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

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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 became like the naive child in the fairy tale who saw that "the emperor has no clothes" — I came to see the piano without the obscuring "clothes" of music notation as much simpler than the clothes make it seem. I wrote this document as "notes to myself" about my developing ideas about how the "no-clothes" piano works — ideas that I believe could be of interest to anyone interested in playing harmonically sophisticated piano music, with understanding, for personal pleasure. This particularly includes people whose don't have the time or ambition to follow the conventional route of practicing until understanding slowly seeps in as a companion of technical skill. I instinctively balked at this route because it seemed the wrong way round. Practicing is needed to develop "chops" but I thought understanding should be possible independently of it.

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 slightly different pitches identified for each piano key by music notation. As anyone knows who has started the piano with the intent of playing only for personal pleasure, music notation is misleadingly simple for pieces in easy key signatures that don't depart from them, and then suddenly blows up in complexity just as pieces become harmonically "interesting." Beyond that point, much written piano music becomes almost impenetrably complex for all but experts. I am not speaking here of virtuoso pieces with music pages black with notes, but of harmonically interesting tonal music that's much simpler than music notation makes it appear. This is unfortunate because the piano is an instrument that exposes how tonal music "works" to anyone who approaches it. [1]

Everything needed for a useful "no clothes" representation of tonal music is hidden in plain sight on the keyboard. This starts with the singer's interval-based "solfege" scale **`do-re-mi-fa-so-la-ti-do`**. This scale says something fundamental about music, namely that it's more about the pitch intervals between notes than about the absolute pitches of the notes. The piano presents the pitch intervals between its notes directly to the eye in terms of "half tones," the intervals played by adjacent piano keys. An interval of a certain number of half tones is harmonically equivalent anywhere on the keyboard. The fundamental interval of music is the octave, composed of twelve half tones. The 7-note solfege scale divides this into two half adjacent half tones (**`mi-fa`** and **`ti-do`**) and five whole tones (all the rest). The piano scale has slightly different sizes of half tones in pitch terms than the singer's scale, because of the lack of variable pitch piano keys, but the small differences are finessed by equal temperament tuning. The musical meaning of intervals of the same size in half tones are the same for both the singer's scale and the piano scale. The intervals of the **`do-re-mi`** scale are easily

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1 An example of complexity blowup 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 home tonic of a piece. 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 home tonic. What they actually imply is slightly different pitches for the notes C and D when used as references for sharps or flats. These pitch differences don't exist on the piano but notating them as if they do creates complexity where none exists.

generalized into a 12-half-tone chromatic scale, of which the **do-re-mi** scale or any other scale, may be understood as a sub-scale that's the \ harmonically equivalent anywhere on the piano. Amazingly, given that a 12-half-tone chromatic scale is fundamental to music, music notation provides no unique representation for it. Instead, chromatic scales of different musical tonics have different key-signature "clothes." This extends to the same tonic on the piano sometimes having different symbols in different key signatures (e.g., footnote 1).

I "reverse engineered" pieces of music I was learning, to understand them in terms of keyboard shapes composed of intervals measured in half tones. I was to driven to this when I discovered that chord symbols, which I had expected to help me get past the complexity problem, are actually part of the problem when chords depart significantly from written key signatures, which they do all for almost all "interesting" music. Some chord progressions I was trying to learn had so many chords, of so many many different types, coming so fast, that I found remembering them impossible.[2]

Making chords part of the solution requires seeing them as keyboard shapes formed from a small number of Lego-like building blocks, primarily fourths (5 half tones), tritones (6 half tones) and fifths (7 half tones) . Everything needed to understand music in these terms is hidden in plain sight on the piano keyboard or in standard practice for voicing chords. Working with building blocks. instead of notes requires only a notation for identifying them by position and size (measured in half tones) instead of by pairs of notes in chord scales. After much experimentation, I found a simple way of doing this using a 6-letter DNA-like alphabet with color-coded letters. I came to these insights after a period of piano lessons as an adult beginner.

THE RESULTS IN A NUTSHELL

I call the "no-clothes" notation that resulted "**PKP**" (standing for "Picturing Keyboard Patterns). It bundles the elements hidden in plain sight on the keyboard and in standard voicing practice for chord progressions into a lightweight notation that's deep enough to capture the full sophistication of written melody plus harmony, in a notation simple enough to be annotated above the staff. Melody notes and harmony building blocks are viewed as occurrences at points in time, leaving duration of notes and rhythm to the pianist, guided by bar lines and optional downbeat lines. This separation of parts helps deal with the reality that the "same" tune (melody plus harmony) may played with very different timing and rhythm (think of the many ways you have heard Gershwin's *Summertime* played). The notation can also be written down separately as a playable shorthand, and is for most of the example pieces in this document. This is not a replacement for music notation but a lightweight complement to it. Its unique combination of simplicity and depth are 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 provides contextual cues to help in learning and remembering new pieces, knowing 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.

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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 presents this piece as an example).

The development was guided by the kinds of pieces I studied, mainly pieces of tonal music from "fake books" in the general areas of "jazz and standards," the "great American songbook," and "classical piano." Atonal music is outside the scope, except for ornamental segments in tonal pieces that can be understood relative to the tonal context. Virtuoso piano music on pages black with notes on the grand staff its outside the intended range of applicability.

Why go to all this trouble when the same things can be expressed in music notation, even if only indirectly? One answer is it gets past the sudden complexity blowup of music notation that occurs when things just begin to get interesting. Another answer is tonal music provides context that chord symbols ignore, enabling harmony reduced to **core harmony** based on building blocks that leaves details to context.

A magical thing happens: tritones — the simplest building blocks on the keyboard because they split octaves into equal keyboard halves — emerge as primary building blocks in shaping core harmony. Knowing the tritone content of a chord progression tends to be sufficient, in context, to determine all the written chords (or valid substitutes). Appendix C provides table of all chords containing tritones. A melody line in chromatic-scale notation provides all the melody tritones by direct inspection. Nothing more is needed to reconstruct the written harmony (or a valid substitute) from the bottom up in building-block terms. Chord substitution — a favorite trick of jazz pianists — falls out as a side effect.

I had many questions about music notation but one stands out: Given that scales are determined by key signatures in music notation, 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 provide an answer that goes to the heart of the enterprise.

IF THESE IDEAS ARE SO GOOD, WHY ARE THEY UNKNOWN?

I have been asked this question many times, with the implication that, if the ideas were any good, some enterprising young pianist would have discovered them. The answer has several parts.

So much time and effort is required to master both the piano and music notation, that any young person who aspires to mastery must accept music notation as received wisdom. The deceptive simplicity of "starter" pieces in simple keys gives no warning of later complexity, enabling music notation to get an early hold on the mind as the only way of thinking about music.

A number of factors contributed to the "thinking outside the box" that produced PKP, the combination of which was, perhaps, unusual. When I started down this path, I was a professor of engineering engaged in research in the then-very-new-field of computer software. This got me thinking about analogies between software running on computer hardware and written piano music played on "piano hardware." My research then was then in an area of software known as "cooperating sequential processes" that has the following counterpart in music. Imagine a group of people want to sing "Happy Birthday to You" to someone. The song has four phrases: the first, second and fourth are "happy birthday to you" and the third is "happy birthday dear so and so." Suppose the four phrases are assigned to four different singers. Then the singers are like cooperating sequential processes: each person sings a sequence of words at a time determined by mutual cooperation. One establishes a context, exercises it sequentially, and sends a signal when it's done. The others wait for triggering signals. When a signal is received, a context switch takes place. And so it goes.

As I studied how piano harmony works in terms of building blocks I came to realize that tritones in harmony are like context switching signals in software. A harmony tritone reaffirms an established context (i.e., mode), signals a new one, or hints at one a new one that might appear the future. Other processes wait for signals to appear. For piano music, I saw the cooperating processes as executed by the hands and brain of the pianist, and I foresaw many details to sort out, but I saw an underlying reality — a hierarchy of modes understood in terms of tritone changes between them. The led to identifying tritones as fundamental structural elements of music, strongly against conventional musical wisdom. I would never have had the confidence to persist with this development without the experience of working with them in software, or the without earlier training in mathematics and physics that me aware of the simplifications made by possible by principles of "duality" and "symmetry."

The final contributing I factor was retirement from my job as a university professor a few years after I first approached the piano, which provided time to develop the ideas in depth. Doing so provided a fascinating retirement hobby.

In the process of developing these ideas, I searched for signs of them in the literature, and reached out to experts for the same thing, and found little or nothing. Closest were ideas about symmetry in the book *The Jazz of Physics*, and about chords as “scale shapes” learned from discussions with jazz pianist Taylor Eigsti in person and by email. I had a series of email conversations with a classical pianist who said he had known, when he was younger, of someone who taught introductory piano to beginners using interval-based concepts that sounded similar to mine, but it never caught on (I suspect because he had no notation for it).

My admitted lack of musical credentials is reasonable cause for skepticism that I have anything useful to say, so the opinions of PKP of a couple of experts are worth quoting before proceeding. 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 with myself in mind as the reader, as I was when I started down this path, namely an adult newcomer to the piano daunted by the complexity of music notation. I was startled at the depth of insight that emerged. I believe the material should be accessible and useful to anyone with as little background as I had when I started out, but also to others, such as: pop and jazz musicians who are not pianists but want to explore harmony on the piano; “wannabe” expert pianists who might appreciate a helpful notation that exposes fundamentals; and anyone with a stake in the piano and curiosity about these issues. Expert pianists are not explicitly on this list because, as I have learned, they have already figured out personal ways of dealing with the complexity of music notation to the extent that they tend not to see it as complex anymore; that said, they may be curious about a notation that could be useful for teaching principles at any level of accomplishment.

Chapter 2 develops the concepts and notation. Chapters 3-5 introduce and explore the idea of a mode hierarchy determined by increasing tritone content, following the way I explored the ideas by reverse engineering many example pieces (Appendices formalize the explorations). Chapter 6 provides a smorgasbord of advanced examples that I found difficult in music notation, the exploring of which helped me to develop PKP and confirm it validity. Chapter 7 provides observations and conclusions. References, acknowledgements and comments from some readers of earlier drafts follow. Appendices are about the relations between conventional representations and PKP, for terminology (A), scales (B), chords (C), parallel bridge modes (D), and implicit concepts of symmetry and symmetry-breaking (E).

There's very little music notation in the form of notes on a staff in this document because the purpose is to see the emperor without the clothes, not to describe the clothes. Needed elements of key-signature notation and chord notation are explained in Appendices. PKP is intended to be used to annotate written music, but this is is helpful only if the annotations are understood in their own terms, independently of music notation. This is possible because the concepts are simple and are directly related to how the ears hear music. Interpretations in terms of music notation are results not a starting points.

The main elements of PKP are melody lines in chromatic scale notation, and harmony lines in alphabet notation that identify building blocks — both either annotated above the staff or written separately — and simple mode tables that provide a cross reference between the two. These are supplemented by Lego-like pictures of keyboard shapes formed from building blocks that can be directly understood in terms of music notation because the building blocks can be so understood. Don't be misled by the many such pictures in these pages into thinking drawing them is a necessary part of using PKP. It isn't — they only to help visualize the notation's relationship to the piano keyboard.

No question, this is a different way of thinking that takes time and effort to internalize and to reconcile with conventional ways. The most fundamental change required is thinking of half tones as the most fundamental music intervals. It's worth learning because it makes the piano more approachable to anyone willing "to step outside the box" of music notation to get a different view. Musical notation doesn't go away, it provides the background relative which the elements of the view are understood.

