the shape by adding an internal note a tritone above the bass note. All-fourths shapes generally imply complex chord symbols because this is not a basic chord shape from a classical mode.

bar	core	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	p2	2	p3	a voicing of	
		@	.	O	R	.	I	.	$	x	x	x	x	@	.	O	R		
2	R	.	.	.	R	.	–	.	.	.	x	.	.	.	.	x	.	IV-*13*	
3	I	.	.	.	.	.	I	.	–	.	.	.	x	.	.	.	x	V-*7#5*	
4	R	.	.	.	R	.	–	.	.	.	x	.	.	.	.	x	.	IV-*13*	
5	M	–	.	.	.	M	.	.	.	.	.	x	.	–	.	.	x	I-*7#9*	ornamental
6	R	–	.	.	R	.	.	.	.	.	x	.	.	–	.	x	.	I-*m6(9)*	
7	O	.	.	O	.	.	.	.	.	x	.	.	.	.	.	.	.	II-*m7b5*	
8	OI	.	.	O	.	.	I	.	–	x	.	.	x	.	.	.	.	V-*7b9*	
16	$	–	.	.	x	.	.	.	$	.	.	.	.	x	.	.	–	I-*m*	triad resolution

As summarized next, there's a strong contrast between the simplicity of these shapes and the complexity of the chord symbols. The adjustment of basic chord symbols to fit scales, or places in scales, they don't quite fit is like "banging square pegs into round holes" — the results tend to be messy.

chord scale notes (bars 1-8)	chromatic scale notes
root of ***I-m6(9)***, "5" of ***IV-13***, "7" of ***II-m7***	**1**
root of ***II-m7b5***, "9" of ***I-m6(9)***, "13" of ***IV-13***	**2**
"7" of ***IV-7***, "#5" of ***V***, "#9" of ***I-7#9***	**p3**
"b5" of ***II***, "b9" of ***V-7b9***	**p6**
"b5" of ***IV-7b5*** (not in the above but could be)	**7**

ENRICHED CLASSICAL MODES

The blues family mode and the major and minor family modes provide enriched classical modes as sub-modes. These modes are parallel modes of the melodic and harmonic minor modes but, as with straight classical modes, the parallel modes may have major or minor tonality, so I refer to them in general as "melodic" and "harmonic" modes, with tonality understood from mode signatures. The enrichments add a second tritone, while preserving the properties of classical modes of seven notes and no adjacent half tones. The modes may be identified by a classical mode name with a sharp or flat suffix identifying the altered note, but this focuses on the modes as altered classical modes, providing no insight into how they emerge in pieces of music. See Appendix D for an explanation of the complex way these modes are conventionally understood.

Parallel Melodic Modes

These are very simple modes — one whole tone short of a whole-tone scale — making them easy to complete from the double tritones. They share the same master mode, generally understood to be the melodic minor mode with signature **//RI**. The alterations that create the second tritone are highlighted in grey, making the modes easy to understand. Five modes without the home tonic are omitted, or included with strikethroughs (**//IP** and **altIP**) and identified as "almost parallel."

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
		@	P	O	R	M	I	L	$	.	.	.	.	@	**tonality**	**source**
	//LO	x	.	x	.	x	.	x	—	x	x	.	x	x	ma	**blues or major family**
	~~**//IP**~~	~~—~~	~~x~~	~~x~~	~~.~~	~~x~~	~~x~~	~~.~~	~~x~~	~~.~~	~~x~~	~~.~~	~~x~~	~~.~~	ma	***almost parallel*** **Ionian sharp one**
	//ML	x	.	x	.	x	—	x	x	.	x	x	.	x	ma	**blues family**
master mode	**//RI**	x	.	x	x	.	x	.	x	.	x	—	x	x	mi	**minor family**
	//OM	x	.	—	x	x	.	x	x	.	x	.	x	x	mi-ma	**major family**
	//PR	x	x	.	x	.	x	.	x	—	x	x	.	x	mi	**minor family**
	altLO	x	—	x	x	.	x	x	.	x	.	x	.	x	mi	**blues or minor family**
	~~**altIP**~~	~~—~~	~~x~~	~~.~~	~~x~~	~~.~~	~~x~~	~~.~~	~~x~~	~~x~~	~~.~~	~~x~~	~~x~~	~~—~~	mi	***almost parallel*** **Phrygian flat one**
	altML	x	x	.	x	x	—	x	.	x	.	x	.	x	mi-ma	**blues family**

Parallel Harmonic Modes

The 2x7=14 parallel modes of the harmonic minor and harmonic major are covered by the 8 parallel modes of the very simple harmonic minor-major mode. This mode is simple because the double tritone forms a stack of three minor thirds; only three double tritones with different notes exist, namely **PM**, **OI** and **RL**, all formed of stacks of three minor thirds; and two minor thirds a minor third apart in these stacks are different in kind, namely one empty and one full. The harmonic minor-major mode is a useful mode in its own right. The 7-note modes follow from omitting one internal note of its full minor third. These modes *are* enriched classical modes with one different note but thinking of them this way is unhelpful because the relationship to classical modes is obscured by the variety of their interval sequences relative to the home tonic and by the weak correlation between the tonality of the nominal master modes and the tonality of the results. It's much simpler to think of them as originating in the family modes. The single note of the full minor third that doesn't fit context is generally obvious.

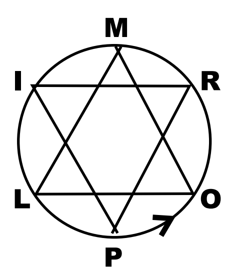
		1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1		
		@ P O R M I L $ . . . . @	tonality	source
	//RL	x . x x———x x . x x x x	mi	blues family
	altRL	x x . x x x x . x x———x	mi or mi-ma	blues family
	//LR	x———x x . x x x x . x x	mi-ma	blues family
	altLR	x x x x . x x———x x . x	mi	minor family
	//IO	x x x . x x———x x . x x	ma	major family
master mode	//OI	x . x x x x . x x———x x	mi or ma	minor or major family
	//MP	x x . x x———x x . x x x	mi-ma	minor or major family
	//PM	x x———x x . x x x x . x	ma	major family

A Helpful Picture

The following evocative picture helps in remembering how the modes are formed. The alphabet is a circular loop in which one end wraps around to the other (implied inversions understood). Classical modes step around the circle by half tones. Enriched classical modes do the same, except they collect a second a tritone a whole tone or minor third up as they go, identified by lines crossing the circle. The second tritones don't repeat for the melodic modes but repeat in opposite inversions for the harmonic modes. Repeats invert the original lead tritone. Alt modes invert both tritones. In both cases, inversions wrap around. "Anomalous" applies to non-parallel modes identified by **//** prefixes because they're part of a sequence.

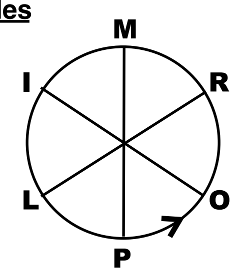
7 melodic minor modes

//LO	alt LO
//IP	alt IP
//ML	alt ML
>//RI	alt RI
//OM	alt OM
//PR	alt PD



8 harmonic minor-major modes

//LD	alt LD
//IO	alt IO
//MP	alt MP
//RL	alt RL
>//OI	alt OI
//PM	alt PM



> identifies the master mode
non-parallel modes (no home tonic) are highlighted
anomalous modes are outlined

EXAMPLE: LAURA

My source for the summary shown next is *The Jazz Book*, John Brimell, CPP/Belwin, 1989, p24. The source book is sub-titled *Today's Easy Adult Piano* but this piece is "easy" only in the sense that the key signature is empty, the density of notes on the page is low, and playing it without thinking about the changes is easy. The not-so-easy part is getting a handle on the changes, due to the presence of adjacent half tones in often-sparse melody lines, and to seemingly irregular relationships between the melody lines and the richly chromatic harmony. In the following summary, fifos are omitted at points marked ✚ because understanding the changes requires only the tritones, and the fifos are easily added from context determined by the tritones.

(a) ⚓ + RL +

♫ | 7 7 | — , p7 7 p7 p5 5 | 6* 3 | — , |

(b) ⚓ + PM + R

♫ | 6 6 | — , p6 6 p6 3 4 | 5 — | — , |

(c) ⚓ OI + I + L RL

♫ | — p3 4 | — , p3 4 | p3 4 | 5* 2 | — , p3 5 p7 | p3* p6 |

(d) ⚓ LO L + + I OI

♫ | — , 6 | 2 — | — , 4 1 — 2 |

repeat (a)-(b) and then go to (e)-(f)

(e) ⚓ + I• + L

♫ | 4 5 | — , 3 4 p6 7 | 2 1 2 | — , 7 1 |

(f) ⚓ LO OI I OI + +

♫ | p3 p3 | — , 3 p3 2 6 7 | 1 — |

Here follows an interpretation in terms of classical modes. The melody lines are from successive classical modes that go from major in (a)-(b) to minor in (c) to major in (d)-(f). Ornamental notes (highlighted) "bleed" between the classical modes. The pentatonic major mode of (d) is a sub-mode of the resolution Ionian mode of (e)-(f). The successive classical modes are determined by single tritones going down by whole tones through (a)-(b)-(c) and then up a minor third to (e)-(f). This may be interpreted as Ionian tonics going down by whole tones through (a)-(b)-(c) and then down a minor third to (e)-(f), except this is unhelpful because the modes are daisy-chained together instead of resolving. It's much simpler to think of this in terms of parallel mode changes with ornamental passing notes.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	@	P	O	R	M	I	L	$	x	x	x	x	@
(a) melody notes	.	.	.	.	.	.	x	x	.	x	x	x	.
//L	x	.	x	.	x	.	x	x	.	x	.	x	x
(b) melody notes	.	.	.	.	x	x	.	x	x	x	.	.	.
//M	x	.	x	.	x	x	.	x	.	x	x	.	x
(c) melody notes	.	.	x	x	.	x	.	x	x	.	x	.	.
//O	x	.	x	x	.	x	.	x	x	.	x	.	x
(d) melody notes	x	.	x	.	x	.	.	.	.	x	.	.	x
//M	x	.	x	.	x	.	.	x	.	x	.	.	x
(e) melody notes	x	.	x	.	x	x	.	x	x	x	.	x	x
//I	x	.	x	.	x	x	.	x	.	x	.	x	x
(f) melody notes	x	.	x	x	x	.	.	.	.	x	.	x	x
//I	x	.	x	.	x	x	.	x	.	x	.	x	x

I find the local irregularity of this interpretation unsatisfying. The piece sounds like each melody phrase is from a fully defined parallel mode of its own. Out of curiosity, I looked for an interpretation in terms of non-classical modes and found the following one in terms of parallel modes of the harmonic-minor-major mode determined by double tritones in the harmony. Only one note (highlighted) is held over from one mode to the next at the end. There's an elegant regularity about this that fits the elegant regularity of the melody phrases to the ear. The regularity helps in remembering the changes and exploring melodic variations based on them. The mode signatures of the double tritones are understood from context to be of the melodic-minor-major mode.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
		@	P	O	R	M	I	L	$	x	x	x	x	@	
(a)	melody notes	.	.	.	.	.	.	x	x	.	x	x	x	.	
	//RL	x	.	x	x	—	—	x	x	.	x	x	x	x	
(b)	melody notes	.	.	.	.	x	x	.	x	x	x	.	.	.	
	//PM	x	x	—	—	x	x	.	x	x	x	x	.	x	
(c)	melody notes	.	.	x	x	.	x	.	x	x	.	x	.	.	
	altOI	—	—	x	x	.	x	x	x	x	.	x	x	—	
	//O	x	.	x	x	.	x	.	x	x	.	x	.	x	for comparison
(d)	melody notes	x	.	x	.	x	.	.	.	.	x	.	.	x	
	//M	x	.	x	.	x	.	.	x	.	x	.	.	x	
(e)	melody notes	x	.	x	.	x	x	.	x	x	.	.	x	x	
	//OI	x	.	x	x	x	x	.	x	x	—	—	x	x	
(f)	melody notes	x	.	x	x	x	.	.	.	.	x	.	x	x	
	//I	x	.	x	.	x	x	.	x	.	x	.	x	x	

ATONAL MODES

The focus of PKP is tonal music but atonal scales summarized next are included because shared letters of their defining words make them visible structural parents of scales lower down in the hierarchy; and also because they may be used ornamentally in tonal music. Atonal scales have no minor, major or minor-major tonality by themselves but representing them by words that place them in the context of the home tonic gives them tonality relative to it. The last mode is unusual in having no tritones but being determined by tritones (it's morphed from the tritones of **O.M.L**.

Atonal modes have a symmetry that makes them compatible with multiple tonics (the shape going up from different tonics is the same). Whole tone scales have circular symmetry and diminished scales have mirror symmetry. Representing them by alphabet words selects the home tonic as a reference. Breaking their symmetry creates related home-tonic scales.

word	type name	1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 @ P O R M I L $ . . . . . @	related to
ORMI	—	——x x x x———x x x x——	**//ORMI, //OR.I, //O.MI**
P.R.I	whole tone	. x . x . x . x . x . x .	**//RI**
O.M.L	"	x . x . x . x . x . x . x	**//OM**
P.RM.L	diminished	x x . x x . x x . x x . x	**//RM.L**
PO.MI	"	. x x . x x . x x . x x .	**//O.MI**
OR.IL	"	x . x x . x x . x x . x x	**//OR.I**
P..MI	augmented	x x———x x———x x———x	**//O.M.L**

EXAMPLE: GIANT STEPS

Coltrane's jazz classic *Giant Steps* (*The Real Book*, 6th Edition, Hal-Leonard) is famously difficult, but that's only in music notation. It touches all the bases that make written music complex but it does so in a way that's so conceptually simple that anyone with some exposure to the piano can understand what it does, if not how to play it well. The written music is visibly II-V-I or V-I of the Ionian mode of three different tonics. The difficulties are as follows. The three tonics are G, B and Eb, the Ionian modes of which differ by 4 notes from each other. The changes alternate between sharp and flat keys (1 sharp, 4 sharps, 3 flats). The changes are rapid (sometimes one every bar). The home tonic to which the melody resolves is none of the Ionian tonics, but F#.

To understand this piece as it actually is on the keyboard requires knowing that the Ionian modes of tonics G, B and Eb rotate into parallel modes of home tonic F# with the same tritones on the keyboard but different anchors relative to the home tonic. The anchor of the Ionian tritone of tonic G relative to tonic F# is **L**, of tonic B is **M**, and of tonic Eb is **O**. The corresponding home-tonic modes are **altL** (Locrian), **//M** (Mixolydian) and **altO** (not a parallel mode). Mixolydian is the primary home-tonic mode but knowing this is not all that helpful for playing the piece as written because the melody line is pieced together from short segments of all the modes. These short segments cohere into an entirely different kind of mode that can be understood in its own terms, shown next.

The basic mode is a tritone-free atonal mode morphed from the whole scale determined by the the tritone cluster **OML**. The three major thirds of the atonal mode go up from the original three Ionian tonics. The melody notes marked "+" break the atonal symmetry to create a unique and easily remembered home tonic scale.

```
                          F# G        A# B       D  Eb       F#
                          1  p2 2  p3 3  4  p5 5 p6 6  p7 7  1
                          @  P  O  R  M  I  L  $  x  x  x  x @
harmony tritones          x  .  x  .  x  .  x  .  x  .  x  . x   //OML
atonal augmented mode     x  x--------x  x--------x  x-------x   //PMI
melody mode               x  x  .  +  x  x--------x  x  .  + x
```

Here follows a summary of the piece that captures its essence. The incomplete harmony is completed on the next page. Arrows indicate the tritone-fifo morphs that determine the modes.