CHAPTER 2: CONCEPTS & NOTATION

PKP concepts and notation enable probing deep and complex waters in music notation without becoming overwhelmed by details. In a famous session of NPR's *Piano Jazz*, pianist Bill Evans said, in conversation with host Marian McPartland, 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 found that the following hierarchy of parallel modes based on pentatonic modes provides a useful conceptualization. The hierarchy bundles increasing chromaticism (departure from the scale of a written key-signature) into coherent modes determined by mode signatures that remain simple while music notation blows up in complexity. This hierarchy is organized by tritone content, with none at the bottom (pentatonic modes) and maximum at the top (atonal modes). Music notation explodes in complexity as it progresses upwards in this hierarchy, but the music itself stays simple in these terms.

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                 atonal modes
             /                \
minor & major               blues family
families |  \               /  |
         |    bridge modes     |
         |                     |
  classical modes       basic blues
             \                /
              pentatonic modes
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A note on terminology: "scales" stand alone; "modes" are scales that belong to a set of scales with the same interval sequence starting from difference positions. Music notation is based on relative modes (same notes). PKP is based on parallel modes (same tonic). Either a way, a master mode determines the interval sequence. I use the more general term "modes" often in these pages because any scale includes the possibility of modes.

This chapter is concerned with the concepts and notation underlying this hierarchy of parallel modes, leaving the details of most modes to subsequent chapters and appendices. Pentatonic minor and major modes provide a base from which basic blues modes and "classical" modes that determine the scales of key signatures are formed in very different ways (I call the modes "classical" because their names originate classical antiquity — Ionian, Dorian, Phrygian, Aeolian, and so on — not as a reference to "classical music"). Illustrative pieces in this chapter are simple ones that anyone can play: *Backwater Blues* and *Happy Birthday to You.*

PKP NOTATION

PKP is about tonal music organized around one or more "tonics" to which melody lines resolve at the end of a piece or section. It represents multi-tonic music by parallel modes of a single home tonic that share a chromatic scale. This works because parallel mode changes and tonic changes are, on the piano keyboard, "two sides of the same coin" — one implies the other. The representations of the musical elements of a piece on the keyboard are position-independent because they're relative to a conceptual home tonic that may be allocated to any piano key. PKP separates the time orders of elements of melody and harmony from the details of timing and rhythm. This aligns well with how most people with musical ears hear and remember tunes. Timing and rhythm are independent add-ons to a tune that can be determined by the pianist while playing a learned tune, or notated by separate downbeat lines.

Mode shapes and chord shapes (including voicings of chords that omit or rearrange notes) are determined by a two-part **universal home octave**, shown next as the two header lines of a mode table. One part of the universal home octave is a 12-half-tone **chromatic scale** of the **no-clothes piano**. The other part is a **building-block scale** that provides a DNA-like alphabet **PORMYL** (pronounced "pormil") that identifies building blocks by the relative positions of their bottom ends, called **anchors**. The anchors are within the lower fifth of the scale frame **@$@**, in which **@** identifies the lower and upper home tonics and **$** identifies the musically important pitch center. This is the consonant pitch center of the octave that's in most tonic scales — tonic scales without a pitch center exist, but are simple derivatives of tonic scales with one. The keyboard center is a half tone below the pitch center. Entries in table are often no more than position markers, typically **x**s, that can be understood in terms of either or both header lines. Showing the anchors of colored building blocks in a contrasting color (white here) in the body of a table often helpful to eye (even more helpful is replacing **x**s by anchor letters).

universal home octave |	@	P	O	R	M	Y	L	$	x	x	x	x	@	**building block scale**
|	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	**chromatic scale**
example mode	x	.	x	.	x	x	.	x	.	x	.	x	x	do-re-mi-fa-so-la-ti-do
example building blocks	.	.	.	.	.	x	.	.	.	.	.	.	x	**fifth**
	.	.	.	.	.	x	.	.	.	.	.	x	.	**tritone**
	.	.	.	.	x	.	.	.	.	.	.	x	.	**fifth**
	.	.	.	.	x	.	.	.	.	x	.	.	.	**fourth**

Outside such tables, the alphanumeric symbols of the universal home octave are shown in a special bold-faced font that stands out to the eye (Arial Black). Mode tables are an exception because a fixed-width font (Courier) in needed to provide vertical formatting. The meaning is the same either way.

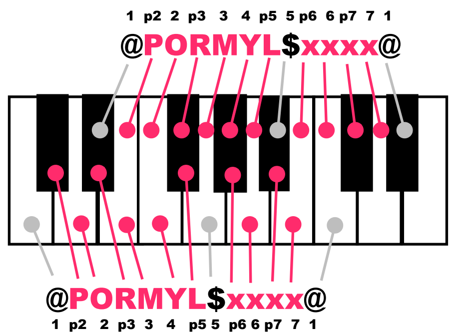
Origin of the Alphabet

Because the classical modes that determine the scales of key signatures contain one tritone each, tritones are identified by reference to them. The names provide both a helpful link to key-signature-based music notation, and a useful way of remembering the alphabet for anyone who knows of the existence of the modes (which is to say, all piano students). The alphabet letters follow from arranging the names of the modes in tritone order going up the keyboard (up the following list), and then picking one letter from each mode name. I initially picked the first letters of the names (PADMIL) to identify the tritone anchors but dropped this because it became endlessly confusing.

L is the first letter of Lydian & Locrian — same because they have the same tritone in opposite inversions
Y is from Ionian, imagined as "iYonian" ("I" is ruled out because it's a chord root in RN notation)
M is the first letter of Mixolydian ("M" also is a chord suffix, not ruled out but it's never confusing)
R is from doRion ("D" is ruled out because it's a note symbol)
O is from aeOlian, also called the "natural minor" ("A" is ruled out because it's a note symbol)
P is the first letter of Phrygian

The Universal Home Octave on the Keyboard

The universal home octave maps to the keyboard as follows for two possible home tonics. The mix of black and white piano keys is visibly very different for overlapped home octaves but the difference is manageable because of the intuitively simple nature of the notations. The only caveat is the necessity of keeping the home tonic fixed in the mind, to avoid confusion with recently played pieces with different home tonics. This can be helped by putting removable stick-on labels on the tonic and pitch-center keys, and by running through scales, arpeggios and chord sequences for a new tonic to get the new representations into the mind and fingers before approaching an actual piece.



The difficulty of doing this is much less than the difficulty of dealing with the many and various different chromatic scales of music notation for different home tonics. One benefit of doing this is understanding pieces of music with different key signatures in common terms. Music notation still has to be dealt with, but my experience has been that it's relatively easy to think in these terms when the PKP notation is annotated on the written music. With a bit of experience, the PKP notation can be used by itself to provide a shorthand description of the melody and harmony of an entire piece.

Melody and harmony modes are represented by the same universal home octave assigned to different actual octaves of a stack of harmonically equivalent home octaves on the keyboard. Melody *lines* are not confined to a single octave but may, in general, range all over the keyboard. However, melody *notes* of a piece appearing in different members of the stack of home octaves on the keyboard may be squeezed into a single octave of the stack by putting them in the same relative positions in it, providing a useful way of identifying modes. A piece may have have different secondary home octaves in different sections, which may be understood in terms of a single home octave because the universal chromatic scale aligns the notes of overlapped octaves.

THE CHROMATIC SCALE

The chromatic scale mirrors the look of the C-octave on the piano, enabling understanding any scale of any home octave on the piano in terms of the C-octave. For the C-octave only, the plain numbers identify white keys and the prefixed numbers identify black keys. The prefix **p** stands for **phlat** and means "next piano key down." It's not a conventional flat, but is the *only* identifier of chromatic scale notes a half tone down from the five numbered notes that have whole tone gaps below them. It applies only to these five notes. There are no symbols corresponding to conventional flats or sharps. The numbers are not degree numbers that count scale notes as **1st-2nd-3rd** and so on, but position indicators with interval implications. To make the difference clear in text outside mode tables, scale symbols are shown in the same font as the alphabet (Arial Black), namely **1-p2-2-p3-3-4-p5-5-**

p6-6-p7-7.

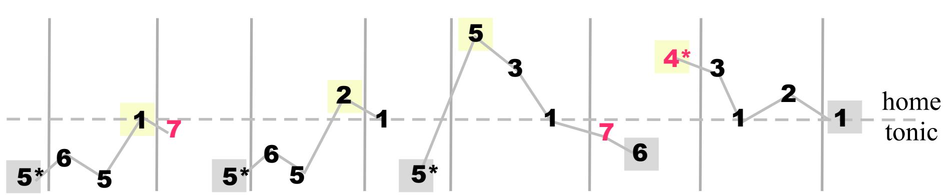
This chromatic scale easy to understand and remember as a simple representation of things familiar to any piano student. The interval sequence of the plain-number scale is **WWhWWWh** where **h** is a half tone and **W** is a whole tone (**2h**). This is the interval sequence, measured in half tones, of both the **`do-re-mi`** scale and the classical mode called "Ionian" that's the default major scale of a key signature. The illustrated **`do-re-mi`** scale is important for our purpose because its position independence brings forward a musical truth. Half tones provide a universal "measuring stick" for understanding music in terms of intervals, independently of their exact pitch sizes represented by the "clothes" of music notation. The understanding in terms of half tones is the same either way. See the books *How Equal Temperament Tuning Ruined Music* and *Lies My Music Teacher Told Me* for more on these matters.

<u>MELODY</u>

Melody lines in this document are single lines of notes from the chromatic scale that determine tunes that can be sung, whistled or hummed with different timing and rhythm. The only specified timing is one note after the other, grouped in bars. Tunes normally have a limited range on the keyboard because they're intended be performed by musical instruments with a limited range (included the human voice). This obviously not intended for virtuoso piano pieces on pages black with notes on the grand staff, that may range over the entire keyboard.

Shown next is the familiar tune *Happy Birthday to You* in music notation, with chromatic scale symbols annotated on the staff next to melody notes, and commas marking the ends of phrases. Understanding a piece begins with its melody line played forward but understood backward, because resolutions to tonics occur at the temporal ends of pieces or sections (the temporal end may be the beginning of a repeat, but you have to go to the end of the section on the page to know it).

Independent representations that omit timing and duration of notes and rests are useful for getting overviews of pieces. Sketching the melody line on graph paper and labeling the points with chromatic scale symbols is one way of doing this. The single tritone of this mode is shown in red text.



This reduces timing of notes to one-after-the-other, and omits durations of notes. However, bar lines and time signatures from the written music, plus added asterisks to represent repeated notes, and commas to indicate phrasing, are often sufficient reminders of how to play a familiar tune. Anticipating the more compact notation coming up, grey and yellow highlighting identify pivot points between melody arcs that trend up from low points (grey) or down from high points (yellow) — think of yellow as mountain peaks illuminated by sunlight and grey as valleys in shadow.

A compact representation follows from collapsing the line of chromatic scale symbols into a single text line (♫ identifies it as a melody line). The highlighted of pivot notes remains, to show the up or down direction of the next note (optionally, readability may be improved by offsetting them up or down from the main text line). Zig-zags *within arcs* don't need highlighting because the trend remains in the direction of the arc.

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

As shown next, an optional downbeat line (identified by 🥁) places downbeat markers (**^**) under the melody line. These markers are independent of anything else, which means different timing and rhythm requires only ignoring or changing them (or avoiding using them in the first place). Timing for notes or rests between downbeat markers that will appear appear in later examples is left open — the only constraint is squeezing them in.

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

The same chromatic scale symbols are used for melody lines with different secondary tonics because this is less confusing than changing the entire chromatic scale for every tonic change. As shown next, mode tables for different secondary tonics sort out the patterns without becoming bogged down in note-symbol differences (tonics are highlighted in blue).

	@	P	O	R	M	Y	L	$	.	.	.	.	@	
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
♫	x	.	x	.	x	x	.	x	.	x	.	x	x	**example melody is in the do-re-mi scale (Ionian mode)**
♫	x	.	x	x	.	x	.	x	x	.	x	.	x	**same scale for a secondary tonic a minor third up**

HARMONY

Harmony can also be squeezed into a single home octave, but the result is different in kind because harmonic equivalence because makes it directly useable as **core harmony**. Core harmony is determined by building blocks identified by the building block scale. A melody line may move through a range of home octaves, with core harmony staying below it simply transposing its building blocks by octaves.

Building blocks are tritones that invert into tritones, and fifths and fourths that invert into each other. Fifths and fourths are understood to be the same type of building block, warranting the distinctive name **fifo** for the type. Dissonance of tritones and consonance of fifos emerge when they're sounded as harmonic units. These two types of building blocks are sufficient to identify, via mode tables, the keyboard shapes of all the scales, modes and chords determined by scale dictionaries such as *The Source* or theory books such as *Modalogy*. What's more, the representations are more general than any dictionary because one representation covers all possible different key signatures. Inner or outer intervals of shapes (e.g., major thirds or minor thirds, and their inversions augmented fifths or major sixths) occasionally appear as building-block-like objects in harmony, but these are special cases that can be covered, without expanding the menu of building blocks, by simple annotations identifying shrunk or expanded building blocks (details are summarized in Appendix A and will be explained as we go along).

The concepts of **symmetry** and **asymmetry** come into play in a very fundamental way in relation to shapes formed from building blocks. The most fundamental interval of music, the octave, is split symmetrically into keyboard halves by a tritone going down and up from its keyboard center (**L**); and asymmetrically into pitch halves by a fifth going down and a fourth going up from the pitch center (**$**). The two halves of the keyboard splits are oppositely inverted building blocks. The two splits differ by half tone and so are mutually dissonant when sounded together. Thus, one of the fundamental contrasts of music — consonance vs. dissonance — presents itself as a morph by a half tone between the symmetric keyboard shape **@L@** (tritone-tritone) and the asymmetric keyboard shape **@$@** (fifth-fourth) that breaks its symmetry.

The term **fifo** enables very simple statements to be made about fundamental things that are obscured by music notation. One important statement is this: the fixed size of tritones enables the much larger number of fifos to be understood as **morphed tritones**, without any increase in notation, which greatly simplifies many things that are misleadingly complex in music notation. This makes identifying tritones the basic function of the alphabet. The difference between an anchor of tritone or fifo is color: red for tritones, blue for fifths, green for fourths.

There are no anchor symbols in the upper fourth of the scale frame because the notes there are provided by building blocks anchored in its lower fifth. Inversions of building blocks may go up from bass notes in upper fourth, but these bass notes are not "anchors." Inversions are identified by underlined anchor letters, thus keeping the building blocks always in view in the notation. Tritones invert into the same color (the tritone **M** inverts into the tritone <u>**M**</u>). Fifos invert into the opposite color (the fifth **M** inverts into the fourth <u>**M**</u>, and the fourth **M** into the fifth <u>**M**</u>). The scale frame **@$@** is not part of the alphabet because it cannot anchor tritones; for tritones, its notes can only provide bass notes of inverted tritones. These limits and restrictions ensure the uniqueness of tritone anchors.

Seeing harmony in terms of building blocks is simplest way of seeing it. Chord symbols are interpreted results that appear in examples as we along. Appendix C provides details.

<u>EXAMPLE PIECE: *BACKWATER BLUES*</u>

A simple blues piece starts us off because anyone can play it, and because blues goes to the heart of what this is all about more quickly and simply than anything else. This piece illustrates the ease of working with tritones to create harmonically sophisticated variations. I first learned this piece for home tonic F in a blues piano workshop at the then Jazz-School in Berkeley, where it was said to be representative of "half the blues pieces played by pop and jazz musicians." I later heard a jazz musician say in a radio interview that learning the blues before learning music notation paved the way for understanding everything that music notation later threw at him — which sounded right to me then, and still does. Blues can be understood, independently of music notation, as a coherent musical form that generates its own characteristic melody lines and rich harmony. It can seem ad hoc — and sometimes incoherent — in music notation because accidentals relative to key signatures that determine its melody and harmony notes give no sense of form.

Here follows a summary of the melody plus harmony of this piece (⚓ identifies core harmony as basically a line of anchor letters, shown above the melody to follow the convention for chord symbols, but played below it). When working from chord progressions, the tritones here would be identified from chords (Appendix C), but this example starts out with tritones and to show how context identifies chords.

***<u>Backwater Blues</u>*: <u>Melody Plus Harmony (original in F)</u>**

⚓ 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 |

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

The all-tritone skeleton harmony is not unusual — blues pieces are often harmonized by mostly (sometimes all) tritone chords. The core harmony octave is straight (not inverted) in **@$@**. The empty melody bars provide space for melodic improvisation. The piece is played in swing-feel rhythm, which delays notes on upbeats to give the effect of the next downbeat "bouncing" off them, but no downbeat line is shown is here to avoid cluttering the picture with details not relevant to the to main point, which is the relationship between modes and building blocks in melody and harmony.

The following mode table analyzes the components of melody and harmony, working backwards from the end. Anchor letters in colored building blocks are in contrasting in white text, to help the eye take in the building block anchors at a glance. Melody and harmony are in separate octaves on the keyboard but each is represented by the same universal home octave, so identifying rows as melody or harmony is sufficient. A minor melody line in bar 10 is harmonized by minor tritone **R** not in the melody, but with matching minor tonality. The melody is in a 6-note minor blues mode formed of the pentatonic mode plus note **p5** — the famous "flatted" fifth of a classical mode. This note forms tritone

L (neutral tonality) with the tonic. The short horizontal lines joining the notes of the minor-blues mode highlight minor-third intervals of scales. The melody tritone L in bar 10 is anticipated by harmony tritone L in bar 9. Working backwards from bar 9, only bar 1 stands out as different in kind — it harmonizes a minor melody with a major tritone M. The oppose tonality alerts the eye and ear to a possible blues because mixed major-minor tonality is a characteristic of blues that provides its happy-sad sound. The analysis backwards enables playing forward with the knowledge that this is a blues with complementary melody and harmony parts.

		@ P O R M Y L $ x x x x @ 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1	
	@$	@ . . . . $ . . . . . @	**scale frame (implicit throughout)**
bar 10	L	. . . . L x	**neutral melody tritone**
		x———x . x x x———x . x	**minor blues melody (bar 10 and others implicitly)**
	R	. . . R . . . . . . x . . .	**minor harmony tritone for minor melody**
	R	. . . R . . . . x . .	**melody fifth morphed from harmony tritone**
bar 9	R	. . . . L x	**harmony tritone anticipates bar 10 melody tritone**
bar 1	M	. . . . . M . . . . . . x . .	**major harmony tritone for minor melody**
	Y	. . . . . . Y . . . . . x . .	**melody fourth morphed from harmony tritone**
		x———x . x . x———x . x	**pentatonic minor melody (all bars except 10)**

Looking ahead to the next chapter, the anchor letters of the three harmony tritones combine into the mode signature //RM.L (pronounced "parallel-are-em-el") that determines a 9-note mode incorporating so many distinguishing features of blues that calling it "the" blues family mode is both warranted and useful. I hasten to add that I did not invent this mode, which I learned in conventional terms in the blues piano workshop mentioned earlier — I only invented this simple, evocative representation of it.

A Notational Diversion

The tritone harmony is represented by tritones going up from anchors, but inverted tritones are harmonically equivalent, which means that a tritone may always be played as a symmetric 3-note shape formed of a tritone going up from an anchor and an inverted tritone going down. Such shapes, which may be called **tritone-octaves**, are the fundamental keyboard shapes of PKP. A simple notation for them is shown next that distinguishes the primary tritone of the shape, in context, from the octave-completion one that merely doubles an end note an octave down or up.

	completion primary	
■L	x . . . . . . L x	**a tritone-octave based on L as primary**
L■	x . . . . . . L x	**a tritone-octave based on L as primary**
	primary completion	

Tritones are fundamental for several reasons: they are fundamental to understanding harmony in terms of building blocks; an octave is the simplest shape on the keyboard; finding its keyboard center provides two tritones; and the result is almost a chord. A tritone-octave can be played as a "starter chord" that adds depth without adding new notes. It can be altered into a chord shape by holding the primary tritone fixed, while shrinking the octave completion tritone towards the keyboard center of the shape. As it shrinks, it touches on a succession of possible notes from the current mode that can provide different voicings of different chords, without reference to chord symbols. This independence of the details of chord symbols is important because the large number and wide variety of tritone chord symbols makes them, in aggregate, among the most complex elements in music notation (recall footnote 2 in the opening chapter, and see Appendix C).

This sets the stage for the following simple but deep structural basis of **core harmony** in general: six tritone-octaves a half tone apart, spanning an octave-and-a-half range. This range encompasses the straight core octave **@$@** on the right and the inverted core octave **$@$** on the left. The selection of one of these as the core harmony octave for a piece determines that primary tritones will be either un-inverted or inverted in the harmony, leading to different keyboard shapes that voice different tritone chords, without reference to chord symbols. Because fifos are morphed tritones, this includes both tritone chords and fifo chords. Difference mixes of un-inverted and inverted tritones are determined by core octaves in between these two, but these two are basic. The helpfulness of deciding the core octave up front cannot be overstated — it decides inversions as a block, instead of individually.

```
inverted core octave       $ . . . . @ . . . . . . $
straight core octave                 @ . . . . . . $ . . . . @
                           $ . . . . @ P O R M Y L $ . . . . @
                           5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
                L■         . . . . . x . . . . . L . . . . . x      ■L
                Y■         . . . . x . . . . . Y . . . . . x .      ■Y
                M■         . . . x . . . . . M .   . . . x . .      ■M
                R■         . . x . . . . . R . . . . . x . . .      ■R
                O■         . x . . . . . O . . . . . x . . . .      ■O
                P■         x . . . . . P . . . . . x . . . . .      ■P
```

Returning to *Backwater Blues*

As illustrated next, the idea is not necessarily to notate tritone octaves explicitly, but to hold them in mind as "starter" shapes to be morphed into more varied shapes that are actual chords or voicings of them. The tritone-octaves are not explicitly notated here, but could if the intent was to play them as selected variations; they're always implied and available. The ■ prefixes of the shapes identify bass lines that are outside the home octave but may be morphed into bass lines in it (suffixes would identify treble lines). The lines are not notated as bass lines, but as offsets down from the anchors of the building blocks. The offsets are mode intervals that are obvious from context (major or minor thirds in the example). Size-neutral prefixes (■) can provide reminders of where these scale intervals are to be attached, leaving the actual size to context. Replacing the prefix ■ by circled numbers that give the sizes in half tones (e.g., ③ for a minor third, ④ for a major third) is possible, but tends to be both redundant and overprecise when context supplies the sizes so simply and directly.

The prefixed anchor symbols determine 3-note shapes that voice the seventh chords shown on the right, formed without reference to the chord symbols. The notes and voicings on the right are written out separately from the table for explanation only — the table determines them without becoming tangled in note symbols. Roots and omitted non-root notes of these chords are marked in the core octave by asterisks and dashes. The suffix "11" on the V-chord identifies the altered note that turns a major seventh chord into a tritone chord — it's the 11-th note of the unaltered chord scale counting from the root (which is the tonic in this case). Chromatic chords bristle with such suffixes, which identify the same actual notes on the keyboard by different suffixes relative to different roots.

The central role of tritones in such chordal harmony is vividly presented to the eye by the red building blocks.