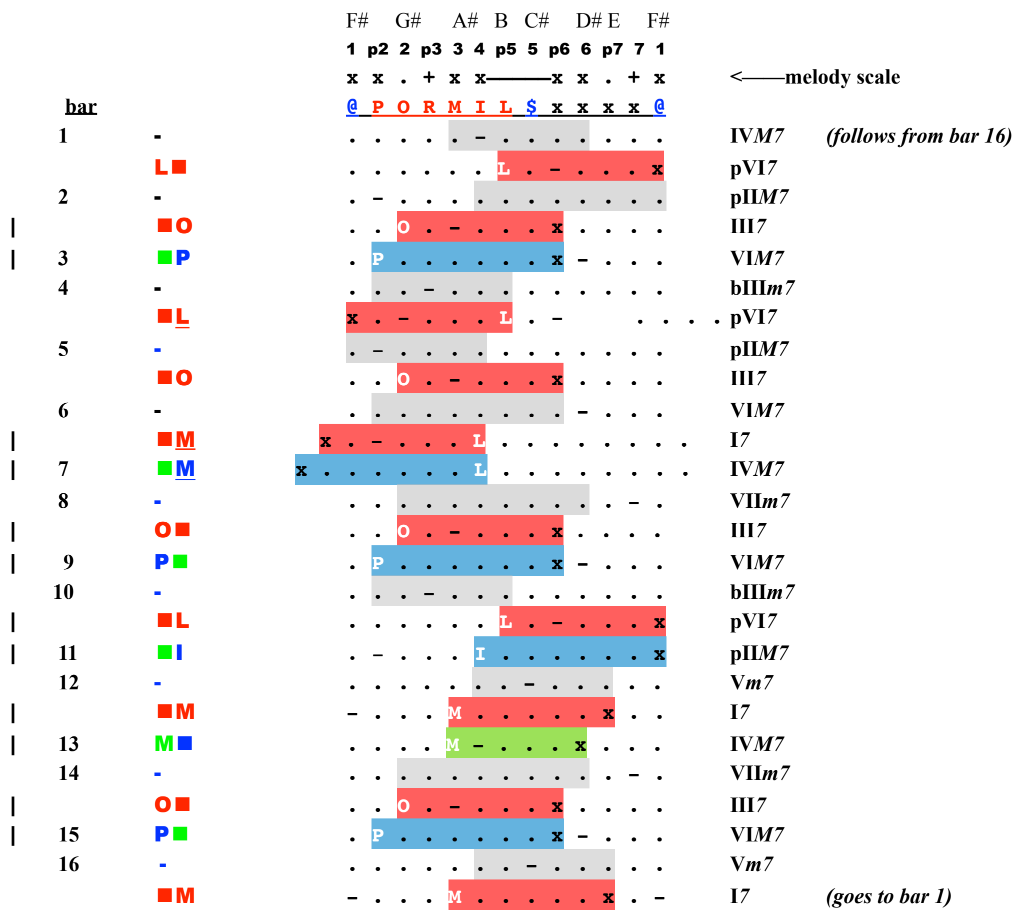
```
⚓     —>M  L        O —> P          L ——> I       M —> M
♫    | 1  p6 | 4   p2  3  | — ,  | 4  p3 | p6  3 | p2  6  1  | — , |
       ^   ^    ^   ^      ^^      ^   ^    ^   ^    ^   ^       ^^

⚓              O —> P       L ——> I          M—>M            O—>P      M—>
♫    | p2  7  3 | — , | 4  p3  p6 | — , | 6  6  1 | — , | p2  p2  3 | — , | 1  1 |
       ^   ^    ^^      ^   ^       ^^     ^  ^     ^^      ^    ^     ^^    ^  ^
```

The melody sequences **1-p6-4-p2-3** and **p6-3-p2-6-1** in bars 1-2 and 5-6 have the same keyboard shape. The transition sequences **4-p3-p6** and **p2-7-3** are the only places notes **p3** and **7** not in the atonal scale appear. The melody line resolves to the home tonic in bars 7 and 13. The long melody arc from bars 8-13 trends steadily upward to the tonic and above. Bars 14-16 set up for a repeat.

The harmony includes all the tritones in the written piece, identified relative to home tonic F#, plus selected core fifos that morph from them to provide harmony in bars where the melody line comes to rest. The remaining harmony fifos of the written music fill in the gaps for smooth flow.

This representation of this piece is both simple and deep, independently of how it's represented in music notation. It's amazing that this famously difficult piece can be represented in such simple terms. The simplicity encourages experimentation. A blues variation suggests itself.

Here follows a Lego-like view of the complete core harmony that satisfies the written chords.



The vertical lines on the left correspond to the earlier over-lines. Octave shapes that go well with the flow of the melody are indicated on the left. The additional fifos of the written music are shown in grey as "ghost" shapes from the melody scale that fill in for smooth flow. The morphs from tritones to fifos are always downwards on the keyboard from the tritones, and have sizes determined by context. This simple harmony fits the written chords shown on the right. Dashes in the building-block view indicate omitted roots. The only appearances of the "passing notes" **p3** and **7** are as roots of two minor seventh chords that are as optional in the chord progression as the notes are in the melody line.

OBSERVATIONS

There are no 5-letter mode signatures because the implied scales would be too close to the chromatic scale to be usefully distinguished from it. The zone within the mode hierarchy ranging from 4-letter words down to 2-letter words that identify parallel modes is complex in music notation. Scales must be understood as enumerated notes relative to one of more than twelve possible different key signatures. The role of classical modes as the defining scales of key signatures makes music from scales that differ markedly from them misleadingly complex. The hierarchy makes this zone simple by pushing note symbols and interval inversions down to a lower conceptual level.

Parallel classical modes bring chromaticism into the domain of classical modes in a very simple way: one alphabet step (up or down) in the alphabet brings in a new tritone that alters one scale note; two steps alters two scale notes; three steps alters three scale notes; and so on. In each step, one altered note is provided by the tritone (the other tritone note is in both modes). The new modes are chromatic relative to the key signature of the original mode. Pentatonic modes contain no tritones but they're sub-scales of classical modes and so are bundled in with them.

The chromaticism of such changes is identified in music notation by accidentals in melody lines and chromatic chords in harmony, without any explicit indication of its origin, which may be classical modes, non-classical modes, a mix of the two, or ornamentation that has no scale implications. Explicit key-signature changes indicate the origin is in classical modes, provided there are no accidentals in the melody and no chords that go outside the key signatures, but much strongly chromatic music is written with a single key signature. Even the simplest classical mode changes can be complex in music notation.

Most interesting music is chromatic to some degree. One way of introducing chromaticism is by moving between successive classical modes. The idea is to establish a mode via a melody line, a core harmonic sequence, or both, before going on to the next mode. For example, the **//I-//M** mode sequence is established harmonically by the core anchor line **I-I-M-I-M-M**. Harmonic resolution in the first mode occurs before going on to the next mode.

The melody lines of the example pieces in this chapter are all short and simple enough to be easy to read in chromatic scale notation. This so even for the difficult *Giant Steps* because its its melody line is short and simple in PKP. The smorgasbord of difficult pieces in the next chapter introduces more elaborate melody lines that are less easy to read in the unfamiliar chromatic scale notation. Keep in mind that the point of PKP is simplifying the representation of melody plus harmony, not necessarily of melody alone. The melody notation is simpler across the board than music notation but learning to read it still requires effort. The most important thing is avoiding interpreting it relative to the home tonic of a previously played piece that's still in the mind.

CHAPTER 4: A SMORGASBORD OF ADVANCED EXAMPLES

This chapter explores a smorgasbord of example pieces that I found difficult to understand when I first encountered them in music notation because of strong departures from classical modes, often combined with difficult or multiple written key signatures. The idea of a smorgasbord is to offer something for everyone. Any one of these pieces rewards deep study and, when the study is in these terms, what's learned is portable between different pieces with different tonics and key signatures.

A takeaway from this chapter is confirmation that tritones are structurally fundamental to music understood in interval terms, and that a DNA-like alphabet is sufficient to cover any tonic scale or chord progression that may be played on the piano, independently of the key signature(s) in which a piece may be written. This is different in kind from "the score is sacred" view of many classical musicians.

In a famous session of PBS's *Piano Jazz*, Bill Evans, in conversation with Marian Macpartland, said words to the effect that he advocated taking a piece apart to understand its architecture before putting it back together in an improvisation. I thought this was a great concept but wondered how "architecture" could be conceptualized. I suggest that the concept of musical domains introduced in Chapter 2 provides a way. The domains identified there, namely **basic classical** (not chromatic), **chromatic classical** (chromaticism introduced via parallel classical modes) and **non-classical** (uses non-classical modes that are inherently chromatic), are explored in some depth in this chapter.

I have heard it said, and believe it to be true, that composition is frozen improvisation. Therefore it, like improvisation, requires a sense of architecture. I suggest that exactly such a sense of architecture is revealed by the examples in this chapter. The fact such a sense can be extracted from such a wide variety of pieces without any information other than that provided by the piece itself suggests that it was put there by a composer or arranger, based on an intuitive understanding that's no doubt different in kind from PKP, but that can be represented simply by PKP.

The examples are intended to be understood by playing them, not just looking at pages, and so should be approached in front of a piano on which they can be tried. Start with the melody line and the tritone core to establish basic flow. Play the tritone core as octave shapes first. Then play the actual shapes shown, including interpolated fifo shapes. Then try variations.

The examples are as follows, in order of presentation:

Goodbye Pork Pie Hat
When Sunny Gets Blue
Prelude to an Afternoon of a Faun
Round Midnight
Straight No Chaser
Blue Monk
Body and Soul
Every Time We Say Goodbye
All of Me
No Greater Love
All the Things You Are
Chelsea Bridge
Lush Life
The Peacocks (the only one in annotated music notation)

GOODBYE PORKPIE HAT

This blues in Eb, the chord progression of which is footnoted on the opening page of the first chapter, is a poster child for chromatic music that's difficult in music notation for all but experts. My source for it is the *Mingus Fakebook*, Hal Leonard (1991). Trying to learn this piece from this source was one of the stimuli that sent me down the path to PKP. The key signature of 3 flats and the home tonic of Eb jointly identify the Ionian mode **//I** as the reference mode for the accidentals that determine blues notes. This is an example of the often misleading nature of key signatures. A 5-flats or 6-flats key signature indicating Dorian or Aeolian modes of Eb would be closer to the **//RM.L** blues that governs the piece for this tonic.

The simple melody line is mostly in the 6-note minor blues sub-scale. Bars 6-7 are a variation that goes "outside" the blues. In bar 7, the **1.p2** notation means the first note is "crushed" into the second note on the same beat. The melody is played in swing-feel 4/4 time.

Keep in mind here and later that this notation is only to illustrate the concepts independently of the obscuring clothes of music notation, and that, most of the time, all that's required is chromatic scale symbols annotated on the staff and augmented anchor lines annotated above the staff next to chord symbols. That said, this is a useful way of capturing the essence of tricky passages, to say nothing of it being valid for any home tonic, not just the written one.

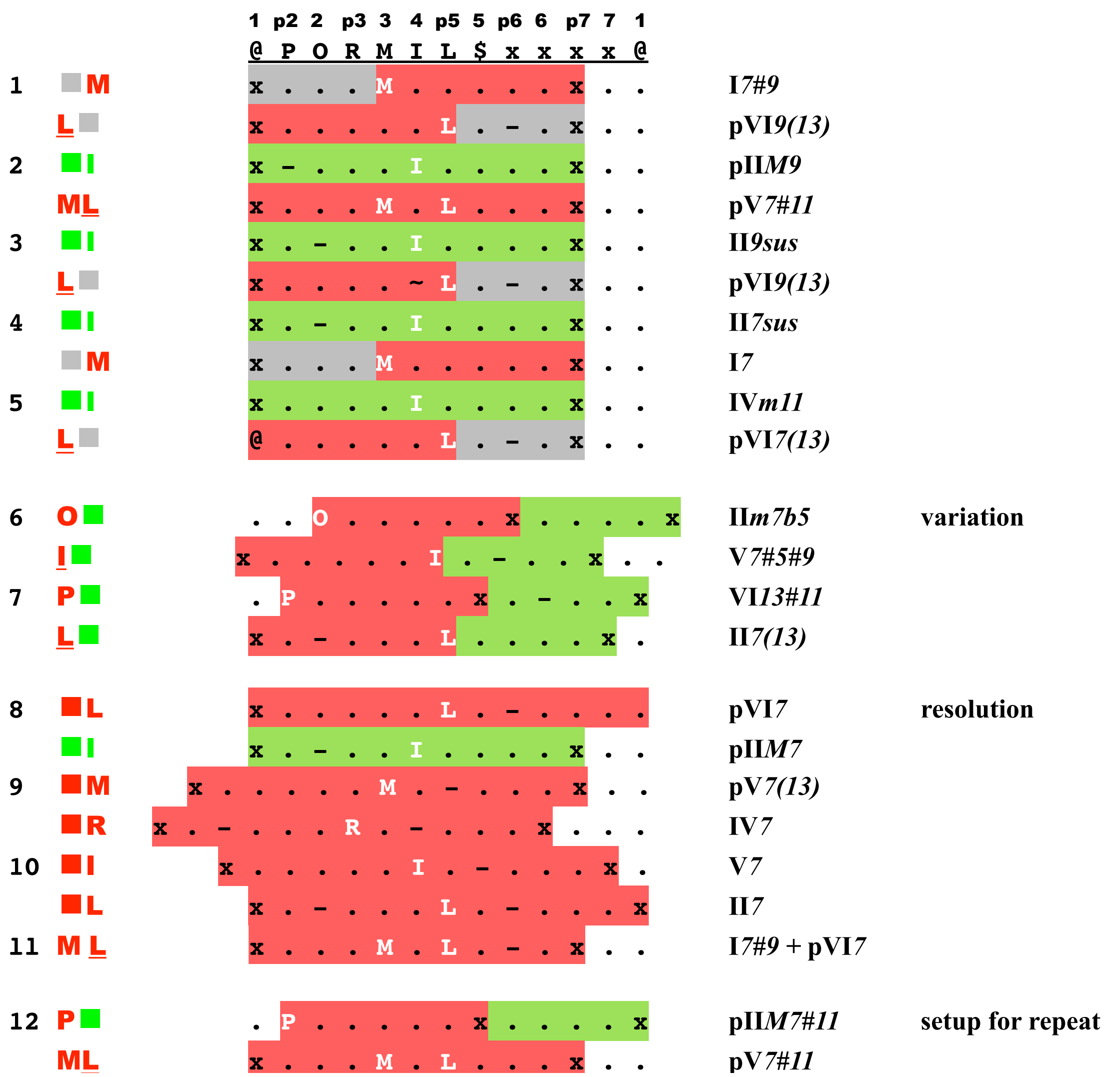
```
⚓     ■M          L■          ■I          ML      ■I          L■
♫ 5 | 1 p3  1 p3  4 p3  1 p7 | 1 p3  1 p7  1 ,  5 | 1 p3  1 p3  p5 p3  1 p7 |
      ^    ^      ^    ^       ^     ^     ^ ^      ^    ^       ^      ^

⚓     ■I        ■M        ■I          L■
♫   | 1 p3  1 p7  1 ,  1 | 5  p7   1 p3  4 p3   p7 p3 |
      ^    ^   ^   ^   ^    ^     ^        ^      ^

⚓     O■          I■               P■           L■                ) variation
♫   | 5 1   1 p3  p7  5  p3 p7 p6 , | p3 p5   1.p2 7 p5   2 |      )
      ^    ^          ^     ^          ^         ^      ^     ^

⚓     L■   ■I        M■  R■   I■         L■          ML          ) resolution
♫   | p3   1   p5 4 | p3   1 ,  | 4 p3 1 p7   p5 4 p3  1 | p3   1 , |  )
      ^  ^ ^ ^         ^ ^  ^ ^   ^         ^     ^     ^      ^ ^  ^ ^

⚓     P■     ML                    ) setup for repeat
♫   | 5 4 p3  1  p7 5 |            )
      ^    ^   ^     ^
```

Three styles of harmony are illustrated: in bars 1-5, the outer notes stay fixed (determined by the double tritone **ML**) while one inner note moves; in the variation in bars 6-7, the tritone shapes are "all fourths," providing an easy-to-play sequence that gives a bluesy sound to this departure from the blues; in bars 8-12, the single-tritone chords are all octave shapes, on the principle that there's so much harmonic variety in the tritone sequence that the tritone-based shapes don't have to provide it.

The Lego-like structure of this harmony is shown next, along with the written chords. Many of the alterations in the chord symbols on the right are provided by context. For example, ***#9*** of the **I7*#9*** chord in bar 1 is melody note **p3**. The free use of tritone substitute chords (e.g., **I7/pV7**, **II7/pVI7**,

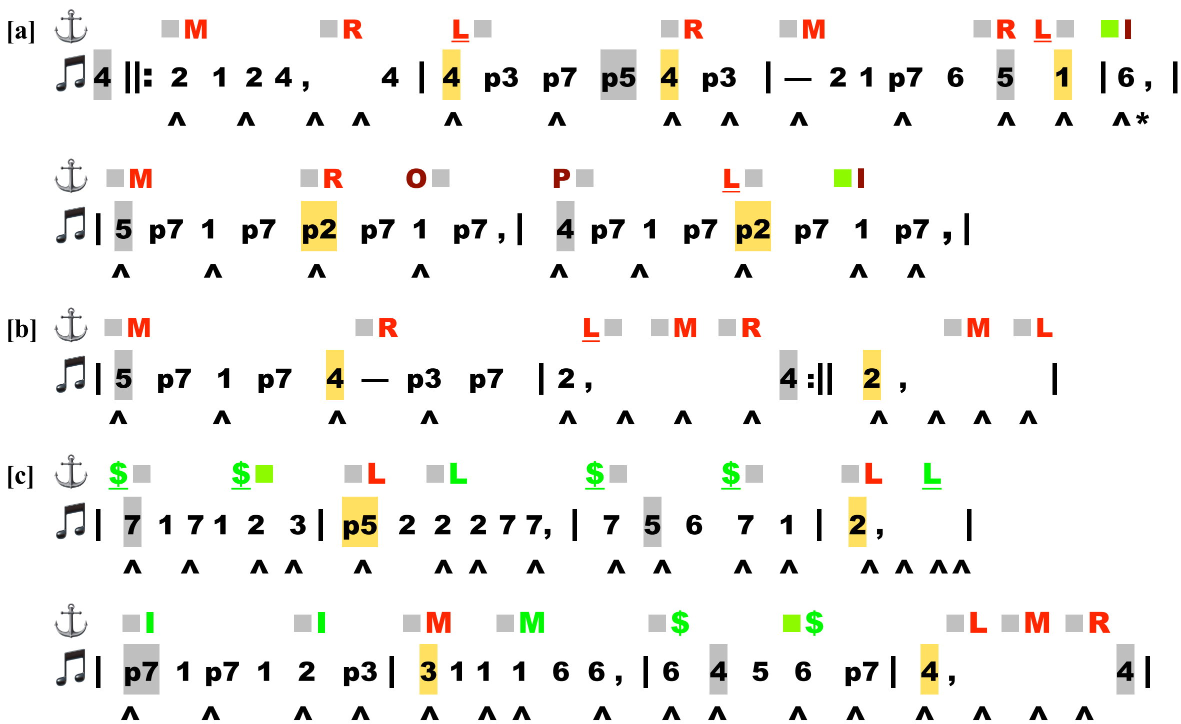
pII*M7#11*/**V***M7#11*) makes for a complex written chord progression. These chords have all non-tritone notes different (including roots a tritone apart) but the same harmonic function; in other words, they combine different fifos with the same tritone. The **pII** roots of the major seventh chords are byproducts of tritone substitutions, not indicators of visits to a mode containing this note. Several repetitions of the non-tritone shape ■I voice a variety of chords, the nuances of which can be left to context. A more accurate voicing of the *sus* chords would be provided by the shape ■$, a whole tone up from ■I, but the two shapes are mutually consonant and the the difference is relatively unimportant to the ear in this context; the ■I shape fits the flow better.

The bass line provided by the chord roots is missing but could easily be added back underneath if desired. That said, this harmony evokes the haunting, rich sound of the piece in a very satisfying way: small note changes in a smoothly flowing keyboard pattern make big sound changes.

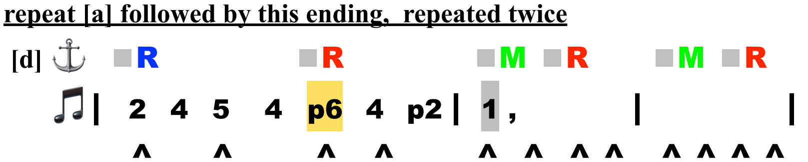


WHEN SUNNY GETS BLUE

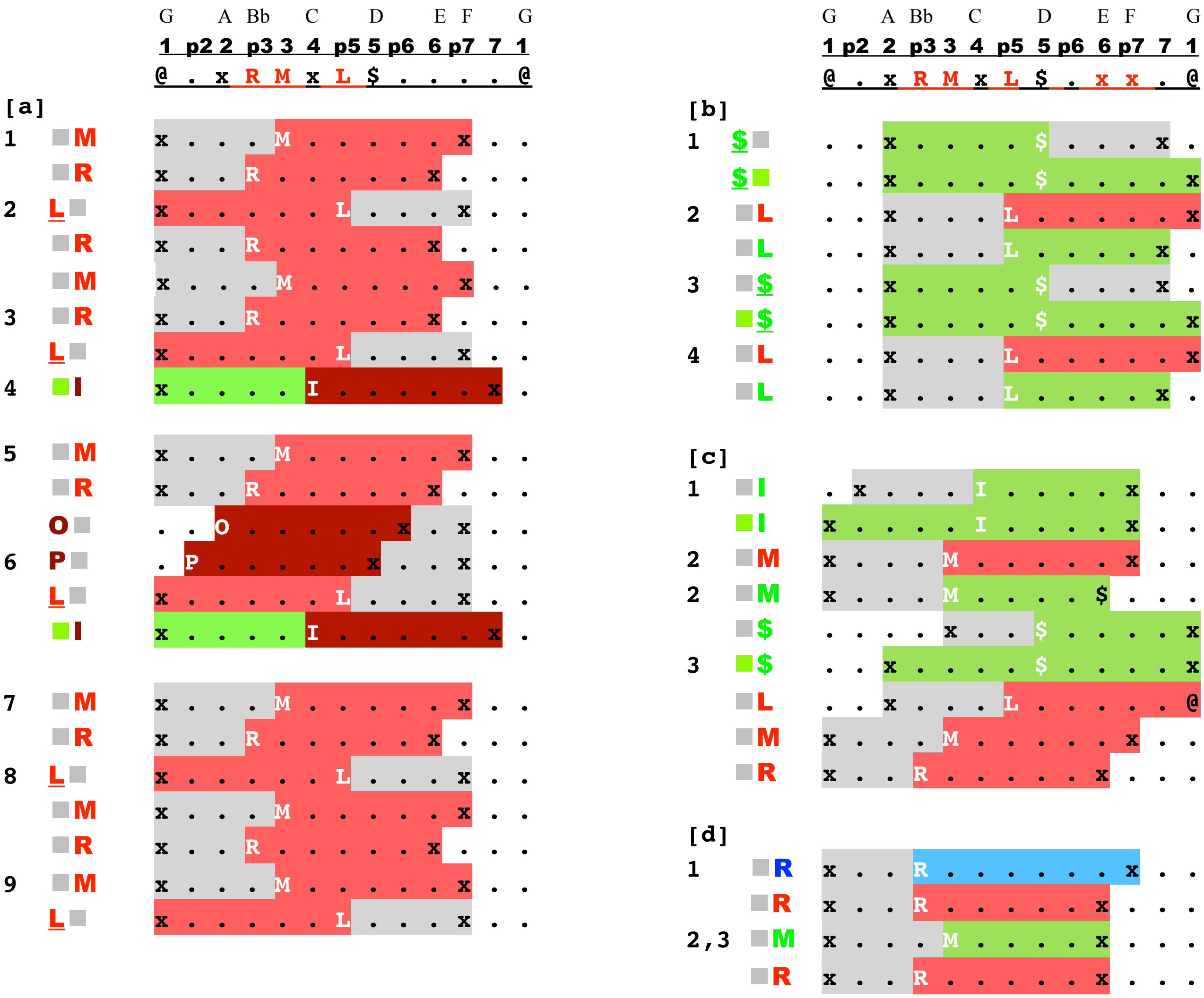
My source for this piece is sheet music by Jack Segal and Marvin Fisher from Hal-Leonard (1956), publication number HL00351105. The home tonic is G and the key signature is one flat, identifying Dorian of G as the reference classical mode. The melody line is a **//RM.L** blues, with a 4-bar section in the bridge [c] that goes to the nearby **//L** mode. The harmony shown here is a modification of the written harmony, which I found to have a confusingly irregular flow. This harmony flows smoothly to my eye and ear. Ornamental tritones in [a] (not in the blues scale) are shown in a darker shade of red.



repeat [a] followed by this ending, repeated twice



Here is what the harmony looks like on the keyboard, in Lego-like terms.



PRELUDE TO AN AFTERNOON OF A FAUN

I was motivated to investigate this hauntingly beautiful Debussy piece by things said about its creative violation of music convention in the article *Beauty in the Void,* Alex Ross, The New Yorker, Oct. 29, 2018. The violations were explained in the article in terms of unusual sequences of different keys. I wondered if there might be a way of understanding it in terms of non-classical modes. My source for the written music is the *Classical Fake Book*, 2nd Edition, Hal Leonard (2013), page 222. The piece looks innocently (and misleadingly) simple there — a melody line with a few accidentals and some mostly simple chord symbols above it for mostly triad chords. The problem with seeing it as it actually is it includes elements of both C# minor (4 sharps, the written key) and Db major (5 flats, same piano key). The melody is visibly a variation of ***//*RM.L** blues. The written harmony is mostly compatible with the blues scale but some of it is not evocative of the blues.

Here follows a summary with harmony that is more evocative of the blues, particularly in [b] and [d], including the final bar of [c] that leads into [d]. The up arrow prefix means go up an extra octave. The written time signature of 9/8 divides each bar into 3 groups of 3 eighth notes, but playing it in 4/4 time, as shown, sounds very close to the original timing and leads naturally to a swing-feel blues. The "**+**" entries in [c] are some slightly tricky chord sequences that are best skipped initially (or perhaps replaced): the written chords are a mishmash of different types that mostly boil down to split fifths, split augmented fifths, and split minor sevenths.

```
[a] ♫  | 1 p7 6 p6 5 p5 5 p7 7 | 1 p7 6 p6 5 p5 5 p7 7 |
         ^     ^        ^     ^     ^     ^           ^     ^

    ♫  | 1 2 5 p3 5 p7 — | — p7 1 6 ↑5 |
         ^     ^     ^     ^              ^   ^    ^

[b] ⚓   P■             ■M   P■              ■M
    ♫  | 1 p7 6 p6 5 p5 5 p7 7 | 1 p7 6 p6 5 p5 5 p7 7 |
         ^     ^      ^     ^     ^     ^       ^     ^

    ⚓   R■          M■        M•            R•
    ♫  | 1 2 5 p3 5 p7 — | — p7 1 6 — |
         ^     ^     ^     ^     ^       ^   ^   ^

[c] ⚓   O▼   +   O▼          +      M.L
    ♫  | — 1 2 7 — 6 3 | 5 — p6 — |
         ^     ^     ^ ^     ^  ^   ^   ^

    ⚓   +          +          +         R■
    ♫  | 6 p6 3 5 p7 1 | 6 5 3 5 p7 1 |
         ^       ^ ^       ^    ^     ^  ^      ^

[d] ⚓                                            P■         R▲
    ♫  | 5 p7 1 5 p7 1 5 p7 1 | ↓5 p7 1 5 p7 1 5 p7 7 | 1 —— |
         ^          ^        ^      ^   ^          ^          ^       ^  ^*
```

Between melody and harmony, all the notes of the chromatic scale are used. Getting a handle on the piece is helped by identifying some notes as passing notes relative to known modes. The melody is visibly in the **//DM.L** blues mode with a couple of ornamental passing notes (**p6** and **7**). The final section is in its pentatonic minor sub-mode with one of these passing notes. The parent diminished mode **//P.RM.L** may be understood as contributing note **p2** to the harmony. This is not to suggest Debussy had these modes in mind, only that having them in mind provides helpful context for understanding the piece.

	C#		D#	E		F#		G#	A		B		C#	<—written key sig.
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	I	L	$	x	x	x	x	@	
	x	x	.	x	x	.	x	x	+	x	x	+	x	//P.RM.L parent mode for harmony
[a]-[c]	x	.	x	x	x	x	x	x	+	x	x	+	x	//RM.L blues melody mode
[d]	x	.	.	x	.	x	.	x	.	.	x	+	x	//R pentatonic minor sub-mode

Harmony

A Lego-like summary of the building-block harmony is shown next.

C# D# E F# G# A B C# <—written key sig.

1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1

	skeleton	@ P O R M I L $ x x x x @	chords	
[a] 1-4	—	. . . .	n.c.	
[b] 5	P■	. P . . . . . x x	~~pII~~	
	■M	. x . . M . . . . . x . .	pVII*dim*/pII	■M
6	P■	. P . . . . . x x	~~pII~~	
	■M	. x . . M . . . . . x . .	pVII*dim*/pII	■M
7	R■	. . . R . . . . . x x	~~II*dim*~~	
	M■	. . . . M . . . . . x x	~~pVII7~~	
8	M•	. . . . M . . x . . x . .	~~IV*dim*~~	
	R•	. . . R . . x . . x . . .	n.c.	
[c] 9	O▼	. . O . . x . . . . x . . .	IV/II	O▼
	+	. . O . . . . . – . . . x .	V	O〉〉▲
	O▼	. . O . . x . . . . x . . .	IV/II	O▼
10	+	. . . R . . . . – . . . x .	VII$^+$	R〉•
	M.L	. . . . M . L . . . x . x	pVII*7b5*	M.L M〉
11	+	. . . . M . . . . – . . . x	VI	M〉〉▲
	+	. . . . . I . . . . – . . . x	pVII*6*	I〉〉▲
12	+	. . . . M . . . . – . . . x	VI	MO▲
	R■	. . . R . – . . . x x	~~IV*dim*~~	
[d] 13	—	. . . .	n.c.	
14	P■	. P . . . . . $ x	n.c.	
15	R▲	. . . R . . . $ . . x . .	pIII*6*	R▲

ROUND MIDNIGHT

The source for this evocative piece in Eb minor by Monk are *The Ultimate Jazz Fakebook*, Hal Leonard, 1988, p. 322 for the main body of the piece (shown first) and *Standards Real Book*, Sher Music, 2000, p. 369 for an optional introduction (next page). The following summary is easy to play without a downbeat line if you've ever heard the tune.

[a] ⚓ @▾ R R O I @▾ R M I R M
♫ | , 5 1 2 5 p3 5 | 1 7 1 p3 4 , | , 1 p3 5 p7 6 1 | p5 4 4 3 , |

⚓ O▾ O @▾ R ⊕ L I @▾
♫ | , 4 p6 1 p3 2 p6 | 5 1 7 p7 6 5 , 1 2 | p3 2 1 2 1 7 | 1 , 1 2 |

[b] ⚓ R L I R L I
♫ | p3 2 1 2 1 | 7 5 , 1 2 | p3 2 1 2 1 | 7 5 , 5 |

⚓ R O O L I M I L L I I
♫ | p6 p6 5 5 | 4 p3 2 , 5 | 1* 1 p7* p7 | p6 1 p7 5 4 p2 7 |

⊕ ⚓ L I R
♫ | p3 2 1 p3 1 p7 | 1 , |

The melody scale is the minor family scale with passing notes, as follows. Much of the harmony is from this scale, with a few ornamental elements that fit the flow (e.g., **L-I**, **I-M**).

	Eb		F	Gb		Ab		Bb	B	C	Db	D	Eb
	1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**
	@	P	O	R	M	I	L	$	x	x	x	x	@
//OR.I+	@	.	x	x	.	x	.	$	x	x	+	x	@
ornamental		+			+		+						

Here follows an optional, 8-bar introduction (or conclusion) that's visibly based on whole-tone intervals and tritones in a highly structured way. Each 2-bar segment repeats the previous one a whole tone down. The harmony tritones are in the reverse alphabet order **LIMROP**. The final 2-bar segment is a rhythmic pattern with no specific melody notes. The up arrows say go up an octave.

⚓ **L** **I**
♫ **| — 7 1 2 3 p5 7 p5 3 7 p5 3 | 2 — 1 5 p3 ↑4 |**
^ ^ ^ ^ ^ ^ ^ ^

⚓ **M** **R**
♫ **| — 6 p7 1 2 3 6 3 2 6 3 2 | 1 — p7 4 p2 ↑ p3 |**
^ ^ ^ ^ ^ ^ ^ ^

⚓ **O** **P**
♫ **| — 5 p6 p7 1 2 5 2 1 5 2 1 | p7 — p6 p3 7 ↑ p2 |**
^ ^ ^ ^ ^ ^ ^ ^

⚓ **M.L** **I.P**
♫ **| ——— | ——— |**
^∗ ^∗

STRAIGHT NO CHASER

Walking bass lines provide an alternative to chordal harmony in many kinds of music, for interest and variety. They are easy to represent in the melody-line notation, easily portable in this form between different pieces with the same or different home tonics, easy to create knowing mode scales of the tonics, and easy to play. These things are illustrated by the following use of a walking bass line from Monk's *Straight No Chaser* (coming up) for *Backwater Blues* (Chapter 2). The interleaving of this bass line and the melody line of *Straight No Chaser* is a bit tricky, so this introduces the bass line in a simpler way, besides making *Backwater Blues* more fun to play. The bass line is identified as harmony by an anchor symbol on the left, but is shown under the melody line where it's actually played, because showing it above would be confusing (it's not confusing for anchor lines shown above the staff because they're not represented in note symbols). There are some transient dissonances between this melody and harmony that could be avoided by some syncopation of the melody, but such dissonances are often a feature of the blues.

♫ | **5** **4** **p3** **—** **1** | **5** **4** **p3** **—** **1** | ———— | ———— |
⚓ | **1** **2** **p3** **3** | **4** **p3** **2** **p2** | **1** **3** **5** **6** | **p7** **6** **5** **3** |

♫ | **5** **4** **p3** **—** **1** | **5** **4** **p3** **—** **1** | ———— | ——— **5** **p7** **3** |
⚓ | **4** **p3** **2** **p2** | **4** **p3** **2** **p2** | **1** **3** **5** **6** | **3** **p7** **6** **2** |

♫ | **p7** **p7** ———— **5** | **1** **p7** **5** **p5** **4** **p3** **—** **1** | ———— | ———— |
⚓ | **1** **2** **p3** **3** | **4** **5** **p6** **6** | **1** **2** **p3** **3** | **1** **2** **p3** **3** |

Walking bass lines are easily created (or understood) using a mode table, as illustrated next. Bass-line notes **p2** and **p6** and **7** ornamental passing notes. To be concrete, the corresponding notes of music notation are shown on top for tonic F.