Core Harmony on the Keyboard

bar	voicing	@				core octave								@	chord symbol	voicing	chord
		@	P	O	R	M	Y	L	$	.	.	.	.	@			
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1			
1	■M	*	.	.	.	M	.	.	−	.	.	x	.	.	I7	1-3-5-p7	1-3-5-p7
2	■R	x	.	.	R	.	*	.	.	.	x	.	.	.	IV7	1-p3-4-6	4-6-1-p3
3	■M	*	.	.	.	M	.	.	−	.	.	x	.	.	I7		
4	■M	*	.	.	.	M	.	.	.	.	.	x	.	.	I7		
5	■R	x	.	.	R	.	*	.	.	.	x	.	.	.	IV7		
6	■R	x	.	.	R	.	*	.	.	.	x	.	.	.	IV7		
7	■M	*	.	.	.	M	.	.	.	.	.	x	.	.	I7		
8	■M	*	.	.	.	M	.	.	.	.	.	x	.	.	I7		
9	■L	.	.	x	.	.	.	L	*	.	.	.	.	x	VM7-*11*	5-1-2-p5	2-p5-5-1
10	■R	x	.	.	R	.	*	.	.	.	x	.	.	.	IV7		
11	■M	*	.	.	.	M	.	.	−	.	.	x	.	.	I7		
12	■M	*	.	.	.	M	.	.	−	.	.	x	.	.	I7		

The intervals identified by the prefixes are the projecting ends of overlapped fifos of seventh chords, the other ends of which are inner notes of the tritones. The implied chord-completion fifos (always fifos because tritones are always core) do not normally have to be specified because the three-note voicings are often sufficient to identify them from context.

			@	P	O	R	M	Y	L	$	.	.	.	.	@		
bar	voicing	implied	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	chord	
1	■M	@M	.	.	.	.	M	.	.	.	.	.	x	.	.	I7	
			@	.	.	.	.	.	.	x							
2	■R	@R	.	.	.	R	.	.	.	.	.	x	.	.	.	IV7	
			@	.	.	.	.	*									
9	■L	OL	.	.	.	.	.	.	L	.	.	.	.	.	+	VM7-*11*	+ *is 11*
			.	.	O	.	.	.	.	.	*						

Blues tritone **L** announces the "turnaround" in bar 9 (arrival of the final four bars). In spite of this being logical in the context, the chord is often substituted, in simple 12-bar blues, by the dominant seventh chord **V***7* containing tritone **Y** that provides a uniform chord progression (all dominant seventh chords). This misleadingly suggests that a progression of dominant seventh chords on roots **I-IV-V** is a defining chord progression of the blues. The substitution is counter-productive because it's misleading — the blues chord progressions follow from blues modes, not from classical modes that determine the chord symbols — and pointless in building-block terms because the keyboard shapes are simple either way. The blues modes do not need tritone **Y**. It is not excluded from the blues — it may appear ornamentally, just as any non-mode tritone may appear ornamentally in any mode — but it should be understood as ornamental when it appears. In these pages, ornamental tritones are shown in a darker of red, when is helpful.

Chords Going Up From Roots

A strength of this notation is the ease of creating variations. The variation shown next is the chord progression itself going up from the roots (it's a variation relative to core harmony). This requires no more than inverting all the tritones of the core harmony except **M**. Again, the essence is captured by red building blocks representing tritones. The overlap with the melody octave is not a problem because it occurs on different beats. Playing this as a variation of core harmony is much easier than playing it cold from the chord symbols, which requires lifting the whole hand, while adjusting the fingers for the different inter-note intervals, and then putting the hand down accurately in a different place, without any direct mode guidance.

Chords Going Up From Roots

```
@       core octave        @
@ P O R M Y L $ . . . . . @ P O R M Y L $
1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5        chord symbols
* . . . M . . - . . x                                  I7
          * . . . x . . - . . R                        IV7
* . . . M . . - . . x                                  I7
* . . . M . . . . . x                                  I7
          * . . . x . . - . . R                        IV7
          * . . . x . . - . . R                        IV7
* . . . M . . - . . x                                  I7
* . . . M . . - . . x                                  IV7
              * . . . . + . - . . . L                  VM7-11        + is 11
         * . . . x . . - . . R                         IV7
* . . . M . . - . . x                                  I7
* . . . M . . - . . x                                  I7
```

A Simple Variation That Implies Very Different Chords

This simple variation is logical in its own terms, and sets the stage for a similar variation (next chapter) of the complex chord progression of *Goodbye Porkpie Hat* that was shown in footnote 2 of the opening chapter. The variation here follows from observing that the repeated tritones **R** and **M** share outer notes when voiced as ■**R** and **M**■ (the shapes are sometimes called "all fourths" because a tritone is an augmented fourth).

```
             @       core octave        @
       . . . @              $ . .                 shifted octave inverts tritones above R
     $ . . . . . @ P O R M Y L $ . . . . . @
     5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
■R   . . x . . . . . R . . . . . x . . .          tritone-octave
■R   . . . x . . . . . R . . . . . x . . .        morphs into this
M■   . . . x . . . . . . M . . . . . . x . .      tritone-octave
M■   . . . x . . . . . . M . . . . . x . . .      morphs into this
```

The variation is shown next. The successive shapes are played by holding the outer interval and moving back and forth between major and minor tonality in between. This is very simple on the keyboard but "sophisticated" in chord notation.

The lone instance of tritone **L** is inverted and voiced the same way. The shape should properly have a major third on top of the tritone instead of a fourth, but the fourth produces a consistent sound that sounds right in a blues context. An added downbeat line cues swing-feel rhythm.

Variation

⚓ 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 |

🥁 ^ ^ ^ ^ ^ ^ ^ ^ ^* ^ ^ ^ ^

⚓ L■ ■R M■ M■

🎵 | p7 p7 —— 5 | 1 p7 5 p5 4 p3 1 | , —— |—— |

🥁 ^ ^ ^ ^ ^ ^ ^ ^ ^* ^*

harmony on the keyboard

		$	x	x	x	x	@	P	O	R	M	Y	L	$	x	x	x	x	@	
bar	shape	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
1	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
2	■R	.	.	.	x	.	.	.	.	R	.	*	.	.	.	x	.	.	.	
3	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
4	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
5	■R	.	.	.	x	.	.	.	.	R	.	.	.	.	.	x	.	.	.	
6	■R	.	.	.	x	.	.	.	.	R	.	.	.	.	.	x	.	.	.	
7	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
8	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
9	L■	.	.	.	.	.	x	.	.	.	.	.	L	*	.	.	.	x	.	turnaround
	or L■	.	.	.	.	.	x	.	.	.	.	.	L	*	.	.	+			
10	■R	.	.	.	x	.	.	.	.	R	.	.	.	.	.	x	.	.	.	
11	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	
12	M■	.	.	.	x	.	.	.	.	.	M	.	.	.	.	x	.	.	.	

The different shapes in this progression have many possible chord interpretations, a few of which are shown next to give a sense of the misleading complexity created by chord symbols bristling with suffixes.

	$	.	.	.	.	@	P	O	R	M	Y	L	$	.	.	.	.	@		
	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
M■				x	.	*	.	.	.	M	.	.	x	.	+				I7-*13*	+ *is 13*
				x	.	.	x	.	.	M	.	*	.	.	+				pV7-*#9*	+ *is #9*
R■				x	.	x	.	.	R	.	*	.	.	.	x				IV*7*	
				x	.	.	x	.	R	.	.	.	x	.	+				pIII7-*#11*	+ *is #11 (b5)*
L■						x	.	*	.	.	.	L	.	.	x	.	+		II7-*13*	+ *is 13*
						+	.	.	x	.	.	L	*	.	.	.	x		VM7-*11*	+ *is 11*
or L■						+	.	.	x	.	.	L	*	.	.	+			VM7-#9(11)	+ *is also #9*

EXAMPLE: *HAPPY BIRTHDAY*

The melody line of this piece was presented earlier as an example of how to notate a melody line in chromatic-scale notation. This melody and the harmony coming up are both in the classical mode called "Ionian" that determines the major scale of a key signature. Looking ahead to the next chapter, the big picture for classical modes is more complex than for blues — multiple single-tritone modes instead of one multi-tritone mode, more fifos in harmony. However a single classical mode is simple by myself, as illustrated next for the master Ionian mode. Classical modes have one tritone and two half tones, attached tritone inside or outside it, depending on its position in the the alphabet — it's outside for the Ionian mode and alternates between inside and outside across the alphabet. The mode signature **//Y** (pronounced "parallel-eye") determines a 4-note symmetric shape (underlined), which determines the mode. The mode is completed by whole tones (o).

```
                      @        core octave        @
                      @ P O R M Y L $ x x x x @
                      1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
mode signature  //Y   o . o . x x . o . o . x x        Ionian mode
```

The single tritone of a classical mode is supplemented by mode fifos in harmony. There are many of them from which to choose, and most of them can be freely substituted for each other (the only exceptions are the mutually dissonant core fifos). The total number of fifos pictured below is twelve (six fifths, six fourths) — which are all the fifos that exist — but four of them go outside the home octave, which leaves eight inside it. Four of the eight are **core fifos** morphed from directly from the mode tritone, and four are **secondary fifos** determined from the completion of the mode by whole tones. The secondary fifos may be understood as morphed from the core fifos by whole tones, or from tritones not in the mode by half tones.

```
                                 @ P O R M Y L $ x x x x @
                                 1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
building blocks  @■, ■$          @ . . . . . . $ . . . . .       scale frame
                 ■Y              x . . . . . Y . . . . . . x     core fifo-octave
                 ■Y            x . . . . . . Y . . . . . . x .   tritone-octave
                 ■M            x . . . . M . . . . . . . x .     core fifo-octave
                 ■M        x . . . . . . . M . . . . . x . . .   secondary fifo-octave
                 ■O        x . . . . . O . . . . . . . x . . .   secondary fifo-octave
                 ■O      x . . . . . . . O . . . . . x . . . . . .   secondary fifo-octave
```

A summary of the melody with an example of anchor harmony is shown next. The harmony line is formed of repetitions of the single mode tritone, with core fifos interspersed between them. The tritone instances go just before the end of phrases that resolve to the tonic in the next step (the second and fourth phrases), or at the end of phrases that resolve later (the first and third phrases). The fifos exercise the mode and join with the tritone instances to provide resolution sequences.

***Happy Birthday*: Ionian Melody Plus Harmony (original in F)**

```
⚓          Y  Y            Y  M       M    Y  Y              Y  Y  M
♫   5* | 6 5 1 | 7, 5* | 6 5 2 | 1, 5* | 5 3 1 | 7 6, 4* | 3 1 2 | 1
```

The core harmony on the keyboard is shown next. The un-inverted tritones tell us that the core harmony octave is **@$@** (F-C-F for tonic F). The melody line moves around the tonic before resolving to it, so the melody octave is **$@$** (C-F-C for tonic F) offset up a fifth. The process of developing core harmony shapes from octaves yields bass line shown. As before, the grey-shaded voicing intervals are the projecting ends of implied fifos. The shapes are voicings of the chords on the right, or of harmonically equivalent inversions (roots are identified by asterisks, omitted chord notes by dashes).

```
                          @      core octave      @ . . . . . . . $  melody . .
                          @ P O R M Y L $ . . . . . @
bar  voicings  implied    1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1     chord symbols
 1     ■Y        OY       . . * . . Y . . . - . . x          IIm7
 2     ■Y        OY       . . x . . Y . * . . . x .          V7
 3     ■Y        OY       . . x . . Y . * . . . x .          V7
 4     ■M        @M       * . . . M . . - . x . . .          I6
 5     ■M        @M       . . x . M . . - . . . x .          IIIm7
       ■Y        OY       . . * . . Y . . . - . . x          IIm7
 6     ■Y        OY       . . x . . Y . * . . . x .          V7
 7     ■Y        OY       . . * . . Y . . . - . . x          IIm7
       ■Y        OY       . . x . . Y . * . . . x .          V7
 8     ■M        @M       * . . . M . . - . x . . .          I6
```

The widely spread-out harmony and melody provide room for the following variation that plays the chords going up from the roots (notice that this is a variation of core harmony, not the other way round). The variation is simple because it requires only inverting selected building blocks upwards and moving selected voicing notes up an octave. Playing this cold from chord notation is much more difficult because of irregular keyboard shapes going up from a jumpy chord root line. It requires the whole hand to be lifted and moved, while adjusting the fingers for different inter-note intervals, and then placing it down accurately.