	F		G	A	Bb	B	C	Db		Eb	E		F	<==F blues			
	1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**				
	@	P	O	R	M	I	L	$	x	x	x	x	@				
//DML	x	.	x	x	x	x	x	x	.	x	x	.	x				
bar 1	x	.	x	x	x	.	.	.	.	.	.	.	.				up
bars 2, 5, 6	.	x	x	x	.	x	.	.	.	.	.	.	.				down
bar 3, 7	x	.	.	.	x	.	.	x	.	x	.	.	.				up
bar 4	.	.	.	.	x	.	.	x	.	x	x	.	.				down
bar 8	.	.	.	.	x	.	.	.	.	.	x	.					up
	.	.	.	x	.	.	.	.	.	x	.	.	.				down
bars 9-11	x	.	x	x	x	x	.	x	x	x	.	x	.	x	x	x	up
bar 12	x	.	x	x	x	.	.	.	.	.	.	.	.				up

Here follows the melody line of *Straight No Chaser* with this walking bass line.

```
♫ 5 | 1 2 p3 3 — 5 1 2 | p3 3 4 p3 —— 5 | 1 2 p3 3 — 5 1 2 | p3 3 — 5 1 2 p3 |
⚓   | 1   2   p3   3   | 4   p3   2 p2   | 1   3   5   6    | p7   6   5   3  |

♫   | — 5 1 2 p3 4 p3 | —————————— | — 5 1 2 p3 3 — 5 | 1 2 p3 3 — 5 1 2 |
⚓   | 4  p3  2  p2    | 4 p3 2 p2  | 1   3   5   6    | 3   p7   6   3   |

♫   | p3 3 4 5 p6 6 p7 7 | — 1 p2 2 p3 3 4 5 | 1 2 p3 3 —— | ———————— 5 |
⚓   | 1   2   p3   3     | 4   5   p6   6    | 1   2  p3  3 | 1  2  p3  3 |
```

The melody line is in the **//RM** sub-mode of the blues family mode with two obvious passing notes (each appears only once). Recall that the mode is a mashup of parallel pentatonic modes).

```
F     G  Ab    Bb     C     D  Eb    F      <== tonic F
1  p2 2  p3 3  4  p5  5  p6 6  p7 7  1
@  P  O  R  M  I  L   $  x  x  x  x  @
x  .  x  x  x  x  .   x  .  x  x  .  x      //RM
                         +        +         passing notes
```

The intricate interleaving of the two lines makes the whole sound like more than the sum of the parts, and requires considerable practice to get right, and also considerable effort to write down correctly. The benefit of this effort is portability of concepts and of keyboard patterns to other pieces.

BLUE MONK

This piece is so chromatic that it seems as if several different home tonics might fit. Only one fits, namely Bb of the written 2-flats key signature, established by the first notes of a double melody line consisting of two lines offset by thirds (major or minor). This choice of tonic makes clear that the appearance of all notes of the chromatic scale is a byproduct of three passing notes.

```
Bb     C      D  Eb     F      G      A  Bb     <== key signature notes
1  p2  2  p3  3  4  p5  5  p6  6  p7  7  1
@  P   O  R   M  I  L   $  x   x  x   x  @
x  .   x  x   x  x  x   x  .   x  x   .  x     //RM.L
   +                     +          +          passing notes
```

As shown next, the double melody line formed of main line with a secondary line a third (major or minor) down from it. The thirds are determined by a simple rule: switch between a major and a minor third when one note in either line moves by a whole tone. This is to avoid the “outside” notes **p2** or **p6** or **7** wherever possible; the rule is broken only when “outside” notes are unavoidable (thus they become passing notes). The positions of the resulting major thirds are marked below by by over lines. For concreteness, the secondary line is shown as a sequence of lighter note symbols, but it’s simpler to think of it as determined by construction from the rule. The opening sequence of a major third and three minor thirds establishes the melody scale.

```
♫ | 3  4  p5 5 ——   | 6  p7  7  1  ——   |  5  6  5  p5  4  p3 — 3 | — p3 — 2   —— |
    1  2  p3 3        4  5  p6  6           3  4  3  p3  2  7     1      7     p7
⚓ | 1    2    p3    3 | 4    5    p6   6 |  1     1     5     p5   | 1    2     p3   3 |

♫ | 6  p7 7  1  ——  | 1  p2  2  p3 —— |  5  6  5  p5  4 p3 — 3 | ——————  5   5   5 |
    p5 5 p6  6        6  p7  7  1         3  4  3  p3  2 7     1
⚓ | 4    5    p6   6 | p5    5     p6 6 |  1     1     5     p5   | 1  p7   6     p6   |

♫ | 5  5  —  —  —  | ↑ 5  6  5  p5  4 p3 — 3 | —  5  6  5  p5  4 | p3  3 ———— |
                     3  4  3  p3  2  7     1     3  4  3  p3  2     7   1
⚓ | 5    6  p7   7 | 1    p7    6   p6   | 5    6    p7     7 | 1    2  p3   3 |
```

Construction of melody thirds from the rule is illustrated next for bars 1-4 (**x** marks blues-scale notes, **o** marks “outside” passing notes, grey shading highlights major thirds)

```
                  Bb    C     D  Eb    F     G     A  Bb
                  1  p2 2  p3 3  4  p5 5  p6 6  p7 7  1
                  @  P  O  R  M  I  L  $  x  x  x  x  @
//DML             x  .  x  x  x  x  x  x  .  x  x  .  x
bar 1             x-----------x  .  .  .  .  .  .  .  .     1-2-p3-3
                  .  .  x--------x  .  .  .  .  .  .  .
                  .  .  .  x--------x  .  .  .  .  .  .
                  .  .  .  .  x--------x  .  .  .  .  .
bar 2             .  .  .  .  .  x-----------x  .  .  .     4-5-p6-6
                  .  .  .  .  .  .  .  x--------x  .  .
                  .  .  .  .  .  .  .  .  o--------x  .
                  .  .  .  .  .  .  .  .  .  x--------x
bar 3             .  .  .  .  x--------x  .  .  .  .  .     3-4-3-p3-2-7-1
                  .  .  .  .  .  x-----------x  .  .  .
                  .  .  .  .  x--------x  .  .  .  .  .
                  .  .  .  x--------x  .  .  .  .  .  .
                  .  .  x--------x  .  .  .  .  .
               o-----------x  .  .  .  .  .  .  .  .  .
                  x-----------x  .  .  .  .  .  .  .  .
bar 4          o-----------x  .  .  .  .  .  .  .  .  .    7-p7
            x-----------x  .  .  .  .  .  .  .  .  .  .
```

The sequence starts with a major third to avoid “outside” note **p2**. It continues with a minor third for the same reason. And so on. The three choices of an outside note (**o**) are unavoidable in order not to disrupt the flow. The result is a smoothly flowing sequence of thirds that’s easy to play and sounds good. This simplicity is obscured in the written music by the clutter of sharps, flats and naturals on different staff lines and spaces required to represent the notes relative to the written key signature.

BODY AND SOUL

This piece is strongly chromatic in a way that's particularly complex in music notation, namely multiple key signatures of different kinds (sharp vs. flat). My source for the written music is *The Ultimate Jazz Fakebook*, Hal-Leonard (1988), p67. Three successive sections have three different key signatures: $\boxed{A}$ 5 flats (Db-Ionian); $\boxed{B}$ 2 sharps (D-Ionian); $\boxed{C}$ 1 flat (D-Aeolian, but actually Dorian due to a natural in the written melody line). Ionian and Dorian of tonic D are nearby parallel modes (only 2 notes different). Ionian of Db is a distant from these (5 notes different from $\boxed{B}$). The obvious home tonic is Db because $\boxed{A}$ starts and ends the piece. The large distance between $\boxed{A}$ and $\boxed{B}$ is more than compensated by the simplicity of every note of $\boxed{B}$ being a half tone up from every note of $\boxed{A}$.

$\boxed{A}$ ⚓ O P M M R LR

♫| — 2 3 2 3 2 | 6* — , | — 5 6 5 6 5 | 2 1 7 5 , |

1_____ 2_____

⚓ O I O M IO I

♫| — 1 6 4 2 | 3 2 , | — 1 2 3 5, 5 6 p3 | 1 — | 1 — |

$\boxed{B}$ ⚓ I M

♫| p2 p3 4 p6* | p2* 4 p6* — p5 | 4* p2 p3 1 p6 , | — |

$\boxed{C}$ ⚓ M O RL M M R O P PR

♫| p2 p3 3 p6* | p3* p7 p2* p6 | 7* p6 p7* p5 | p3 2 p2 6 |

The melody scales are classical modes. The strongly chromatic harmony is not, but is consistent with the melody. When I first encountered this piece, I struggled with trying to understand how this harmony implied the melody scales and finally realized it doesn't.

		Db		Eb		F	Gb		Ab		Bb		C	Db	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
		@	P	O	R	M	I	L	$	x	x	x	x	@	
$\boxed{A}$	//I	@	.	x	.	x	x	.	$	.	x	.	x	@	Ionian of tonic **1**
$\boxed{B}$	altL@p2	x	x	.	x	.	x	x	.	x	.	x	.	x	Ionian of tonic **p2**
$\boxed{C}$	altM@p2	.	x	.	x	x	.	x	.	x	.	x	x	.	Dorian of tonic **p2**

EVERY TIME WE SAY GOODBYE

This Cole Porter piece is hauntingly lovely, with major-minor changes that go well with the words about love and loss. The home tonic is Eb and the key signature is 3 flats, identifying the Ionian mode. The melody line sequence **5-4-3-2-1-7-1** at the end confirms this as the resolution mode. Otherwise, much of the of the melody line is in the major family mode **//O.MI^{+}**. This and much of the harmony are strongly chromatic.

Although the main tonality is major, minor (or minor-ish) segments appear in both melody and harmony. Section (d) is solidly minor. The words in section (f) include the famous phrase “how strange the change from major to minor.” The change may be interpreted as between family modes **//O.MI^{+}** (grey highlighting) and **//OR.I^{+}**. The melody makes no explicit change of tonality here but could. The sound of a fourth going down a half tone in the harmony conveys the change to the ear.

(a)⚓ M I I M PM I I
♫ | 3 3 3 — | — 3 3 3 | 3 — — 3 | 4 — 2 1 7 |

(b) ⚓ M PM I I M M R A
♫ | — 5 5 5 | — 5 5 5 | 5 — — 3 4 5 | p6 — 4 3 2 |

(c) ⚓ R R O I R M M
♫ | — 1 1 1 | 1 7 — 5 | p7 — 3 4 5 | 6 —— |

(d) ⚓ R O O O L L O I
♫ | — p6 p6 p6 | p6 5 — 1 2 | p3 p3 — 1 p3 2 | ——— |

(e) repeat (a)-(b)

⌐ //O.MI^{+} ⌐//OR.I^{+}
(f) ⚓ $ RL O I M M R O
♫ | — 1 1 2 1 | 1 7 — 5 6 | p7 3 6 2 | 1 7 1 5 4 |

(g) ⚓ M M L I M RL OI
♫ | 3 3 3 — | — 2 1 7 | 1 —— | ——— |

The major to minor bars of (f) are shown next. The harmony lead-in to these bars is **RL-OI** down a half tone. The family modes follow from filling in **OI** differently. The chords shown are from these modes.

			1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
			@	.	O	R	M	I	.	$	x	+	x	x	@		
(f)	**M**	*I-7*	–	.	.	.	M	.	.	.	.	.	x	.	.	|	**//O.MI+**
	M	*IV-M7*	.	.	.	.	M	–	.	.	.	x	.	.	.	|	
	D	*IV-m7*	.	.	.	D	.	–	.	.	x	.	.	.	.	|	**//OR.I+**
	A	*pVII-7*	.	.	A	.	.	.	.	.	x	.	–	.	.	|	

ALL OF ME

I learned this version of *All of Me* (along with *No Greater Love* coming up) in Susan Muscarella's piano comping course some years ago at the then Jazz School in Berkeley (now the Jazz Institute). The objective was learning about 4-note "open" voicings of extended and altered seventh chords often used to accompany soloists. The home tonic is C and the key signature empty, nominally identifying the Ionian mode, but the melody line uses all but two notes of the chromatic scale and the harmony uses all of them. Open voicings of the harmony chords rearrange the notes and sometimes omit the roots. The standard way of explaining such voicings is by rearranged degree numbers of chord scales, in which the same notes from adjacent chords have different degree numbers relative to different roots, which are sometimes omitted. Such representations are indirect relative to the keyboard, difficult to comprehend as a whole or remember, and too cumbersome to annotate routinely on the written music. This complexity goes away when the shapes are understood in terms of building blocks.

The following summary shows the melody line with 3-note shapes to voice all chords (except double tritones). The double bar lines delimit 4-bar phrases. The melody line is from the mode **//O.MI⁺**, with two appearances of minor note **p3** as ornamental passing notes. Harmony tritones **P** and **L** are ornamental substitutes for **O** and **I**. The 3-note shapes are incomplete versions (top notes omitted) of the 4-note open voicings shown on the next two pages. The anchor suffixes identify the gaps in the open voicings as intervals (■ is a fourth, |||| is a major third, ||| is a minor third, and || is whole tone). Many of the voicings are interesting sounding and easy to play "all fourths" shapes (counting tritones as augmented fourths). Play octave shapes based on the anchors to begin with (except for double tritones) and then shrink them into the shapes shown. The latter are easy to expand into the 4-note open voicings by adding one obvious note. Rhythm is implied swing-feel 4/4 time.

⚓ **M■ I■ M■ O■ MO P■ P|||| @|||| P|||| @||||**

♫ **| 1 5 3, — | — 1 2 1 | 7 p6 3, | — || 6 5 3, | — p3 3 p7 6 | 5 4, — | —— |**

⚓ **O|| OI @■ OI @■ $|||| L|||| I|||| I■ I||||**

♫ **| 3 p3 2 , | — 3 p6 7 | 2 1, — | — || 7 p7 6, | — 6 2 7 | 6 7, | —— |**

repeat first 8 bars

⚓ **L■ L|||| O|| P■ P|||| I|||| I■ I|||| M■ P|||| $|||| I||||**

♫ **| 2 1 7 2 | — , 1 | 7 3 5 | 7 , 6 || 1 6 , 1 3 | — 3 — 1 | —, — | ——— |**

Open Voicings

Four-note "open" voicings of the written chords are shown next. The **X\Y** notation identifies non-overlapping building blocks **X** on the bottom and **Y** on top. The shapes are voicings of the chords shown on the right. The chord symbols are all satisfied serially in the flow. The four notes are difficult to play with the left hand, but easy-to-play 3-note voicings of the same chords follow from playing the core shown in the foregoing skeleton summary with a note added on top (in other words by knocking off the top note below); the top notes are easily added by the right hand under the melody line, if desired.

Chords on roots I, II and V are from the Ionian mode. The other chords (highlighted in yellow) provide visibly simple segues between the Ionian voicings, when seen in building-block terms.

Bars 1-8

```
                1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
A.MI+           @ – O – M I – $ x  + x  x  @ – O – M I – $ x  + x  x  @

1  M \ O        . . . . M . . . . x . . – . A . . . . $ . . . . .    I-6(9)
   I \ M        . . . . . I . – . . . x . . . . M . . . . x . . .    V-9(13)
2  M \ O        . . . . M . . . . x . . – . A . . . . $ . . . . .    I-6(9)
3  O \ L        . . O . – . . . x . . . . x . . . . L . . . . . .    III-9
4  M \ O        . . . . M . . . . . x . . . O . . . . . . . . . .    III-9b5

5  P \ L        . . . . . . . x . – . . . P . . – . L . . . . x .    VI-9(13)
6  P \ I(       . . . . . . . x . – . . . P . . . I . . . x . . .    VI-7b13
7  @ \ M        . . . . . . . x . . . . @ . – . M . . . . x . . .    II-m9
   P \ I(       . . . . . . . x . – . . . P . . . I . . . x . . .    VI-7b13
8  @ \ M        . . . . . . . x . . . . @ . – . M . . . . x . . .    II-m9
```

Bars 9-16

```
                1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
                @ – O – M I – $ x  + x  x  @ – O – M I – $ x  + x  x  @
9  O \ M        . . . . . . . . x . . . . . O . M . . . . x . . .    III-7
10 O \ I        . . . . . . . . x . . . . . O . . I . . . . . x .    III-7b9
11 @ \ M        . . . . . . . x . – . . @ . . . M . . . . x . . .    VI-m7
   O \ I        . . . . . . . . x . . . . . O . . I . . . . . x .    III-7b9
12 @ \ M        . . . . . . . x . – . . @ . . . M . . . . x . . .    VI-m7

13 $ \ M        . . . . . . . $ . . . . @ . – . M . . . . x . . .    II-9sus
14 L \ M        . . . . . . L . . . . . @ . – . M . . . . x . . .    II-9
15 I \ M        . . . . . I . . . . . . @ . – . M . . . . x . . .    II-m9
16 I \ M        . . . . . I . – . . . x . . . . M . . . . x . . .    V-9
   I \ R        . . . . . I . – . . . x . . . R . . . . x . . . .    V-7b9b13
```

Bar 17-24 - repeat bars 1-8

Bars 25-32

Bar	Shapes	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	Chord
		@	–	O	–	M	I	–	$	x	+	x	x	@	–	O	–	M	I	–	$	x	+	x	x	@	
25	L \ M	.	.	.	.	.	.	L	.	.	–	.	x	.	.	.	.	M	.	.	.	.	x	.	.	.	VI-6(9)
26	L \ M	.	.	.	.	.	.	L	.	.	–	.	.	@	.	.	.	M	.	.	.	.	x	.	.	.	VI-m6(9)
27	O \ M	.	.	.	.	.	.	.	$	.	.	.	.	.	.	O	.	M	.	.	.	.	x	.	.	.	III-m9
28	P \ L	.	.	.	.	.	.	.	$	.	–	.	.	.	P	.	.	.	.	L	.	.	.	.	x	.	VI-9(13)
	P \ I	.	.	.	.	.	.	.	$	.	–	.	.	.	P	.	.	.	I	.	.	.	.	x	.	.	VI-7b9b13
29	I \ M	.	.	.	.	.	I	.	.	.	.	.	.	x	.	–	.	M	.	.	.	.	x	.	.	.	II-m9
30	I \ M	.	.	.	.	.	I	.	–	.	.	.	x	.	.	.	.	M	.	.	.	.	x	.	.	.	V-13
	I \ R	.	.	.	.	.	I	.	–	.	.	.	x	.	.	.	R	.	.	.	.	x	.	.	.	.	V-b9(13)
31	M \ O	.	.	.	.	M	.	.	.	.	x	.	.	–	.	O	.	.	.	.	x	.	.	.	.	.	I-6(9)
	P \ I	.	.	.	.	.	.	.	x	.	–	.	.	.	P	.	.	.	I	.	.	.	.	x	.	.	VI-7b9b13
32	$ \ M	.	.	.	.	.	.	.	$	.	.	.	.	@	.	–	.	M	.	.	.	.	x	.	.	.	II-m9(11)
	I \ R	.	.	.	.	.	I	.	–	.	.	.	x	.	.	.	R	.	.	.	.	x	.	.	.	.	V-7b9b13

Understanding how the shapes satisfy the chord symbols requires knowing the relationship between the numeric suffixes of the chord symbols and the chromatic scale. I explain this only to make clear that the shapes satisfy the written chords, not to suggest figuring the shapes out this way. In bars 3-4, chord suffix "9" is chromatic scale note **p5** and chord suffix "b5" is chromatic scale note **p7**. The 3-note voicings in bars 3-4 don't include **p5** but it's included in bar 5, thus satisfying the bar-4 chord in the flow. The bar-4 shape jumps up a minor third in bar 5, with a wiggle that puts a fourth on top instead of a major third. The wiggle provides degree "13" of the chord. It also provides degree "9" of the bar-4 chord, thus satisfying two chord symbols at one stroke.

NO GREATER LOVE

I learned this piece in Bb major (2-flats key signature) in the same piano comping course as *All of Me*. It uses the same major family mode but is interestingly different.

♫ 7 1 2

⚓ M■ R■ O|||| P|||| I■ M■ I■ I■
♫ | 1 7 6 3 | 5 p5 4 1 | 3 | — , 3 7 p7 | 7 | — , 6 3 p3 | 2 | — , 7 1 2 |

⚓ L|||| I|||| I■ M■ R■
♫ | ——————repeat bars 1-4 —————— | 6* 3 2 | 1 2 | 1, | —— |

⚓ OI $||| IO $||| IO $|||| L||| I|||
♫ | 3 p6 7 2 | 1, | p6 7 2 4 | 3, | 3 p6 7 2 | 1 7 6 3 | 2 — | — , 7 1 2 |

⚓ | I■
♫ | ——————————repeat bars 9-11—————————— | —— |

Here's the same thing with a walking bass line provided in class (blue text).

♫ 7 1 2

♫ | 1 7 6 3, | 5 p5 4 1 | 3, | — 3 7 p7 | 7, | — 6 3 p3 | 2, | — 7 1 2 |
⚓ | 1 5 1 3 | 4 1 4 7 | p7 4 p7 4 | 6 3 6 p3 | 2 6 2 p3 | 2 6 2 p2 | 2 6 2 p6 | 5 2 5 p2 |

♫ | ——————repeat bars 1-4 —————— | 6* 3 2 | 1 2 | 1, | —— |
| 2 6 2 p2 | 2 p6 5 7 | 1 3 4 p2 | 5 7 1 p6 |

♫ | 3 p6 7 2 | 1, | p6 7 2 4 | 3, | 3 p6 7 2 | 1 7 6 3 | 2 , — | — 7 1 2 |
| 7 4 3 p6 | 6 p6 6 p7 7 4 3 p7 | 6 3 6 p7 | 7 4 3 p6 | 6 p6 6 p3 | 2 2 6 p7 | 5 7 2 7 |

♫ | ——————————repeat bars 9-11—————————— | —— |
1 5 1 1

Here follows a development of the bass line for bars 1-4. The line outlines a building block and then transitions to the next one via an internal or external note. The only passing notes outside the major family scale are **p2** and **p3** at the ends of bars.

```
            1 p2 2 p3 3  4 p5 5 p6 6 p7 7  1
            @  P O  R M  I  L $  x x  x x  @
//O.MI+     @  . x  . x  x  . @  x x  x x  @
            x  . .  . x  .  . x  . .  . .  .
            .  . .  . .  x  . .  . .  . x  x

            .  . .  . .  x  . .  . .  x .  .
            .  . .  x x  .  . .  . x  . .  .

            .  . x  x .  .  . .  . x  . .  .
            .  x x  . .  .  . .  . x  . .  .

            .  . x  . .  .  . .  x x  . .  .
            .  x x  . .  .  . x  . .  . .  .
```

ALL THE THINGS YOU ARE

I learned this beautiful piece early in my musical adventure, and found it easy to learn because the keyboard sequences are simple, but difficult to understand in music notation. The source is *The Ultimate Jazz Fakebook*, Wong, Hal Leonard (1988). The home tonic is Ab and the key signature is four flats, identifying the starting and ending melody modes as Ionian. In the following interpretation, the piece visits successive parallel and alt classical modes. The determining tritones of these modes in (a)-(b)-(c)-(d) are **I-R-L-M**. The implied Ionian tonics are **1-3-5-7** but this isn't helpful because the passages don't all resolve to them, but transition to the next passage via shared notes. Better to think in terms of the home-tonic modes because they provide everything needed to play the changes.

The skeleton melody line and associated core harmony of this interpretation are shown next for bars 1-26, where all the changes occur.

(a)//**I** ⚓ **$ I I M M**

♫ **1 | 4 1 | 7* | 7 3 7, | 6*|**

(b)**altD** ⚓ **R R**

♫ **| 6 p3 6 | p6, | — |**

(c) //**L** ⚓ **O $ L L M P PM**

♫ **| 5 | 1 5, | p5* | p5 7 p5, | 3* | 3 p5 5 p5 3**

(d)**altM** ⚓ **L M M R R**

♫ **| p3, p5 7 p5 | p5 3*, | — 5 p6 3 | p3, | — |**

⚓ **M**

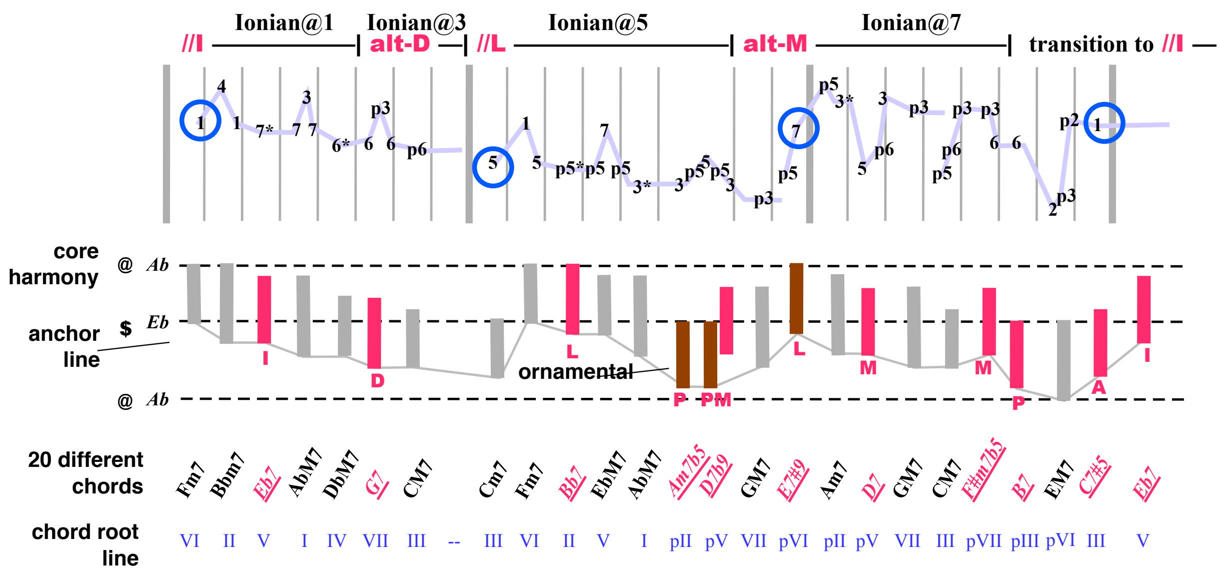
♫ **| — p5 7 p3 | p3 p2*, |**

(e)trans. ⚓ **P @ O ... I**

♫ **| — 2 p3 p2 | 1 | — |**

(f)//**I** **...**

The following overview picture is helpful in getting a handle on the piece as a whole (this shows the alphabet as the original **PADMIL**, so **AD** must be understood as **OR**).



Here follows a summary of the modes of this interpretation ("notes" in the left column means actual melody notes). The sometimes-sparse melody lines are open to different interpretations but this interpretation provides a useful handle on the piece.

		Ab		Bb		C			D Eb		F		G	Ab	
		1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	
		@	P	O	R	M	I	L	$	x	x	x	x	@	
(a)	notes	x	.	.	.	x	x	.	.	.	x	.	x	x	
	//I	x	.	x	.	x	x	.	x	.	x	.	x	x	**Ionian@1 (Ab)**
(b)	notes	.	.	.	x	.	.	.	.	x	x	.	.	.	
	altR	.	x	.	x	x	.	x	.	x	x	.	x	.	**Ionian@3 (C)**
(c)	notes	x	.	.	.	x	.	x	x	.	.	.	x	x	
	//L	x	.	x	.	x	.	x	x	.	x	.	x	x	**Ionian@5 (Eb)**
(d)	notes	.	x	.	x	x	.	x	.	x	.	x	x	.	
	altM	.	x	.	x	x	.	x	.	x	.	x	x	.	**Ionian@7 (G)**
(e)	notes	x	x	x	x	.	.	.	.	.	.	.	.	x	**sparse, ambiguous**
(f)	**//I**	x	.	x	.	x	x	.	x	.	x	.	x	x	**Ionian@1 (Ab)**

The (d)-(e)-(f) harmony transition shown next is "interesting." My piano teacher at the time suggested I just memorize it. And so I did, but I kept worrying away at understanding it in more fundamental terms. This shows that it transitions at the end by sharing notes between modes, resulting in an unusual sequence of chord symbols.

		Ab		Bb		C		D	Eb		F	Gb		Ab	
		1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	
		@	P	O	R	M	I	L	$	x	x	x	x	@	
(d)	|||**M**	.	x	.	.	M	.	.	.	.	.	x	.	.	**pVII*m7b5***
(e)	**P**■	.	P	.	–	.	.	.	x	.	.	.	.	x	**pIII*7***
	@■	@	.	.	.	.	.	.	x	–	.	.	.	x	**pVI*M7***
	O||||	.	.	O	.	–	.	.	.	x	.	.	.	x	**III*7#5***
(f)	|||**I**	.	.	.	.	.	I	.	–	.	.	.	x	.	**V*7***

CHELSEA BRIDGE

My source for this hauntingly beautiful Strayhorn piece is *The Ultimate Jazz Fakebook*, Wong, Hal Leonard (1988). There are two written key signatures but only one home tonic on the piano, the black key immediately above middle C. The piece moves from Ionian major of this tonic (Db major, 5 flats) to Aeolian minor of the same tonic (C# minor, 4 sharps), and then back to Ionian major. This is complex to begin with and the complexity is multiplied by staying with the 4 sharps key signature to return to Ionian major. Between these parallel classical modes of the same tonic are chromatic passages that multiply the notational complexity once more. The result is a confusing muddle of many more than twelve note symbols relative to the two written key signatures, with tricky timing in some places. The piece is musically sophisticated by any measure, but the notational complexity is out of proportion to the sophistication.

I first learned this piece by rote with great difficulty from the written music, but thought that anything that sounds this good must have simple musical logic behind it. It does, as shown below and on the next page. Tritones identify scales; fifos implied by them are mostly omitted. Digging this kind of thing out of written music is a struggle, but doing it sharpens the ability to think in terms of keyboard intervals instead of the notes of key signatures. It may look complex at first glance, but it's valid for any home tonic, and shines a light on commonly used patterns, which are obscured in music notation by showing the same piano key in different places by sharps or flats or naturals in spaces or lines of a musical staff.

(a) ♫ | — 6 7 1 2 3 4 5 | ... //I
^ ^ ^ ^

(b) @〉 L〉 @〉 L〉 ... play aug. fifths
⚓ L.O M.L L.O M.L P ... major modes
♫ ||: p6 ——, 6 p5 | ——, 5 p6 | — , 6 p5 — 5 p2 | —, | ... major with ⚓
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

(c) 1______ 2______
⚓ I I M M R O
♫ | 3 1 —— | 3 5 —— | 3 1 —— , :|| ——, 5 p6 | ... 1: maj. triad, 2: segue
^ ^^^ ^ ^^^ ^ ^^^ ^^^ ^

(d) ⚓ O A
♫ | p7* p7 p7* | p7 1 p3 5 p7 2, — p3 | 7 p6 p3 1 p7 5 —, 2 | ... //A
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

(e) ⚓ P I
♫ | p2 — p3 4 | 5 — p6 p3 p2 7 | p7 p2 ——, 7 p7 | ... minor mode alt-IP
^ ^ ^^ ^ ^ ^ ^ ^ ^ ^^^ ^

(f) ♫ 6 p5 6 p2 p5 p2 ... segue
^ ^ ^ ^

(g) ⚓ M R O P ... sets up for a repeat
♫ | p5, 6 7 1 2 3 4 5 | ... //I
^ ^ ^ ^

Here are the melody modes and transitions between them. The main sequence is **//I-//O-//I**. The in-between modes and segues are related to them in simple ways. The changes are musically interesting but easy to understand and play as shown here, once you “get it.” I can imagine that virtuoso pianists are able to read the written music and understand these changes instinctively in whatever terms they use to conceptualize music, but this leaves everyone else stuck with learning the piece laboriously by rote, without any real understanding. Knowing the changes below enables even inexpert pianists to approach the piece with understanding.

```
             1 p2 2 p3 3  4 p5 5 p6 6 p7 7  1
             @  P  O  R  M  I  L  $  x  x  x  x  @
(a)          x  .  x  .  x  x  .  x  .  x  .  x  x   //I     Ionian
(b)          x  .  x  .  x  .  x  .  x  x  .  x  x   //LO    major mode
             @  .  .  .  .  .  .  .  x  .  .  .  .           imply by aug. fifth @〉
             x  .  x  .  x  .  x  x  .  x  x  .  x   //ML    major  mode
       x  .  .  .  .  .  .  .  L  .  .  .  .  .  .           imply by aug. fifth L〉
(c)          x  .  .  .  x  .  .  x  .  .  .  .  x   //I     major triad
------------------ minor of home tonic ------------------
             @  .  .  .  .  .  .  .  x  .  .  .  x           segue to minor via aug. fifth @〉
(d)          x  .  x  x  .  x  .  x  x  .  x  .  x   //A     Aeolian
(e)          .  x  .  x  .  x  .  x  x  .  x  x  .   alt-IP  Phrygian flat one (minor)
(f)          .  x  .  .  .  .  x  .  x  .  .  .  .           ambiguous but suggests Locrian next
             x  x  .  x  .  x  x  .  x  .  x  .  x   alt-L   Locrian goes down 1/2 tone to Ionian
------------------ major of home tonic ------------------
(g)          x  .  x  .  x  x  .  x  .  x  .  x  x   //I     Ionian
```

LUSH LIFE

This beautiful Strayhorn piece is melodically and harmonically rich, and challenging to play from the written music because there are often two or more chords per bar, many of them chromatic relative to the written key signature of five flats (major tonic Db). The piece is so chromatic that there is more than one way of understanding it. It can be seen as daisy-chained, short segments of successive parallel classical modes, but this quickly bogs down in complexity. The view of it here is in terms of two non-classical parallel modes of the home tonic for both melody and harmony: one is the 10-note **//ORMI** minor-major mode in [A] and [C]; the other is the tonic-less **//IP** mode (Ionian#*1*) in [B].