***Happy Birthday*: Chords Going up From Roots**

```
               @      core octave      @
               @ P O R M Y L $ . . . . . @ P O R M Y L $
               1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5
bar 1   ■Y     . . * . . Y . . . - . . x . . . . .              IIm7
  2     ■Y     . . . . . . . * . . . x . . - . . Y              V7
  3     ■Y     . . . . . . . * . . . x . . - . . Y              V7
  4     ■M     * . . . M . . - . x . . . . . . . .              I6
  5     M■     . . . . * . . - . . . x . . x . . . .            IIIm7
        ■Y     . . * . . Y . . . - . . x . . . . .              IIm7
  6     ■Y     . . . . . . . * . . . x . . - . . Y              V7
  7     ■Y     . . * . . Y . . . . . . x . . . . .              IIm7
        ■Y     . . . . . . . * . . . x . . - . . Y              V7
  8     ■M     * . . . M . . - . x . . . . . . . .              I6
```

Another simple variation creates open voicings, in which the top core building blocks are separated by inverting them upwards (the backslashes indicates separation).

***Happy Birthday*: Open Voicings**

		@			core octave									@								
		@	P	O	R	M	Y	L	$	.	.	.	.	@	P	O	R	M	Y	L	$	
bar	**separated**	**1**	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	
1	O\Y	.	.	O	.	.	.	.	.	.	x	.	.	x	.	.	.	.	Y	.	.	II*m7*
2	O\Y	.	.	O	.	.	.	.	x	.	.	.	x	.	.	.	.	.	Y	.	.	V*7*
3	O\Y	.	.	O	.	.	.	.	x	.	.	.	x	.	.	.	.	.	Y	.	.	V*7*
4	@\M	@	.	.	.	.	.	.	x	.	x	.	.	.	.	.	.	M	.	.	.	I*6*
5	O\M	.	.	O	.	.	.	.	x	.	.	.	x	.	.	.	.	M	.	.	.	vIII*m7*
	O\Y	.	.	O	.	.	.	.	.	.	x	.	.	x	.	.	.	.	Y	.	.	II*m7*
6	O\Y	.	.	O	.	.	.	.	x	.	.	.	x	*	.	.	.	,	Y	.	.	V*7*
7	O\Y	.	.	O	.	.	.	.	.	.	x	.	.	x	.	.	.	.	Y	.	.	II*m7*
	O\Y	.	.	O	.	.	.	.	x	.	.	.	x	.	.	.	.	.	Y	.	.	V*7*
8	@\M	@	.	.	.	.	.	.	x	.	x	.	.	.	.	.	.	M	.	.	.	I*6*

CHAPTER 3: THE MODE HIERARCHY

Multi-tritone chromaticism is explored via examples understood in the context of the mode hierarchy. The blues path is followed farther up in the hierarchy because is simpler at all levels in these terms. Blues examples are *Goodbye Porkpie Hat* and a revisit to *Backwater Blues* that explores variations based on classical modes. The classical slide only goes as far as chromatic classical modes, with examples *Over the Rainbow*, *I Got Rhythm* and *Giant Steps.*

```
                          atonal modes
                     /                   \
              minor & major              blues family
              families |   \            /  |
                       |    bridge modes   |
                       |                   |
this chapter:   classical modes          basic blues
                     \                   /
                        pentatonic modes
```

FROM PENTATONIC MODES TO THE MODE HIERARCHY

Pentatonic modes are the basic modes of music in many cultures worldwide because the absence of dissonance — no half tones or tritones — makes music easily singable, hummable or whistleable by people with musical ears but no musical training.

Parallel pentatonic major and minor modes are shown next in terms of the universal home octave.

```
                                    @ P O R M Y L $ . . . . @
                                    1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
      scale frame @$                x . . . . . . x . . . . x    establishes basic consonance

      fourth M                      . . . . x . . . . x . . .    establishes major tonality
      fourth O                      . . x . . . . . . x . . .    splits lone major third
//M   parallel pentatonic major     x . x . x-----x . x-----x

      fifth R                       . . . x . . . . . . x . .    establishes minor tonality
      fifth Y                       . . . . . x . . . . x . .    splits lone major third
//R   parallel pentatonic minor     x-----x . x . x-----x . x
```

The inter-note intervals of the completed modes are whole tones and minor thirds, the latter highlighted as being deliberately empty by joining their notes by horizontal lines (this is helpful because minor thirds are relatively rare scale intervals that can look as if they shouldn't be empty).

The establishes the form of signatures of parallel modes as the anchor letters of defining building blocks, prefixed by **//** (pronounced "parallel"). The defining building blocks here are the fourth **M** for major and the fifth **R** for minor because everything else is "boilerplate" that follows by construction on the keyboard.

The most visible instances of pentatonic modes on the piano are the clusters of 5 black piano keys within the C-octave: the major mode starts on the bottom black key of the 3-tritone cluster, and the relative minor mode (same notes) on the next black key down. A lot of fun can be had and insight gained by experimenting with these black-key modes, and the corresponding parallel modes. The parallel modes are so close to the 6-note basic blues mode (coming up) that experimenting with blues is easy.

PARALLEL BLUES MODES

Backwater Blues introduced a 6-note blues scale called “minor blues” that was taught to me when was I started out — and I am sure is taught to all beginners — as “the” blues scale. It has a companion “major blues” scale that’s a parallel mode of it. Both scales are straightforward developments of pentatonic modes that add one note, which combines with a pentatonic note to form a tritone. Thus do tritones enter the blues picture.

This can be understood as a result of musicians “bending” major note **3** of the pentatonic major mode into major note **p3** to get a happy-sad effect, and liking the result well enough to incorporate into a new mode called **major-blues** (the tonality is minor-major but the name refers to the pentatonic-major origin). The bent note combines with note **6** of the original mode to form minor tritone **R**. The **minor-blues** mode introduced by *Backwater Blues* is a parallel mode of this major blues mode (same interval sequence starting a minor third up). The tritone a minor third up is **L**, which has note **p5** as in anchor — the famous flatted 5th of the blues. The mode signatures add the tritones to the original fifos.

	@	P	O	R	M	Y	L	$	x	x	x	x	@	
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
//M	x	.	x	.	x	—	—	x	.	x	—	—	x	**pentatonic major**
//MR	x	.	x	x	x	—	—	x		x	—	—	x	**major blues is pentatonic major + tritone R**
//R	x	—	—	x	.	x	.	x	—	—	x	.	x	**relative pentatonic minor**
//RL	x	—	—	x	.	x	x	x	—	—	x	.	x	**minor blues is pentatonic minor + tritone L**

The mashup (union) of the two 6-note blues mode is a 9-note family blues mode. The mode signature is all-tritone (the non-tritone notes come from the pentatonic modes). The family mode captures the following features of blues: mixed tonality identified by **RM**, three “bent” notes **p3**, **p5** and **p7** from the three tritones, five adjacent half tones in the lower fifth, three whole tones above the lower tonic and pitch center, and below the upper tonic, and two more notes than the seven notes of classical modes. Ionian tritone **Y** is not part of this family mode derived in this logical way, although it may be an ornamental addition.

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

The family mode has many sub-modes. Not encountered so far are double-tritone bridge modes shown next (the double and single horizontal lines in rows of the table highlight major and minor thirds in the double tritones that determine these modes).

	@	P	O	R	M	Y	L	$	x	x	x	x	@	
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
//RM.L	x	.	x	x	x	x	x	x	.	x	x	.	x	**family mode**
//M.L	x	.	x	.	x	.	x	x	.	x	x	.	x	**bridge mode: Mixolydian-#4, or Lydian-*b7***
M.L	x	=	=	=	x	.	x	=	=	=	x	.	x	**based on this double tritone tritone**
//R..L	x	.	x	x	—	—	x	x	.	x	x	.	x	**bridge mode: Dorian-*#4***
R..L	x	—	—	x	—	—	x	—	—	x	—	—	x	**based on this double tritone**

The altered degree numbers ***#4*** and ***b7*** in the conventional descriptions of these modes on the right are only for information, and are not part of PKP representation. For example, note **p7** in the ***//*****M.L** mode is the top note of tritone **M**, which can be understood in conventional terms as the flatted 7th degree of the Lydian classical mode. This note makes the ***//*****M.L** mode a sub-mode of the blues (which the ***//*****L** mode is not). Bridge modes will be visited in detail in the next chapter.

A Sophisticated Blues Example: *Goodbye Porkpie Hat*

This blues in Eb, the complex chord progression of which was shown in footnote 2 of the opening 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), where it's presented with a 3-flats key signature and many accidentals. Trying to learn this piece from this source was one of the stimuli that sent me down the path to PKP.

It's a 12-bar blues with an unusual 6-2-4 bar layout, in which the middle 2 bars are a minor-ish variation. The melody line in all but these two bars is in the same 6-note minor blues mode as *Backwater Blues* in the previous chapter, and the harmony is similar in kind to the final variation of it. The melody is played in swing-feel 4/4 time — commas indicate phrases terminated by a downbeat, with the note following the comma on an upbeat. In the minor-ish variation, the **1.p2** notation in bar 7 means the first note is "crushed" into the second note on the same beat. The complex written chords shown on the next page are satisfied partly by the anchor line shapes, partly in the flow, and partly by melody notes — knowing they're satisfied is useful, but knowing it doesn't make dealing with the chord notation any easier. The shape notation is easy.

***Goodbye Porkpie Hat* : Blues Melody Plus Harmony (original in Eb)**

⚓ ■M L■ ■Y ML ■Y L■
♫ **5 | 1 p3 , 1 p3 4 p3 , 1 p7 | 1 p3 , 1 p7 1 , 5 | 1 p3 , 1 p3 p5 p3 , 1 p7 |**

⚓ ■Y ■M ■Y L■
♫ **| 1 p3 , 1 p7 1 , 1 | 5 p7 , 1 p3 4 p3 , p7 p3 |**

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

⚓ L■ ■Y M■ R■ Y■ L■ ML
♫ **| p3 1 , p5 4 | p3 1 , | 4 p3 1 p7 , p5 4 p3 1 | p3 1 , |**

⚓ P■ ML
♫ **| 5 4 p3 , 1 p7 5 |**

The first five bars establish a very simple harmonic pattern that's similar to the one in the final variation of *Backwater Blues* in the previous chapter. This pattern establishes a framework for understanding the rest of the harmony. The pattern is determined by the blues tritones **R**, **M** and **L** from the written chords. Tritones **M** and **L** that appear often are joined in double tritone **ML**, which splits into shapes ■**M** and **L**■ that provide most of the core harmony. The voicing intervals indicated by the grey-box prefixes and suffixes are understood to be major thirds implied by the outer interval of the double tritone. Smooth transitions between these shapes are provided by the all-fourths shape ■**Y** that originates in many different chords but is always part of the blues. Blues tritone **R** appears later only once (bar 9), where it may be understood to be the turnaround marker.