[A] ⚓ @ O M O M O M I O R

♫ 5 ||: 1* 2* | 3* 2* | 3* 2* | 3* 4* 5* p6*|

1______ 2______

⚓ I I O I M M R

♫ | p7*— p6 p7 p6 | 5* p7 p3*| 2*, — 5 :|| 2*, — 7 |

[B] ⚓ I P O P RL R P R P RL

♫ | 7* p2* | 3* 5* | 7 p2 6 7*| 7 — 7 | 7* p2* | 3* 5* | 7 1 6 7*

⚓ I M MP RL OI

♫ | 6 7 5 6 7 3 | — | — , 5 4 3 | 2 | — , 2* 3 1 | 5 — , | — |

[C](a) ⚓ M‹ I M‹ I R O M L I

♫ | 5 p7 p3 p6 | 5 7 p3 p7 | 6 5 1 3 4 5 | p7 — p6 |

(b) ⚓ M R P O

♫ | repeat bars 1-2 of (a) | 6 5 1 3 5 p6 | 7 — 1 |

(c) ⚓ O L RL M O P L I

♫ | 2 3 4* — p3 | 2 3 4* p3 | p6 p7 7* — p7 | p6 p7 7 6|

(d) ⚓ RI OI P

♫ | repeat bars again | 6 5 1 3 4 5 | 6 — 3 |

(e) ⚓ O L I RL P

♫ | 5 4 5* 4 | 3 2 3 7 | 2 1 2 — 2 1 | 1 p7 6 — 3 |

(f) ⚓ O L I O R M M O R M

♫ | 5 4 5* 4 | 3* 2 3 | p7 7 1 p2 | — 2 p3 3 |

These modes lead naturally to short, easy-to-remember segments in classical and other modes that follow from the flow. For example, **alt-IP** morphs into **//I** halfway through [B] by altering one note. From time to time, the harmony of the different sections substitutes **P** and **L** for **O** and **I**, but thinking of these as ornamental relative to the **//ORMI** keeps things conceptually simple.

Harmony fifos are mostly omitted for simplicity, except for characteristic sequences of them in [A] and the ending bars of [C].

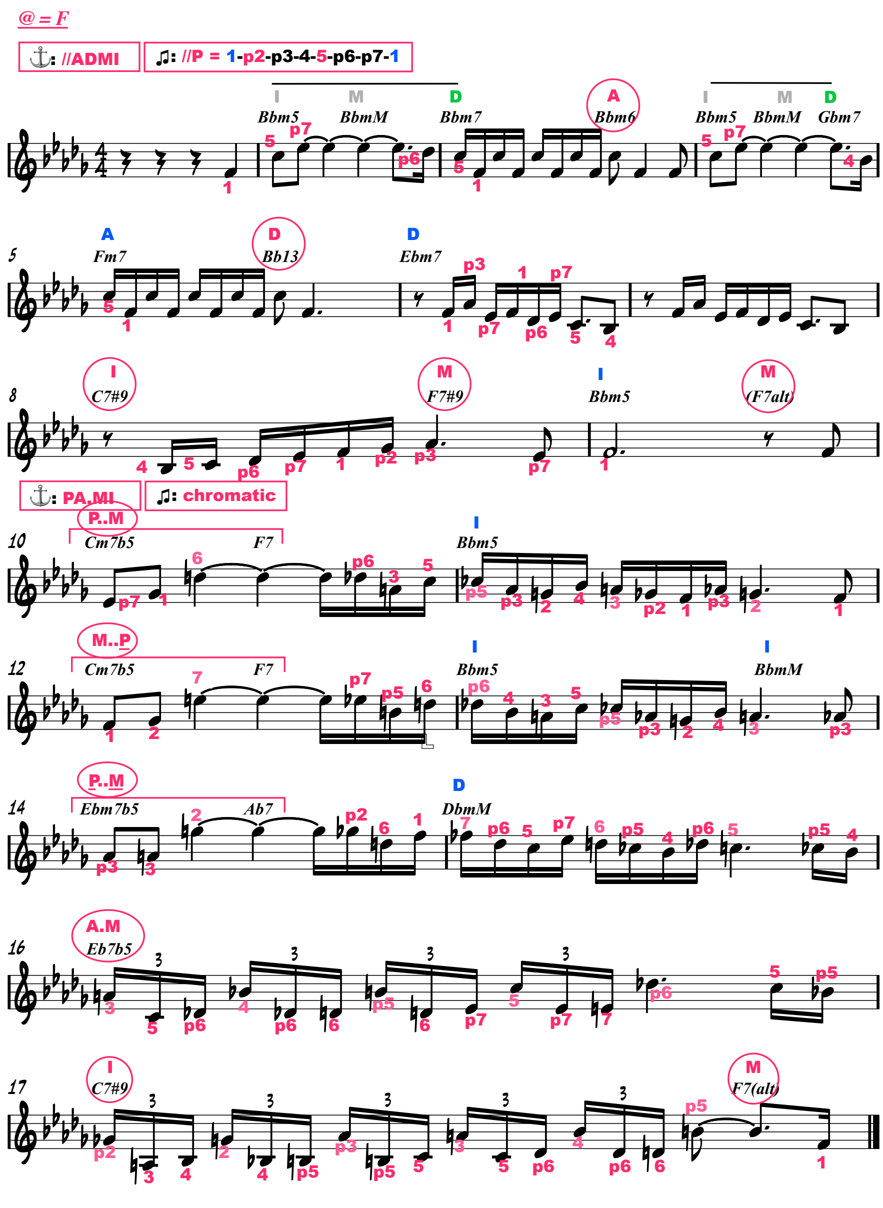
The double tritones **PM**, **OI** and **RL** that appear in many places in the harmony are diminished seventh chords, commonly used ornamentally in any context in which they sound good. The double tritones have circular symmetry (all intervals are minor thirds), so only three of them with different notes exist. They can be played as four notes but they can also be voiced with three notes (a tritone with a minor third on top, or the opposite) or even with two notes (outer notes a major sixth apart), when the context implies the other note(s). A sequence of two or three of them, often used as an ornamental transition between modes, can be played as as sequence of major sixths anchored by any three of six tritone anchors (e.g., **P-O-R** going up and **L-I-M** going down, to name just two possibilities — others require inversions of individual tritones).

The chromatic melody-line run in the final two bars is a signature of the piece.

THE PEACOCKS

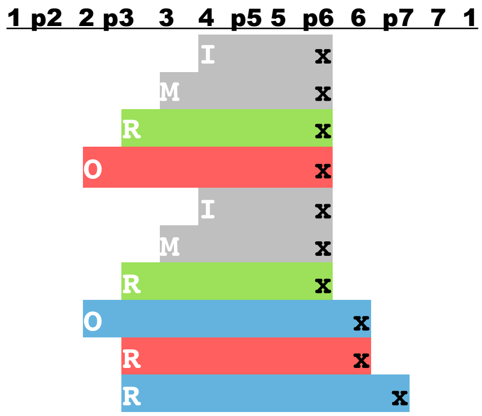
This hauntingly beautiful piece by Jimmy Rowles wraps up the chapter with an example in annotated music notation (in handwritten annotations, circling tritone anchors, or their chords of origin, or both is helpful). This is a Sibelius score created from a borrowed fake book to which I no longer have a reference. The annotations use the original **PADMIL** alphabet, requiring **AD** to be understood as **OR**. The piece sounds so "right" as written that jazz improvisations rarely stray far from it.

The home tonic is determined to be F by the final notes of bars 9 and 17. In bars 1-9, the combination of the 5 flats key signature, the home tonic and the lack of accidentals in the melody line identifies the melody scale as Phrygian of the home tonic (mode signature **//P**). The melody line in bar 8 runs up through all the notes of this scale starting a fourth up (fifth down) from the tonic. The contrasting harmony is chromatic. The over-lines in bars 2 and 4 indicate held treble notes.



The ups and downs of the melody line are directly visible in the notes on a staff but the drawback is this commits to a particular tonic and key signature, and gives little direct sense of context.

The core harmony in opening bars is visibly from the **//ORMI** scale (which is minor-major relative to the home tonic).



The melody of the second section consists mainly of individually simple sequences from the full chromatic scale that are prompted by the harmony. In bars 11-15, the sequences are **↘3h↘h↗3h** (net **↘h**). In bars 16-17, the sequences are **↘9h↗h** (net **↘8h).**

CHAPTER 5: OBSERVATIONS & CONCLUSIONS

Music notation is here to stay and must be lived with, but this this doesn't preclude alternate views of piano music from a different perspective. I looked for an alternate view of harmony and found one based on intervals.

The central role of tritones in PKP tends to seem inappropriate to people savvy in music notation, for several reasons. In general, it goes against received musical wisdom. More specifically, tritones cannot even be written down in music notation until a key signature is established, so imagining them as identifiers of scales is difficult. Anything involving multiple tritones is complex in music notation because it implicitly brings in other key signatures — the more tritones, the more complexity. The very concept of fifos is unconventional and even more so is the concept that they can be treated as morphed tritones, understood from context. The payoff is insight into deep structure that is difficult to see in music notation. Appreciating these things requires stepping outside the box of music notation, at least momentarily.

Thinking in notes and thinking in intervals *is* different in kind. Many experts who have learned the hard way to think in notes apparently find thinking in intervals too alien to contemplate. Comments from them have run the gamut from "obviously wrong" to "wrong headed" to "naively simplistic" to "overwhelmingly complex." One expert said, dismissively, I had "found a tritone hammer and saw everything as a nail." The book *Modalogy*, devotes 50 or so complex pages to parallel modes without ever mentioning the possibility that tritones might simplify things.

Because I started out seeing intervals and notes as dual views of the same thing, I came to find it natural to switch back and forth. I have made my best effort in this document to convey the simplicity of this. I believe, based on my personal experience as an adult beginner, that any beginner could easily learn to think this way.

I know from personal experience that PKP helps with learning and remembering new pieces, knowing while playing where to go next from where you are (and how you got there), recovering from getting lost, experimenting with harmonic and melodic variations, and improvising. It turns the conventional relationship between practicing and understanding on its head: instead of practicing being required to develop understanding, understanding guides practicing.

The jumpy chord root lines in many of the examples demonstrate that referring chords to constantly moving roots creates misleading complexity. This complexity is both conceptual (the underlying, smoothly flowing core harmony is obscured) and actual (playing the jumpy harmony is technically difficult because all the fingers must be lifted and moved by large intervals). It's easier to learn the core harmony and introduce the jumps later, if desired, via inversions, which are always easy on the keyboard, given an anchor line.

GENERAL BENEFITS

PKP annotations above the staff tell you many things. Combined with context provided by the melody line, they tell you where to go next from where you are and how you got there. They tell you what notes will sound right or not right at any point by identifying tonic scales in play in a very immediate way. They tell you about transitions between major and minor tonality and between different tonics. The provide a basis for enrichment and improvisation.

Scale, modes and chords are seen as part of a continuum expressed in the same terms. This seems to me to be a very powerful benefit, compared to seeing everything beyond classical modes as special cases identified by accidentals (which includes chromatic chords with suffixes that imply accidentals). The representations of scales and chords in terms of tritone clusters are unfamiliar to expert pianists but the interval stacks that they imply on the keyboard are completely familiar.

With PKP, playing music is guided by note-based symbology on the music page (one dual view) plus PKP annotations above the staff (the other dual view) that suggest core harmony and make changing tonic scales and tonics directly visible to the eye in terms of changing alphabet words.

A mode hierarchy of less than a page covers much ground. The mode signatures provide a novel, high-level, conceptual view of tonic scales that's easier to hold in the mind's eye than the very much larger number of spelled out tonic scales in music notation. The modes cover 12x39=468 scales of 12 different tonics in music notation (more than is covered by scale dictionaries such as *The Source*). Words of 1-4 letters from the 6-letter alphabet identify, by tritone content, modes with 7 or more notes, 1-4 tritones, and no intervals larger than a minor third. The count of 39 modes includes 11 single modes covered by single words and 4x7=28 parallel modes covered by transpositions of 1-2 letter master words. A selected home tonic anchors all of this to the keyboard.

The words are analogous to the words of biological DNA in the sense that they identify deep structure without spelling out the details. Words of biological DNA are "expressed" as proteins, the building blocks of life. **PORMIL** words are "expressed" as building blocks of scales and harmony. Biological DNA is "extracted" from biological samples and interpreted by sophisticated machines called "sequencers." **PORMIL** scales and building blocks are "extracted" and "sequenced" from musical lines by sophisticated machines called human eyes. Biological DNA is "inherited" from parents. **PORMIL** words are "inherited" from general knowledge about them encoded in the hierarchy.

Symmetry breaking in the scale hierarchy and symmetry breaking in core harmony are two sides of the same coin. In the hierarchy, it yields scales with fewer tritones. In harmony, it releases the tension of dissonance to produce consonance. Seeing the simplicity of this requires forming mental images of it relative to the schematic tonic octave that are independent of specific assignments of the octave to the keyboard.

Understanding harmony is possible independently of practicing. Keyboard symmetries centering around tritones enable high-level representations of harmony that are simple in their own terms and deep in harmonic meaning in any terms.

Music is freed from its key-signature straightjacket. Harmony scales are understood at a glance from alphabet words aggregated by eye, instead of having to be figured out or remembered from key signatures, accidentals and chromatic chord symbols. Tonic changes are no more difficult than any other changes.

Anchor lines that define harmonic cores replace chord root lines as the fundamental musical lines of harmony. Chord roots are visibly secondary elements in the flow of the music because inversions move them into the body of the chord, where they become no more than another chord note that may be omitted if implied by context.

Sight reading anchor lines provides deep context. Anchor lines tell you where to go next from where you are and how you got there. They tell you what notes will sound right or not by identifying tonic scales in play. They tell you about transitions between major and minor tonality and between different tonics.

Multiple explicit or implicit key signatures become a non-issue. This is true whether the key signatures imply tonic changes or only scale changes for the same tonic. Tonic changes amount to no more than moving (conceptually) a tonic pointer within the home octave and reinterpreting the alphabet letters relative to it, without changing any notation.

Chord symbols become a non-issue. Chord complexities that result from banging square pegs (chord symbols) into round holes (places in scales where they don't quite fit) are misleading. Chords described by chord symbols are, on the keyboard, almost universally composed of combinations of PKP's two kinds of building blocks, of which only tritones are always core. A melody line plus an anchor line above the staff imply a voicing of an unidentified chord progression. Specific chords are identified by assigning roots.

Relating the notation to the keyboard is simple. Different home octaves look very different on the keyboard because of different mixes of black and white piano keys, but the difference is manageable for two reasons: mapping the notation to the keyboard boils down to assigning a 6-letter alphabet to 6 adjacent piano keys; and the C octave provides a mental reminder of the meaning.

Learning blues prepares you for anything music notation can throw at you. Blues is an example of "folk music" that evolved independently of music notation and therefore tends to be regarded as naive when measured against its depth and complexity. This condescending view is unwarranted. Blues is harmonically sophisticated in a highly organized way that makes it, to my mind, a better starting point than classical modes of key signatures for understanding many forms of music.

Sharps and flats are not needed. Building blocks are the same number of half tones no matter how they are notated. This enables PKP to dispense with sharps and flats without any loss of musical accuracy. Expert pianists tend to think they are still needed to identify context because they have learned to use them for that, but note positions relative to tonics are sufficient.

The simple flow of harmony in harmonic cores, in which building blocks slide or morph into other building blocks, is universal. Nothing constrains harmony to be played this way but the flow is so natural and easy to play that much is to be gained by learning pieces this way and then transitioning to other playing styles if desired.

Tritone-intensive harmonic cores of much music provide so much harmonic variety that voicing them requires only adding depth. Depth is easily added by doubling the treble line of the harmonic core an octave down, or the bass line an octave up, and then making adjustments to move points on the line closer to the core, if desired.

No more piano wizardry is required to have fun playing music than the ability to sight-read melody lines in music notation. Anyone with eyes to see intervals on the keyboard can play harmonic cores from anchor lines annotated above the staff, and remember them.

The simple way harmony is represented provides great freedom in choosing how to play it. Playing styles may range between the extremes of smoothly flowing harmony within the octave of the home tonic of piece to jumpy harmony in which all harmony notes go up from a chord root line. Improvisation follows naturally and is fun, even if not expertly done.

The simplification provided by the alphabet is different in kind from simplifying chord symbols. Any sophistication in the harmony is in the tonic scales of origin of the chords.

Mode signatures provide an above-the-staff markup notation for the concept of "modal jazz" which is otherwise a concept without a notation.

PKP annotations above the staff are not always necessary. With experience, straightforward chord progressions may be sight-read in PKP terms.

SOME REFERENCES

1. Barta, *The Source: The Dictionary of Contemporary and Traditional Scales*, Hal Leonard (1995), for helping me to be sure I was not missing important scales.
2. Mehegan, *Jazz Improvisation 1: Tonal and Rhythmic Principles*, Watson-Guptil (1984), for Roman-numeral chord notation, and for teaching me (unintentionally) that it is not a solution for complex chromatic chord progressions, but a problem if pushed beyond its basic function of specifying chord root lines.
3. Eskelin, *Lies My Music Teacher Told Me*, Stage Three Publishing (1994) for insight into the nature of scales and musical "perfection," and for encouraging me to think outside the box.
4. Dmitri Tymoczko, *A Geometry of Music* (2011) for stimulating discussions of how to think about music from different angles.
5. Mark Levine, *The Jazz Theory Book*, Sher Music Co. (1995) for providing examples of well known jazz scales and harmonic forms in conventional notation, against which to verify PKP coverage.
6. George Russell, *The Lydian Chromatic Concept of Tonal Organization*, http://www.georgerussell.com/lc.html, for making me aware that PKP covers the concept, because nothing is changed by replacing the Ionian mode by the Lydian mode as the default reference major mode for any piece of music.
7. Edward Frenkel, *Love and Math: The Heart of Hidden Reality*, Perseus (2013) (on Kindle), for many insights into the usefulness of symmetry.
8. Jeff Brent with Schell Barkley, *Modalogy — Scales, Modes & Chords: the Primordial Building Blocks of Music,* Hal Leonard (2011), for the most comprehensive treatment I have found of this subject. The result is painstakingly accurate but overwhelmingly complex because it sticks to representations based on sharps and flats that follow from the misalignment of pitches of notes of overlapping octaves.
9. Ross W. Duffin, *How Equal Temperament Tuning Ruined Harmony (and Why You Should Care)*, W.W. Norton (2007), for an understanding of the piano's deviation from musical perfection.
10. Stephon Alexandar, *The Jazz of Physics: The Secret Link Between Music and The Structure of the Universe*, Basic Books (2016). This amazing book resonates strongly with my own ideas. The author is a jazz musician and physicist who speaks of doing physics as informing the playing of jazz and playing jazz as informing the doing of physics. Both require rising above formalisms to form conceptual representations, with symmetries highlighted as particularly important.

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My piano teacher in San Francisco for several years, Ken Fishler, provided inspiration and how-to information on chord voicings, while patiently tolerating and responding to my question-everything approach. My first piano teacher in Ottawa, Canada, Sally Robinson, started me off right as an adult beginner by helping me to learn favorite harmonically sophisticated pieces by following her fingers on the keyboard without understanding anything about what I was doing except that it sounded right — being able to play these pieces, even if clumsily and by rote, enabled understanding to seep in gradually. I think that without this particular way of starting out — fingers on the keyboard first, written music later — I would not have started thinking about keyboard harmony in the way I did. It forced to my attention the large gap between simplicity on the keyboard and complexity of the full notation that represents it.

I wore out the patience of many music professionals by bombarding them with unsolicited email requests for comments on my ideas. I would like to thank four in particular, who politely responded to numerous emails in spite of being uncomfortable with my ideas: Harry Likas, Dmitri Tymoczko, Jeff Brent and Daniel Glover. Their criticisms helped me change my explanations without changing my mind.

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My wife Sheila's accurate musical ear helps me know what does and does not sound good on the piano, in addition to making my life generally interesting. My grandsons Joshua and Ethan Feiber provided encouragement and comments; Joshua set up the website www.pianotheoryman.com as birthday gift; Ethan, who learned very young to play the piano impressively well by ear, has experimented with the notation and found it helpful for approaching written music.

SOME COMMENTS FROM READERS

The following comments provide a kind of history of the development of PKP: the dates on the left identify when the commenters read different drafts of this material; the material has evolved considerably since then. The unconventionality of putting tritones on center stage has tended to get in the way of expert musicians accepting the ideas at all, let alone seeing them as simple, which has not been helped by the fact that it took me a long time to find the simple way of explaining the ideas that appears in this document. I continue to think the ideas are important for learning the piano in a less restrictive manner than is conventional but have not yet been able to find an audience. At the very least, the more recent comments show that the PKP method is more than just a fantasy of an over-enthusiastic amateur.

(2016) Taylor Eigsti more recently than below. "… a fascinating and in-depth look at various ways that keyboard shapes can lead to a whole new way to look at notation and the piano."

(2011) Paul Steinbeck. Assistant Professor of Music Theory; Washington University, St. Louis

"The hook ... , at least in my opinion, is that it's possible to attain a deep understanding of chords (and their constituent intervals) without recourse to Western notation. This has direct consequences for physical patterning, fingerings, etc. Essentially, your method combines the utility of a play-by-ear approach with the depth of a mathematically-informed theory of music."

(2009) Robert Rawlins. University Music Department Chair (Rowan University); jazz musician; teacher; author of several books on jazz

"I became aware of Raymond Buhr's novel method for analyzing and voicing chromatic chord progressions in 2008 through a draft of a paper he wrote on the subject. I have kept up to date on developments of the method and we have had many email exchanges discussing issues of interpretation and application. I am a member of his intended target audience—a jazz musician who is not a pianist who needs to work out harmonic patterns on the piano from time to time. I am also a music teacher who has actually tried out aspects of his method on students. I can vouch from personal experience for his method's helpfulness in dealing with complex chromatic chord progressions."

(2009) Susan Brand. Board Chair, The Jazz School in Berkeley; amateur pianist

"When Raymond Buhr consulted me about his theory of chromatic chord progressions, I was immediately struck by his ability to analyze and attempt to simplify this complex subject. Mr. Buhr brings a unique perspective and a great deal of enthusiasm, depth of understanding and originality of viewpoint to the subject. Over the years I have watched the continuous work that he has put into editing and rethinking his work. He has had ongoing consultations with many knowledgeable musicians/teachers/editors and all have contributed to the development of the method described in this book. His ideas offer a way of understanding musical theory that will add greatly to the field and will be extremely helpful to musicians and music educators."

(2008) Taylor Eigsti. Jazz pianist, composer, teacher, former Artist in Residence at The Jazz School in Berkeley

"Through the brilliant lens of an engineer, Raymond Buhr has laid out an analysis of harmony that is a unique and complex look at the right-brain from the left-brain's perspective."

APPENDIX A: UNCONVENTIONAL ELEMENTS

TERMINOLOGY & NOTATION

- **anchor:** identifies a building block by the position of its bottom end relative to the home tonic
- **anchor set:** set of tritone and fifo anchors that define a scale by construction
- **anchor line:** anchor sequence written above the staff
- **alphabet: PORMIL** identifies anchors by the first letters of the names of classical modes (internal letters in the case of **O** and **R**)
- **building block:** tritones or fifos (fifths or fourths) anchored at alphabet positions (size distinctions determined by color coding anchors: red for tritones, blue for fifths, green for fourths).
- **chord shapes:**
    - anchor centered-octave shapes are “starter” chords, optionally id’d by anchor prefix or suffix ■
    - shapes formed of combinations of building blocks represent chords with 4 or more notes
    - triads are split building blocks identified by anchor superscripts ▼(minor), ▲(major), ● (dim)
    - chord roots are add-ons that determine chord symbols
- **chromatic scale of the home octave: 1-p2-2-p3-3-4-p5-5-p6-6-p7-7-1**
- **context:** provided by mode signatures for melody and harmony plus flow of both
- **core:** set of octave shapes morphed asymmetrically by a half tone from a tritone shape
- **family:** a set of sub-scales of a family scale defined by a single mode signature
- **fifo:** fifth or fourth that are opposite inversions (add up to an octave)
- **flow:** formed by morphs and slides of building blocks
- **frame:** defined by the tonic **@** and pitch center **$** of a tonic octave
- **mode signature:** word identifying a tritone cluster that implies a scale
- **pattern:** organized arrangement of intervals on the keyboard or over time
- **pitch center:** note identified by a fifth/fourth octave split, symbolized by **$**
- **morph:** change in the size of a building block by a half tone at one or both ends
- **outside:** not in a given tonic scale, as distinct from “chromatic” meaning not in a key-signature scale
- **shape:** combination of building blocks
- **slide:** size-preserving movement of a building block
    - **wiggly slide:** combined morph and slide
- **phlat:** prefix **p** identifying chromatic-scale notes in the whole tone gaps of the major scale of a tonic
- **tonic pointer:** suffix of form **@t** attached to an anchor symbol to indicate a secondary tonic
- **word:** set of alphabet letters with optional dots indicating skipped letters

APPENDIX B: ABOUT SCALES

KEY-SIGNATURE SCALES

The following summary of the standard interpretation of the major and natural minor tonic scales of key signatures (Ionian and Aeolian modes) is a helpful reference. It shows the sharped notes of sharp scales in red and the flatted notes of flat scales in blue. Although there are only five black piano keys, scales with six flats or sharps exist because of the scale-spelling rule that the same letter note cannot appear on both sides of a half-tone interval. For example, note B is C*b* in a 6-flats scale.

Major (Ionian) and relative minor (Aeolian) scales are shown on the same line because they have the same key signature. Parallel minor scales (diagonal lines) have the same tonic, which does not necessarily mean the same note symbol because the same piano key may be represented by different note symbols (e.g., the parallel D*b* major and C# sharp minor scales, which have the same black-key tonic on the piano, have different note symbols for it).

Ionian tonics going down by fifths

Ionian	rel. Aeolian	key sig.	Ionian scale
C	A	empty	C-D-E-F-G-A-B-C
F	D	1 *b*	F-G-A-B*b*-C-D-E-F
B*b*	G	2 *b*	B*b*-C-D-E*b*-F-G-A-B*b*
E*b*	C	3 *b*	E*b*-F-G-A*b*-B*b*-C-D-E*b*
A*b*	F	4 *b*	A*b*-B*b*-C-D*b*-E*b*-F-G-A*b*
D*b*	B*b*	5 *b*	D*b*-E*b*-F-G*b*-A*b*-B*b*-C-D*b*
G*b*	E*b*	6 *b*	G*b*-A*b*-B*b*-C*b*-D*b*-E*b*-F-G*b*
F#	D#	6 #	F#-G#-A#-B-C#-D#-E#-F#
B	G#	5 #	B-C#-D#-E-F#-G#-A#-B
E	C#	4 #	E-F#-G#-A-B-C#-D#-E
A	F#	3 #	A-B-C#-D-E-F#-G#-A
D	B	2 #	D-E-F#-G-A-B-C#-D
G	E	1 #	G-A-B-C-D-E-F#-G
C	A	empty	C-D-E-F-G-A-B-C

switch from flat to sharp keys

parallel (same tonic) Ionian & Aeolian modes
- - - - same tonic symbols
—— different tonic symbols

Avoiding multiple written key signatures by using accidentals to identify implicit key changes replaces one kind of complexity by another because accidentals have many more uses than this (e.g., ornamental passing notes, or identifying scales that originate in no key signature). Sorting out the possibilities requires considerable head-scratching at a very low conceptual level.

Key-signature-based music notation has stood the test of time and is here to stay because of the huge legacy of music written in it. But the piano has also stood the test of time without needing adjustable piano keys to play the nominally slightly different pitches identified for each piano key by music notation.

CROSS REFERENCES

Cross-referencing music notation and PKP notation requires the following table. This is the simplest case. More generally, naturals may enter the note-symbol picture to cancel sharps or flats of key signatures, and white piano keys may be represented by sharps or flats (B=Cb, C=B#, F=E#, E=Fb) to satisfy the scale-spelling rule that the same letter note must not appear twice. Experts develop rules of thumb about sharps and flats as indicators of what's going on, and see PKP as discarding these clues — not so, the clues are present in PKP in a different way.

1	p2	2	p3	3	4	p5	5	p6	6	p7	7
@	P	O	R	M	I	L	$	x	x	x	x
C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B
C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B	C
D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B	C	C#/Db
D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B	C	C#/Db	D
E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B	C	C#/Db	D	D#/Eb
F	F#/Gb	G	G#/Ab	A	A#/Bb	B	C	C#/Db	D	D#/Eb	E
F#/Gb	G	G#/Ab	A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F
G	G#/Ab	A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb
G#/Ab	A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G
A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab
A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A
B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb

SOLFEGE SCALES

The singer's solfege scale **do-re-mi-fa-so-la-ti-do** represents the pitch sequence of the standard major scale (Ionian mode) for any starting tonic **do**. All the intervals are whole tones except for half tones **mi-fa** and **ti-do**. This translates into **1-2-3-4-5-6-7-1** from the chromatic scale relative to major tonic **do** as **1**. The solfege minor scale **la-ti-do-re-mi-fa-so-la** represents the pitch sequence of the standard minor scale (Aeolian mode) for any starting tonic **la**. This translates into **1-2-p3-4-5-p6-p7-1** from the chromatic scale relative to minor tonic **la** as **1**. The problem for our purpose is solfege scales are only for classical modes and attempts to extend them are clumsy and complex (see Wikipedia).

SCALES AS INTERVAL SEQUENCES

Scales generally have only three sizes of inter-note intervals, namely half tones (**h**), whole tones (**2h**) and minor thirds (**3h**). Sometime I represent **2h** by **W** and **3h** by W^{+}. Sometimes I just use the numbers. For example, the 6-note minor blues scale could be written variously as:

1-p3-4-p5-5-p7-1	**chromatic scale**
3h-2h-h-h-3h-2h	
$W^{+}WhhW^{+}W$	
321132	**half tones understood**

"Figured bass notation" (Appendix C) is different in kind. It represents chords going up from bass notes by number sequences in which the numbers count scale steps between successive notes, which requires knowing the scales in advance by other means.

APPENDIX C: ABOUT CHORDS

Chords identified by chord symbols with four or more notes boil down to combinations of the two kinds of building blocks. Here follow some examples. Two fifos (fifths or fourths) form major-7, minor-7 or major-6 chords. One fifo and one tritone form dominant-7, half-diminished-7 (a.k.a. minor-7-♭5) or minor-6 chords. Three fifos or two fifos and a tritone form 9th, 1lth and 13th extensions of these chords. When tonic scales depart from key signatures, the same kinds of building blocks are available from the scales but now more than one tritone is available. For example, two tritones form diminished-7 or dominant-7-♭5 chords. Two tritones and one fifo (that may share a note with a tritone) form variations of other chord types such as dominant-7♭9. Omitting inner notes of combinations may yield different intervals, or thinned voicings of chords. For example, an augmented fifth (8 half tones) is combination of two tritones a whole tone apart with their inner notes omitted; and a 3-note voicing of a 4-note seventh chord is composed of the outer notes plus the most important inner note.

ANCHOR LETTERS FROM TRITONE CHORDS

The following table of tritone chords summarizes the simplest examples of chords with tritones in different positions.

offset of tritone bass note above root R	suffixes on root symbol R										
	7	7♯9(13)	9♭13 (or ♯5)	7♭9	7♭5 (or ♯4 or ♯11)	dim7 (or o7)	m7♭5	m6	M7(11)	♭9	M7♯11 (or ♭5)
fourth									x		
major third	x	x	x	x	x						
minor third		x				x		x			
whole tone			x								
half tone				x						x	
0					x	x	x				x

Only chord variations that alter tritone content are included. For example, R7, R9, R7#9, R13 and R9(13) are all variations of R7 with the same tritone content and so are all represented in the table by R7 (variations are left to context). Diminished seventh chords (Rdim7) have no counterpart in classical modes. Sus chords are not shown because they have no tritones. They are typically V-7♯3 chords. A Vsus-V-I progression is a substitute for a II-V-I progression in which one note is altered between the first two steps.

Inverting the tritone of a chord into the home octave (if it isn't already there) determines its PKP anchor. For example, The tritone of a V-7 chord is partially outside the home octave but its inversion is within it. The bass note of its inversion is a fourth above the home tonic which makes its anchor **I**.

Double tritones are the normal upper limit for tritone content of chords encountered above the staff in fake books, lead sheets and sheet music.=

FIGURED BASS NOTATION; EXTENDED CHORDS

Figured bass notation provides a simple representation of chords from scales with 7 notes and no adjacent half tones. It represents chords by stacks of numbers going up from a bass note, in which each number is a count of the scale steps to the next note up. The stacks are annotated on a staff as literal stacks of numbers (vertical lists). I write them here as horizontal lists separated by plus signs. For classical modes, a major or minor third is always two scale steps and whole tone is always one scale step (e.g., a seventh chord is **2+2+2** and a sixth chord is **2+2+1**).