The harmony is shown next as it appears on the keyboard, with ornamental (non-blues) tritones shown in a darker shade of red. The simple blues pattern of bars 1-5 is broken by the minor-ish variation in bars 6-7. The blues returns for bars 8-12, in a slightly different format, for variety. The appearances of non-blues tritones are like passing notes in melody — they're faired into the flow.

```
                @      core octave     @
                1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
                @ P O R M Y L $ x x x x @
1    ■M         * . . . M . . . . . x . .     I7#9          blues
     L■         x . . . . . L . * . x . .     pVI9(13)
2    ■Y         x * . . . Y . . . . x . .     pIIM9
     ML         x . . . M . L . . . * . .     pV7#11
3    ■Y         x . * . . I . . . . x . .     II9sus
     L■         x . . . . ~ L . * . x . .     pVI9(13)
4    ■Y         x . * . . Y . . . . x . .     II7sus
     ■M         * . . . M . . . . . x . .     I7
5    ■Y         x . . . . Y . . . . x . .     IVm11
     L■         @ . . . . . L . * . x . .     pVI7(13)

6    O■         . . O . . . . . x . . . . x   IIm7b5        variation
     Y■       x . . . . . Y . * . . x . .     V7#5#9
7    P■         . P . . . . . x . * . . x     VI13#11
     L■         x . * . . . L . . . . . x .   II7(13)

8    L■         x . . . . . L . * . . . .     pVI7          blues
     ■Y         x . * . . Y . . . . x . .     pIIM7

9    ■M     x . . . . . . M . . . . . * . .   pV7(13)
     ■R   x . – . . . R . * . . . x . . .     IV7           turnaround
10   ■Y       x . . . . . Y . * . . . x .     V7
     L■         x . * . . . L . . . . . x     II7
11   M L        * . . . M . L . . . x . .     I7#9 + pVI7   set up for repeat
12   P■         . P . . . . . x . . . . x     pIIM7#11
     ML         x . . . M . L . . . * . .     pV7#11
```

Three styles of harmony are present. In bars 1-5, the outer notes stay fixed (determined by the bridge 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.

Many of the alterations in the chord symbols on the right are provided by context. For example, ***#9*** of the **I*7#9*** chord in bar 1 is melody note **p3**, and the **pII** roots are byproducts of tritone substitutions. The free use of tritone substitute chords (same tritone, root a tritone away) makes for a complex written chord progression. These chords have all non-tritone notes different.

PARALLEL CLASSICAL MODES

Happy Birthday to You introduced the classical Ionian mode as default major mode of a key signature. Other modes follow from pentatonic modes by filling in their empty minor thirds with one whole tone and one half tone in all possible ways, which adds a tritone and two half tones to each mode. The immediate result is the six primary parallel modes on the left, listed in the order of their tritones on the keyboard (pairs of "x" entries). The mode signatures are tritone anchor letters prefixed by "//" standing for "parallel." The master mode is identified by "**>**". The symmetric, 4-note **mode constructor** shapes follow from the one seen earlier for the master Ionian mode. Completion whole tones are identified by "o" entries. Master tonics highlighted in blue zig-zag down down by fifths and up by fourths within the home octave (in other words, the relative modes starting on the blue-highlighted tonics and wrapping around are all the master Ionian mode). Modes marked ✖ aren't parallel modes because they don't include the home tonic, but are important because they come into play mode changes.

primary modes

		@	P	O	R	M	Y	L	$	x	x	x	x	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	//L	x	.	o	.	o	.	x	x	.	o	.	x	x	Lydian
>	//Y	x	.	o	.	x	x	.	o	.	o	.	x	x	Ionian
	//M	o	.	o	.	x	x	.	o	.	x	x	.	o	Mixolydian
	//R	o	.	x	x	.	o	.	o	.	x	x	.	o	Dorian
	//O	o	.	x	x	.	o	.	x	x	.	o	.	o	Aeolian
	//P	x	x	.	o	.	o	.	x	x	.	o	.	o	Phrygian

derived modes (all non-tritones notes different)

	@	P	O	R	M	Y	L	$	x	x	x	x	@	
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
altL	x	x	.	o	.	x	x	.	o	.	o	.	x	Locrian
✖ altY	.	o	.	o	.	x	x	.	o	.	x	x	.	
✖ altM	.	o	.	x	x	.	o	.	o	.	x	x	.	
✖ altR	.	o	.	x	x	.	o	.	x	x	.	o	.	
✖ altO	.	x	x	.	o	.	o	.	x	x	.	o	.	
✖ altP	.	x	x	.	o	.	x	x	.	o	.	o	.	

The six derived modes on right follow from the same primary modes for the inverted mode tritone. Inverting a tritone is the same as transposing it by a tritone, so the modes are the primary modes transposed by a tritone. The derived modes are harmonically equivalent modes within the home octave with the same tritone and all non-tritone notes different. The mode signatures are the tritone anchor letters prefixed by **alt**. Borrowing a term from chord notation, they may be understood as **tritone substitute modes**. The **altL** mode (Locrian) is a seventh parallel mode because tritone **L** contains the home tonic. The other **alt** modes are unnamed relative to the home tonic, but the mode signatures provide equivalent handles for them. Having them all "under one roof" is important because all come into play into changes understood relative to the home tonic.

The parallel modes are listed in tritone order, which provides the useful feature that modes in successive rows of the table differ by one note.

Answering a Question

The following question was asked 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 is provided by the following picture. It illustrates, for the Ionian mode, a tritone-octave morphing directly into 4 fifo-octaves, each of which provides 2 fifos (1 fifth, 1 fourth).

primary mode:

```
        @ P O R M Y L $ . . . . . @
■Y    . x . . . . . Y . . . . . . x
■Y    x . . . . . . Y . . . . . . x .
■M    x . . . . M . . . . . . x .
```

alt mode:

```
        @ P O R M I L $ . . . . . @
■L      x . . . . . . L . . . . x .
■Y      x . . . . . . Y . . . . . . x .
■Y    x . . . . . . Y . . . . x . .
```

The different morphings determine different parallel modes. Given the establishment of a mode by one of these core sequences, morphing the tritone in the opposite direction from the one that established the mode will sound wrong to the ear, suggesting the opposite core. Thus, changing one note of a core fifo by a half tone changes the mode. Knowing the simple relationship between the cores enables rejection of fifo possibilities that don't fit a particular mode. For example, the establishment of an Ionian mode by the core sequence **Y-Y-M** excludes the fourths of its alt mode determined by the core sequence **L-Y-Y**.

Two Sides of the Same Coin

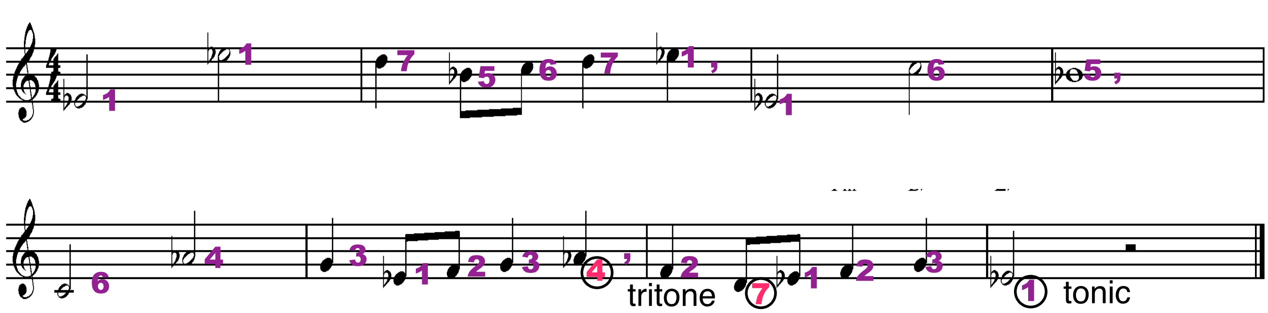
Parallel mode changes and same-mode tonic changes are "two sides of the same coin." Footnote 1 of Chapter 1 provided an example of music notation's complex representation of parallel mode changes that are both fundamental to music and simple on the keyboard. We now have the notation to illustrate the simplicity, not only of the mode changes but also of the tonic changes that are the "other side of the coin."

The mode change from major (Ionian **//Y**) to parallel minor (Aeolian **//O**) is simple by any measure. The corresponding same-mode tonic change that's the other side of coin is Ionian to Ionian up a minor third. This is implicit in the notation at bottom left but may be made explicit by the notation at bottom right, which means "transpose **//Y** to tonic **@p3**" (which is different from writing **//Y@p3**, which only specifies a relative tonic in the same scale).

	Db C# @ 1	P p2	Eb D# O 2	E R p3	F M 3	Gb F# Y 4	L p5	Ab G# $ 5	A x p6	Bb x 6	x p7	C x 7	Db C# @ 1	
														5 flats to 4 sharps alters 9 note symbols
//Y	x	.	o	.	x	x	.	o	.	o	.	x	x	**but only alters 3 yellow-highlighted notes**
//O	x	.	x	x	.	o	.	x	x	.	o	.	x	
//O@p3	o	.	x	x	.	o	.	x	x	.	o	.	o	**same-mode tonic change is tr[//Y]@p3**

Dipping a Toe into Classical Chromatic Waters: *Over the Rainbow*

Multi-tritone chromaticism occurs in the domain of classical modes when a piece either visits successive classical modes, over stays in one classical mode while incorporating ornamental tritones. This example dips a toe into chromatic waters by developing strongly chromatic ornamental harmony from scratch for the opening melody phrase of *Over the Rainbow*. The melody is straight Ionian (**//Y**), trending downwards in zig-zags over an the home octave of home tonic Eb (the implied Ionian key signature is 3 flats).



Here follows a summary of melody plus chromatic harmony in PKP notation. The harmony consists of all the tritone anchors in reverse order starting on **L** and wrapping around: **L-Y-M-R-O-P-L-Y**. This harmony exploits the fact that all fifos of a classical mode are morphed from *some* tritone, making it easy to find a melody note that can be harmonized by a tritone. The absence of tritone inversions in the summary follows from choosing the harmony home octave on the keyboard to be straight **@$@**. The melody octave is the next octave up.

Over the Rainbow **: Ionian Melody Plus Chromatic Harmony (original in Eb)**

⚓ **L Y M R O P L Y**

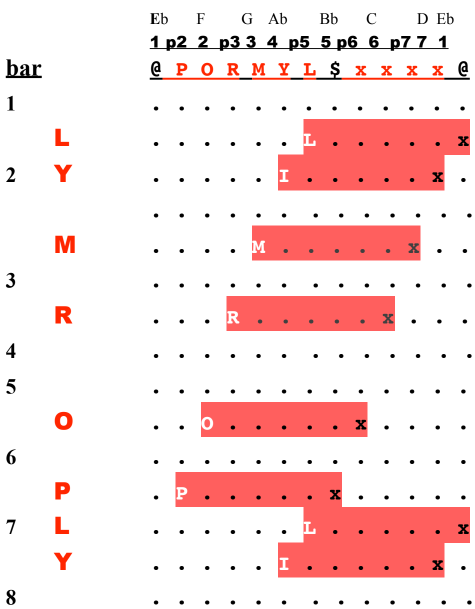
♫ **| 1 1 | 7 5 6 7 1, | 1 6 | 5, | 6 4 | 3 1 2 3 4, | 2 7 1 2 3 | 1, |**

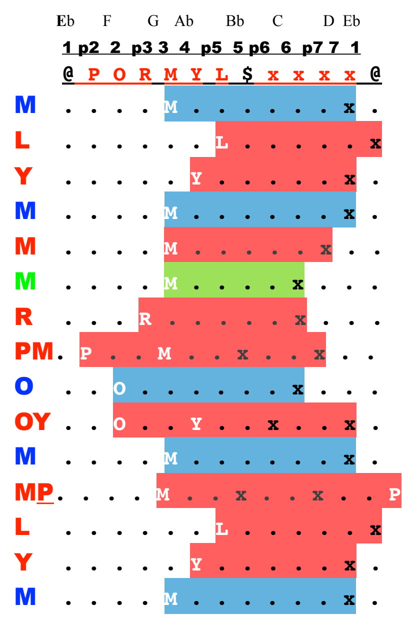
This harmony line, with ornamental additions, is shown next. The original tritones provide a fixed framework for adding core fifos of the mode and some other variations. This harmony demonstrates the flexibility of many fifos being understood as morphed from many fewer tritones. Play the single building blocks as octave shapes that go with the flow.