Figured bass notation can be helpful for understanding extended chords of classical modes that follow from splitting chord steps of size **2** into **1+1** sequences and then moving the added note up an octave. The **+4** on top of two of the extended chords on the right is a consequence of avoiding **1+1+1** sequences in the in-place forms. The corresponding chord symbols have degree-number suffixes 6, 9, 11 or 13 added to basic symbols to identify the extensions.

chord type	(2) = split	in place	extended
seventh	2+2+2	2+2+2	–
ninth	(2)+2+2	1+1+2+2	2+2+2+2
eleventh (seventh+11th)	2+(2)+2	2+1+1+2	2+2+2+2+4
thirteenth (ninth+13th)	(2)+2+(2)	1+1+2+1+1	2+2+2+2+2+4

DOUBLE TRITONES

The number and variety of chords formed of or voiced by double tritones is startling. The chord symbols are all over the map but the double tritones have only three basic keyboard shapes exemplified by **RM**, **M.L** and **R..L** from the blues family mode, namely two tritones offset by a half tone, a whole tone or a minor third. Let's symbolize these shapes by **XX**, **X.X** and **X..X** , where the **X**s represent alphabet letters and the dots represent skipped letters. The same shapes appear for different mixes of tritones on both sides of the mode hierarchy. Double tritones with whole tone and half tone separations are progressively more dissonant than single tritones when their notes are sounded together. Double tritones with minor third separations have a "sweet" sound that's somewhere between dissonance and consonance.

The basic shapes are simple but finding any particular inversion of one on the keyboard can be difficult if you try to do it by finding the individual inversions and combining them." Two things make it difficult: one is different mixes of black and white keys in different home octaves; the other is different outer and inner intervals for different inversions. Better to work inwards from the outer intervals, as shown next.

←major sixth (9h)→

all inversions of X..X x . . x . . x . . x

←augmented fifth (8h)→

X.X & X.X x . x . . . x . x

←minor seventh (10h)→

X.X & X.X x . . . x . x . . . x

←fifth (7h)→

XX & XX x x . . . . x x

←maj. seventh (11h)→

XX & XX x . . . . x x x

Find the bass note, establish the treble note, then move inwards from both ends by the offset interval. Either all inversions have same shape or all inversions have only two shapes.

MISLEADINGLY COMPLEX CHORD SYMBOLS FROM CLASSICAL MODES

This illustrates, for the Ionian mode, that a startling variety of chords are voiced by simple shapes formed of a tritone combined with different fifos (some are rootless, all are in the mode).

```
1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
@ P  O R  M I L  $ x  x x  x @
. .  . .  . x .  . .  . .  x .     V7, IIm7(13), IM9(11)
. .  x .  . . .  x .  . .  . .

. .  . .  . x .  . .  . .  x .     V9(13), IVM7b5
. .  . .  x . .  . .  x .  . .

. .  . .  . x .  . .  . .  x .     V7(11), IIm7(13)
x .  . .  . x .  . .  . .  . .

. .  . .  . x .  . .  . .  x .     V13(11), IM7b5
x .  . .  . . .  x .  . .  . .

. .  . .  . x .  . .  . .  x .     VIIm7b5, IVM6b5, IIm6
. .  x .  . . .  . .  x .  . .
```

CHORDS FROM NON-CLASSICAL MODES.

This illustrates that non-classical modes provide many new chords.

```
                1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
                @ P  O R  M I L  $ x  x x  x @
minor family    @ .  x x  . x .  $ x  x x  x @
OR              . .  O R  . . .  . x  x .  . .    IV7#9(13), VII7#9(13)
R.I             . .  . R  . I .  . .  x .  x .    IV7b5, VII7b5
O..I            . .  O .  . I .  . x  . .  x .    IIdim7, IVdim7, pVIdim7, VIIdim7
                                                  rootless 7b9 rel. to roots a 1/2 tone down
|||R+           x .  . R  . . .  . .  . .  x .    ImM7, pIIIM+
||||$           . .  . x  . . .  $ .  . .  . @    Im (minor triad @▼, spread out)

major family    @ .  x .  x x .  $ x  x x  x @
MI              . .  . .  M I .  . .  . x  x .    pII7#9(13), V7#9(13)
O.M             . .  O .  M . .  . x  . x  . .    III7b5, pVII7b5
O..I            . .  O .  . I .  . x  . .  x .    as above
|||$            . .  . .  x . .  $ .  . .  . @    I (major triad)

blues family    @ .  x x  x x x  $ .  x x  . @
RM              . .  . R  M . .  . .  x x  . .    I7#9(13), pV#9(13)
M.L             . .  . .  M . L  . .  . x  . x    I7b5, pV7b5
R..L            . .  . R  . . L  . .  x .  . x    analogous to O..I
```

The strongly dissonant chords formed of two tritones offset by half tone would tend to be voiced in context as a stacked tritone and fourth with no internal half tones. This shape has a rich sound with a dissonant edge. The weakly dissonant chords formed of two tritones offset by a whole tone can be played with all notes in any inversion. The chords formed of two tritones offset by a minor third have a circular symmetry (same shape in all inversions) that produces a unique sound I have come think of as "sweet."

CHORDS DIRECTLY FROM TRITONES ON THE KEYBOARD

Tritone chords may be identified directly on the keyboard as indicated by the following selection of examples. Context would determine which one fits.

3-note chords	X . . X . . X	**X*dim***
	x . . x X	**X*dim* (inverted)**
	x . . . . . . x . . X	**X*dim* (inverted)**
4-note chords	X . . . x . . x . . x	**X7 (3 note voicing omits inner note)**
	X . . x . . . x . x	**Xm6 (3 note voicing omits inner note)**
	x . X x	**X7 (3 note voicing of inversion)**
	x . . x . . . x . X	**X7 (inverted)**
	X . . x . . . x . . x	**Xm7b5**
	x . . . . x . X	**Xm7b5 (3-note voicing of inversion)**

TRITONE SUBSTITUTE CHORDS

The tritones of all possible dominant seventh chords and their tritone substitutes for any home tonic are easily determined from a table of the following form, the top line of which is the actual scale frame of the home tonic on the keyboard (**Eb-Bb-Eb** provides an example). The chord roots are the **X** entries in the table. All possible chords are listed on the right for the home tonic.

	Eb							Bb					Eb		
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
	@	P	O	R	M	I	L	$	x	x	x	x	@		
L	.	.	X	.	.	.	L	.	X	.	.	.	.	F7	B7
I	.	X	.	.	.	I	.	X	.	.	.	.	.	E7	Bb7
M	X	.	.	.	M	.	X	.	.	.	.	.	X	Eb7	A7
R	.	.	.	R	.	X	.	.	.	.	.	X	.	D7	Ab7
O	.	.	O	.	X	.	.	.	.	.	X	.	.	Db7	G7
P	.	P	.	X	.	.	.	.	X	.	.	.	.	C7	Gb7

APPENDIX D: ABOUT ENRICHED CLASSICAL MODES

The enriched classical modes identified as “melodic” and “harmonic” presented in the book *Modalogy* are summarized next, except with notes in numeric-chromatic-scale notation, instead of in the RN (Roman Numeral) notation with sharps, flats and naturals used in the book. Corresponding PKP mode signatures are shown on the left.

The purpose is twofold. One is to verify the correctness of the PKP view of these modes. The other is to highlight the complexity that results from using sharps, flats and naturals. For example, the tritone anchored by **R** that is a component of many of the minor modes is understood as **p3-6** in the symbolic chromatic scale, and that’s it. Inversions in different places in harmony are left to context. In *Modalogy*, tritone anchor **p3** is ♭III or ♯II and tritone anchor **6** is VI or 𝄫VII, and that’s only the anchors.

The alphabet soup of names and the intricate details of the scales makes them very difficult to distinguish functionally, or to remember as enumerated scales. Seeing the possibility that tritones might be fundamental scale-defining objects for these modes is effectively impossible in the terms used in *Modalogy*. This impossibility is demonstrated by a discussion of defining and non-defining notes of the many and various modes that never mentions tritones.

PKP’s way of knowing the modes by 2-letter mode signatures from a 6-letter alphabet is simple and unambiguous. It enables seeing the modes as emerging from family context instead of as independent entities that give no hint of where they might be used. It simplifies the harmonic modes by making the master mode harmonic minor-major, thus reducing 2x7=14 parallel modes to 8 parallel modes. An 8-note minor-major mode is easily reduced to a 7-note harmonic minor or major mode to fit context.

Parallel Modes of the Melodic Minor |WhWW|WWh|

//LO	1-2-3-p5-p6-6-7-1	Lydian Augmented
alt-LO	1-2-p3-4-p5-p6-p7-1	Aeolian Diminished
//ML	1-2-3-p5-5-6-p7-1	Lydian Dominant
alt-ML	1-p2-p3-3-p5-p6-p7-1	Jazz Altered
//RI	1-2-p3 -4-5-6-7-1	Melodic, or Jazz, Minor
//OM	1-2-3-4-5-p6-p7-1	Jazz Mixolydian
//PD	1-p2-p3-4-5-6-p7-1	Jazz Phrygian

Parallel Modes of the Harmonic Minor |WhWW|hW+h|

//RL	1-2-p3-p5-5-6-p7-1	Romanian, Dorian ♯4, Mishebarakh
alt-RL	1-p2-p3-3-p5-p6-6-1	Leading Tone Minor Diminished, Super Locrian 𝄫7
//LR	1-p3-3-p5-5-6-7-1	Lydian Blues Major, Lydian ♯2
alt-LR	1-p2-p3-4-p5-6-p7-1	Jazz Phrygian Diminished
//OI	1-2-p3-4-5-p6-7-1	Harmonic Minor, Aeolian ♮7, Jazz Minor ♭6, Mohammedan
//IO	1-2-3-4-p6-6-7-1	Ionian Augmented
//PM	1-p2-3-4-5-p6-p7-1	Phrygian Dominant

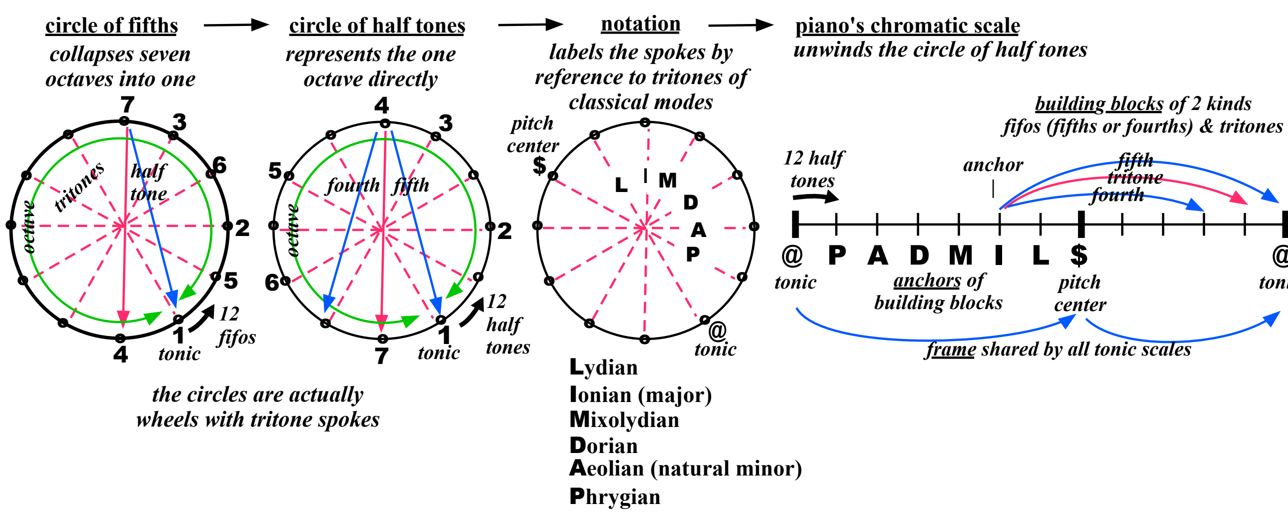
Parallel Modes of the Harmonic Major |WWhW|hW+h|

//RL	1-p3-3-p5-p6-6-7-1	Lydian Blues Augmented, Lydian Augmented ♯2
alt-RL	1-2-p3-4-p5-6-p7-1	Jazz Minor ♯4, Lydian Diminished
//LR	1-2-p3-p5-5-6-7-1	Lydian Melodic Minor, Lydian ♭3
alt-LR	1-p2-p3-4-p5-p6-6-1	Leading Tone Major Diminished, Locrian 𝄫7, Locrian Diminished-7
//OI	1-2-3-4-5-p6-7-1	Harmonic Major
//PM	1-p2-3-4-5-6-p7-1	Jazz Phrygian Dominant, Mixolydian ♭2
alt-MP	1-p2-p3-3-5-p6-p7-1	Altered Phrygian Dominant, Phrygian ♭4, Superlocrian ♮5, Superphrygian

APPENDIX E: ABOUT SYMMETRY & SYMMETRY-BREAKING

The elements of PKP are summarized here in a way that provides a link between the concept of symmetry breaking in these pages and in the book *The Jazz of Physics*. This kind of thing is fascinating to anyone with a mathematical bent but possibly not to anyone else. (This uses the original version of the alphabet, namely **PADMIL**, before I replaced **AD** with **OR** to avoid confusion with letter notes.)

The circle of fifths shown below left presents the basic elements of tonic scales and chord progressions from them in one simple picture. The points going counterclockwise around the circle are 12 notes a fifth apart (7 half tones) across 7 keyboard octaves (12 fifths x 7 half tones = 7 octaves x 12 half tones). The circle is manifestly a wheel with tritone spokes. The notes of the major scale are the numbered points around the half circle delimited by the highlighted tritone spoke (6 half tones).



The circle visibly establishes two kinds of Lego™-like **building blocks** as fundamental elements of music, namely fifths or fourths referred to jointly as **fifos** for simplicity, and tritones. The circle as labeled identifies fifths going up the keyboard through 7 octaves or fourths going down the keyboard through 5 octaves. For the major scale, it identifies a basic chord root line going down by five fifths (3½ octaves) or five fourths (2½ octaves) to the tonic (equivalent to progressively zig-zagging down a fifth and up a fourth within one octave).

The pictorial geometry of the circle of fifths and the musical geometry of its interpretation are different in a way that is counterintuitive (different numbers of octaves going around the circle for fifths and fourths, very different musical sizes of lines of almost the same pictorial length that cut across the circle). This becomes confusing for more general chord progressions of this and other scales.

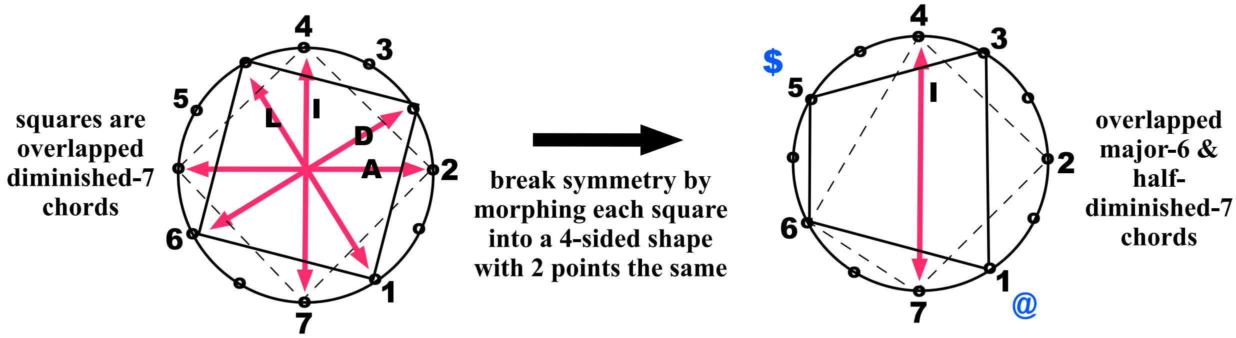
The circle of half tones rearranges the spokes of the circle to put the labeled points around it in scale order. Around the circle remains an octave and across any spoke remains a tritone. The half tones across the circle now go around it and the fifos around the circle now go across it.

The end points of all the spokes of either circle visibly identify all the points around it, suggesting a notation that labels spokes (building blocks) instead of points (notes). This simple observation is the twist that leads to PKP's unique combination of simplicity and depth. The spoke labels, called **anchors**, directly identify tritones but also identify fifos. In the chromatic scale that unwinds from the circle, each anchor letter identifies a tritone and two fifos morphed from it. The letters identify relative positions of the anchors in the chromatic scale. Tritone anchors are unambiguous independently of context and fifo anchors are ambiguous but the ambiguity is generally resolved by context. No anchors are needed in the top pitch half of the octave because inversions cover them.

The letters of the **PADMIL** alphabet mark the relative positions of the anchors of the single tritones of classical modes, but this is only to provide a correspondence between PKP notation and music notation. It does not bind the letters to the classical modes, or to tritones.

SYMMETRY BREAKING IN THE CIRCLE OF FIFTHS

According to *The Jazz of Physics*, symmetry-breaking is a deep feature of how both music and the universe work. Here's a view of breaking the symmetry of a diminished scale to yield a major scale that corresponds to an example on page 66 of the book (in the book, the dotted square and its transformation are not shown and no mention is made of tritones).



The symmetry-breaking is shown next in progressive steps that morph tritones into fifos.