⚓ **M L Y M M M R PM O OY M MP L Y M**

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

Here's how such harmony is developed on the keyboard, starting from the tritones. The double tritones provide elegant symmetric relationships between successive shapes: the sequence **PM-O** shrinks the outer notes of the double tritone inwards a half tone; and **O-OY-M** moves a fifth aligned with the bottom note of **OY** to a fifth aligned with the top note.





Cascaded Classical Modes: *I Got Rhythm*

The Gershwin piece *I Got Rhythm* — taken here from *The Standards Real Book*, Sher Music (2000), p191 — is the origin of widely copied chord changes known as “Rhythm Changes” by jazz musicians. The changes move through successive parallel modes of the home tonic, first by ornamental harmony that suggests the changes without executing them, and then by actual changes. Dealing with these changes can be challenging in music notation, depending on the key signatures involved.

A new mode-change line (marked ◒) is added on top, in which changes are identified by the prefix “ ┌ ” (the change persists until next mode signature appears).

◒ ┌ //Y
⚓ Y Y Y Y Y M R O Y Y M Y
♫ | — 5 6 | 1 2, | 2 1 | 6 5 , | 5 6 | 1 2 4 2, | 3* 2 3 2 | 1, — |

◒ ┌altO ┌ altP ┌//L ┌ //Y
⚓ O O O P $ L Y Y
♫ | 3 3 | 3 p5 , | 3 3 | 3 6 , | 2 2 | 2 3 , | 2 2 | 5 , |

The **M-R-O** tritone sequence in bars 1-8 is 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 minor and the melody line in bars 10-11 is major, so it must be **altO** (same tritone, all non-tritone notes different). The same goes for tritone **P** in bars 12-13: the mode is **altP**. The mode in bars 14-15 is ***//L*** and bar 16 returns to ***//Y***. 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 ***//Y*** to **altO** in bars 8-10.

The mode changes are shown in following mode table. The symbols in far right column indicate transpositions of the home Ionian mode.

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

The other side of the coin of parallel mode changes is the Ionian tonic changes shown on the right (up a major sixth and then down by fifths). However, the melody line stays close to the original Ionian mode and doesn’t actually follow these tonic changes. It resolves to relative tonics **p5-6-3-5** instead of **6-2-5-1**.

The harmony of bars 4-7 is shown next. 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 using grey box prefixes and suffixes.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
		@	P	O	R	M	Y	L	$	x	x	x	x	@	
4	■Y	.	.	*	.	.	Y	.	.	.	.	.	.	x	II-*m7*
	■Y	.	.	x	.	.	Y	.	*	.	.	.	x	.	V-*7*
6	■Y	.	.	x	.	.	Y	.	*	.	.	x	.	.	V-*m7*
	M■	.	.	.	.	M	.	.	.	.	.	x	.	*	I-*7*
6	R■	.	.	.	R	.	*	.	.	.	x	.	.	x	IV-*7*
	O■	.	.	O	.	.	.	.	.	x	.	*	.	x	pVII-*9*
7	■Y	.	.	*	.	.	Y	.	.	.	.	.	.	x	II-m7
	■Y	.	.	x	.	.	Y	.	*	.	.	.	x	.	V-*7*

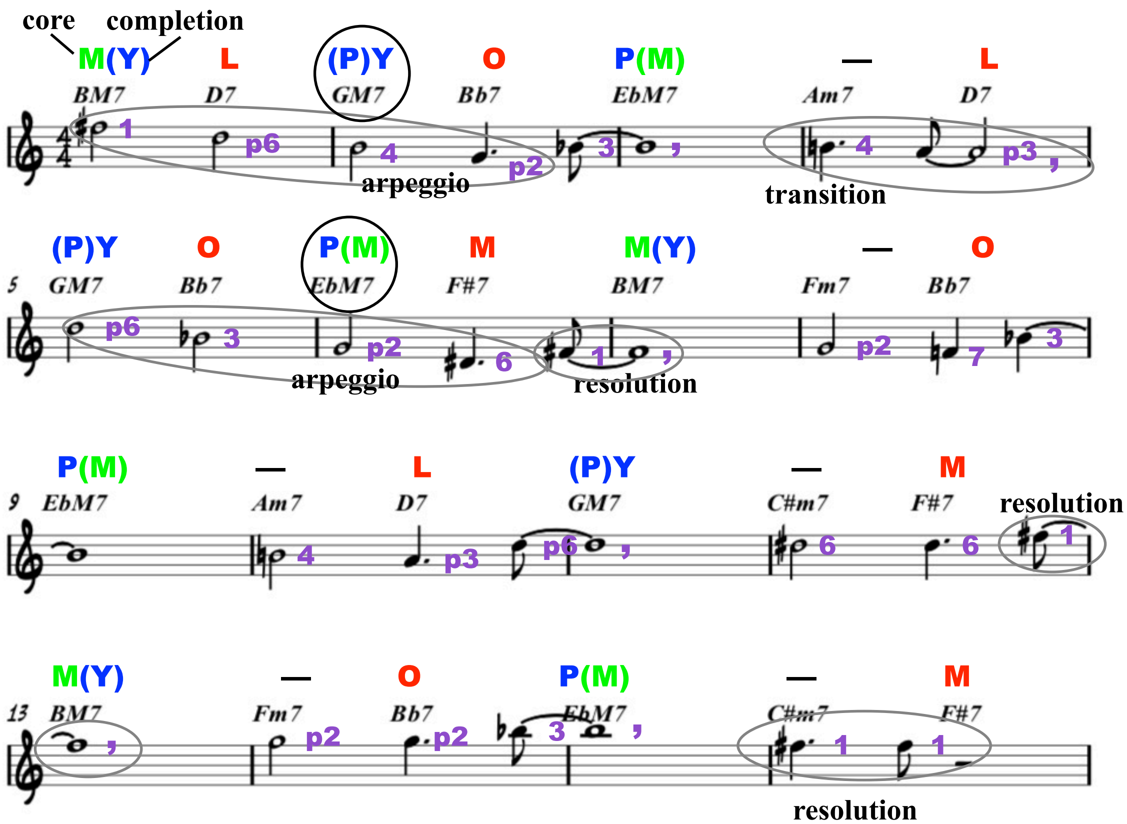
The harmonic sequence for bars 9-16 where the mode changes occur is shown next.

			1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
			@	P	O	R	M	Y	L	$	x	x	x	x	@	
9	O■		.	.	O	.	.	.	.	.	.	x	.	*	.	VII-*m7*
10	O■		.	.	O	.	*	.	.	.	x	.	.	x	.	III-*7*
11	O■		.	.	O	.	*	.	.	x	.	.	.	x	.	III-*m7*
12	P■		.	P	.	.	.	.	.	x	.	*	.	.	.	VI-*7*
13	$■		x	.	.	.	.	.	.	$	.	*	.	.	.	VI-*m7*
14	L■		x	.	*	.	.	.	L	.	.	x	.	.	.	II-*7*
15	Y■		x	.	*	.	.	Y	.	.	.	x	.	.	.	II-*m7*
16	Y■	x	.	.	.	.	.	Y	.	*	.	.	.	.	.	V-*7*

The **VII-*m7*** chord in bar 9 includes note **p5**, of the **altO** mode. After that, the only notes that go outside the Ionian 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 that are not exploited here but could be.

<u>Pushing the Classical Envelope: *Giant Steps*</u>

Coltrane's famously difficult jazz classic *Giant Steps* presents in music notation as rapid changes between Ionian modes of tonic G (1 sharp), tonic B (4 sharps) and tonic Eb (3 flats) that differ from each other by 4 notes (the "giant steps"). However, the way it does it is simple when viewed in PKP terms. Shown next is an annotated Sibelius copy of a chart for this piece (from *The Real Book*, 6th Edition, Hal-Leonard). The harmonic progression is simple by itself — a succession of basic **II-V-I** chord progressions of each of these modes, with the **II** chord often omitted. The essence of these progressions is a tritone morphing into a fifo. The melody mode is simple because melody notes are cherry-picked from the Ionian modes to make it so, for home tonic F# a half tone below Ionian tonic G. The Ionian tritones relative to tonic F# are **O**, **M** and **L** and the tritone-fifo morphs are **O-P**, **M-M** and **L-Y**. The fifos combine in pairs to form three major seventh chords. The fifo combination **PMY** determines a 6-note, atonal scale called "augmented" which determines, with a couple of transition notes, a simple 8-note melody scale of tonic F#.



The following mode table summarizes the PKP picture (* identifies chord roots). The **OML** tritones morph into the **PMY** fifos that determine the atonal mode. The **OML** tritones themselves disappear from the melody line (only one note of each remains) but they remain its formative tritones. The transition notes identified by "**+**" form tritones with notes of the atonal scale, but these tritones and the fifos don't form a coherent mode. So the melody line boils down a simple atonal mode determined by the harmony tritones, with added transition notes.

		F#	G				B			Eb				F#	<—tonics
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
		@	P	O	R	M	Y	L	$	.	.	.	.	@	
D*7*	**L**	x	.	.	.	.	.	x	.	*	.	.	.	x	
G*M7*	**(P)Y**	.	*	.	.	.	x	.	.	x	.	.	.	x	
B*b7*	**O**	.	.	x	.	*	.	.	.	x	.	.	.	.	
Eb*M7*	**P(M)**	.	x	.	.	x	.	.	.	x	*	.	.	.	
I*7*	**M**	*	.	.	.	x	.	.	.	.	.	x	.	.	
B*M7*	**M(Y)**	.	.	.	.	x	*	.	.	.	x	.	.	x	
atonal scale	**PMY**	x	x	.	.	x	x	.	.	x	x	.	.	x	
melody scale		x	x	.	+	x	x	.	.	x	x	.	+	x	**OML missing**

Here follows a summary of melody plus skeleton harmony. The inversions of the **M** and **L** tritones in bars 4-7 get them out of the way of the descending melody line in these bars. The six dashes in the anchor line are placeholders for in-line fifos to be added from context (they originate with the **II** chords of the original Ionian modes).

Giant Steps **(original in F#)**

⚓ **M L Y O P — L Y O P M M**

🎵 **| 1 p6 | 4 p2 3 | —, | 4 p3 , | p6 3 | p2 6 1 | —, |**

🥁 **^^ ^ ^ ^ ^ ^ ^ ^* ^^ ^ ^ ^ ^^ ^ ^^ ^^ ^***

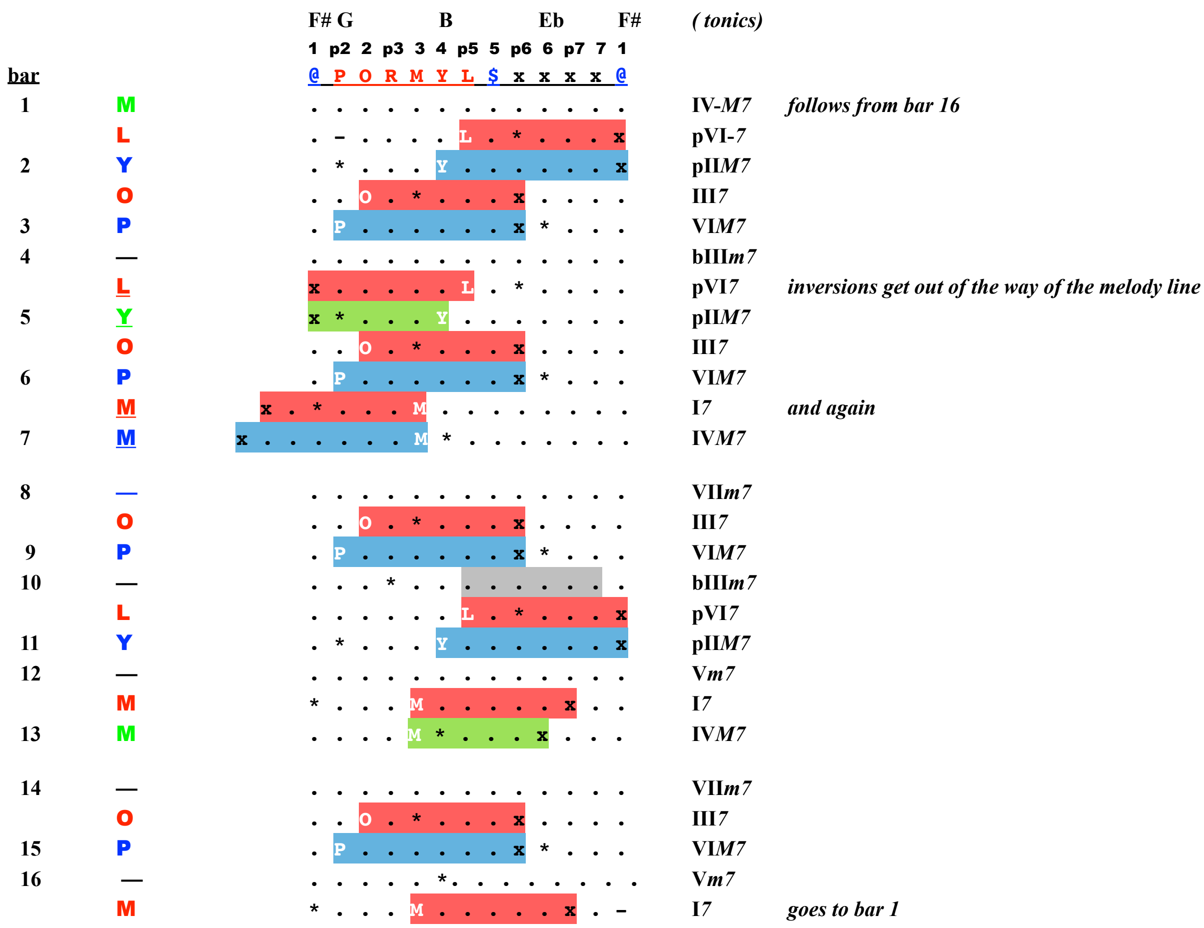
⚓ **— O P — L Y — M M — O P — M**

🎵 **| p2 7 3 | —, | 4 p3 p6 | —, | 6 6 1 | —, | p2 p2 3 | —, | 1 1 — |**

🥁 **^^ ^^ ^* ^^ ^^ ^* ^^ ^^ ^* ^^ ^^ ^* ^^ ^^**

The only trace left of three rapidly changing Ionian modes from distant key signatures is the **OML** harmony tritones morphing into the **PMY** fifos — each tritone always provides the same next fifo in the core harmonic sequence. The main thing to remember is this piece doesn't actually exercise the classical modes identified by the tritones. This skeleton gives a good sense of the sound of the piece and is easy to play. Once this is "in the fingers," adding the missing details is easy.

Here follows a Lego-like view of the core harmony. This simple harmony fits the written chords shown on the right (chord roots are indicated by *). The fifo placeholders easily filled in from the flow.



I spent countless hours trying to figure out this piece over the course of development of these ideas, and annoying experts I consulted with half-baked ideas about its organization. An example of a half-baked idea was imagining that the essence of the piece is scales defined by double tritones from the whole tone **O.M.L** scale. No matter how much I massaged this view, it became complicated and sounded wrong. Experts concluded my "engineer's view" of piano music is inherently complex. It isn't — I just didn't fully understand it at the time. It took me a long time to understand the underlying symmetries that make it simple.

This interpretation is easy to understand and play and provides a much simpler basis for variations than the rapidly changing, distant classical modes of the original.

CHAPTER 4: BRIDGE MODES

The double-tritone modes I have come to call **bridge modes** originate in master modes called **melodic minor**, **harmonic minor** and **harmonic major** that alter one note of a classical mode by a half tone. The master modes are individually simple, but the suites of parallel modes generated from them are bewilderingly complex, in aggregate, in musical notation. They're intricate in detail, and are known by an alphabet soup of complex and exotic names, often many different names per mode (see Appendix D). I have ever heard or read an explanation of the origin of the terms "melodic" and "harmonic," but this chapter suggests one: the highly regular forms of the scales of the melodic modes may have been thought more suitable for melody than the highly irregular ones of the harmonic modes. The modes are important because they're common in chromatic music. Nothing demonstrates the useful role of tritones in understanding music better than these modes. Nothing obscures it better than music notation.

Mode signatures with two letters provide four of seven notes of each these modes, and one additional reference note (the transposed master tonic) is sufficient to complete the mode by whole tones. The mode signatures take care of the details, by construction, and are easy to relate to other modes in these suites or elsewhere in the mode hierarchy.

Examples are provided by *Summertime* and *Laura* in this chapter and by other pieces in subsequent chapters.

```
                                   atonal modes
                                 /              \
                       minor & major          blues family
                       families |  \          /  |
    this chapter:               |   bridge modes |
                                |                |
                         classical modes     basic blues
                                 \              /
                                 pentatonic modes
```

COMPLEMENTARY MELODIC & HARMONIC MODES

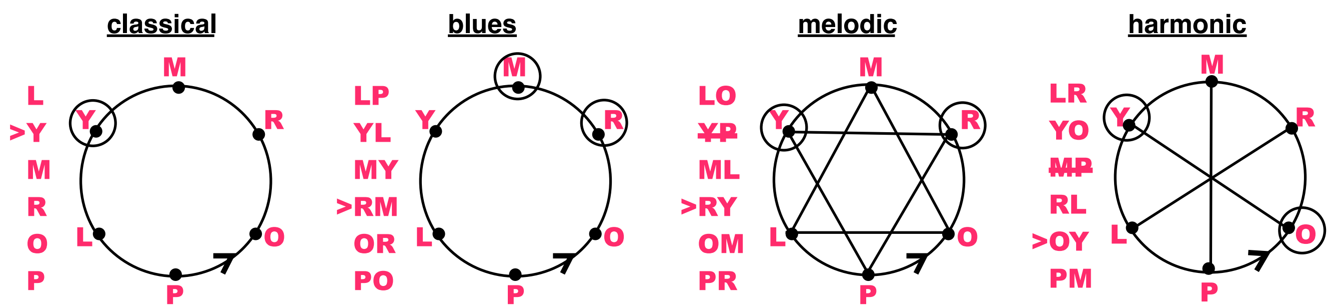
Separate tables of the parallel melodic and harmonic modes are provided in Appendix D, for reference, but the basic modes are best understood first as complementary modes originating in shared contexts determined by tritone content, identified by simple, 2-letter words. The master modes are shown next. The classical mode names with altered degree-number suffixes identify the modes in conventional terms, but this quickly bogs down in details when trying understand inter-mode relationships in suites of parallel modes. These things are better sorted out in terms of the identifying 2-word letter words.

			@	P	O	R	M	Y	L	$	.	.	.	.	@	
mode	**word**	**unambiguous signature**	**1**	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**	
melodic-minor	**R.Y**	**//RY**	x	.	o	x	.	x	.	o	.	x	.	x	x	**Ionian-*b3* provides context**
harmonic-minor-major	**O..Y**	**//OY**⊕	x	.	x	x	x	x	.	o	x	—	—	x	x	**harmonic-minor-major**
harmonic-minor	**O..Y**	—	x	.	x	x	▮	x	.	o	x	—	—	x	x	**Aeolian-*#7* from context**
harmonic-major	**O..Y**	—	x	.	x	▮	x	x	.	o	x	—	—	x	x	**Ionian-*b6* from context**

The word **R.Y** is unambiguous for the 7-note modes but the word **O..Y** is ambiguous (the optional dots indicating skipped letters are useful to keep in all mind). The 8-note union of the harmonic-minor and -major modes is unambiguous for minor-major tonality, leaving actual tonality to context The superscript indicates filling in the underlined minor third that is offset from the empty minor third in the mode. The 8-note mode reduces by context to two suites of 7-note modes by omitting the blacked-out notes.

Words the identifying the tritone content of suites of parallel modes are summarized next against a background of the alphabet as a circular loop, that does not include the tonic and pitch center. The master words identified by **>** are outlined in the loop. All the arcs are half tones between same inversions of tritones, except **P**-**L** and **L**-**P**, which is a fourth between oppositely inverted tritones, which is harmonically equivalent to a half tone. The home tonic and pitch center are in these fourths but not in conceptual loop of half tones.

This presents a continuum of modes identified by single tritones and by double tritones with half-tone offsets (**RM**), whole-tone offsets (**R.Y**) and minor-third offsets (**O..Y**). The example with a half-tone offset is “cooked up” to fill a gap in this logical continuum, without itself contributing to the bridge modes (blues is too chromatic to need parallel modes). The melodic and harmonic modes are the end of the continuum because no more double tritones with different notes exist. The melodic modes are determined by six different words, the last two of which wrap around in the loop. The harmonic modes are determined by only three different words that wrap in the around to loop to the same words with the letters in the opposite order. In each case, the first word of the overlap is crossed out as an identifier of a parallel mode, because the double tritone crosses the home tonic in a way rules it out a note of the mode.



The master melodic minor mode is very simple, namely one whole-tone short of a whole-tone scale. The double tritone **RY** provides four of seven notes (think of it as **R.Y** because this brings forward to the eye the whole-tone interval between the letters). The double tritone provides a symmetrical constructor shape that combines with the tonic to form an asymmetric shape that’s completed by whole-tones.

The harmonic minor and major modes are simple in a different way. The double tritone **OY** provides the same four notes for both modes (think of it as **O..Y** because this brings forward to the eye the minor-third interval between the letters). A minor-third is a half tritone on the keyboard, so the double tritone is a stack of three minor thirds. All inter-note intervals are same in any inversion, so only three harmonically different double tritones of this shape exist on the keyboard (the shape is conventionally known as a “diminished seventh chord” but this too a narrow definition for our purpose).

As for classical modes, the primary modes have **alt** modes (not shown here) with the same tritone content and all non-tritone notes different.

LOOKING AHEAD

Looking to the next chapter, we now have enough information to get a sense of how melodic and harmonic modes can be complementary in shared contexts. In each case, the home tonic (original, or transposed for a parallel node) is highlighted in blue. The blacked-out entry establishes the correct master tonality.

Example 1: Shared Minor Context

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
melodic minor	//RY	x	.	o	x	.	x	.	x	.	x	.	x	x	minor home tonality
harmonic minor	//OY$^{\oplus}$	x	.	x	x	■	x	.	x	x	—	—	x	x	master from context
shared context	//OR.Y	x	.	x	x	.	x	.	x	x	—	—	x	x	minor family

Example 2: Shared Major Context

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
melodic major	//OM	x	.	x	.	x	x	.	x	x	.	x	.	x	major home tonality
harmonic major	//OY$^{\oplus}$	x	.	x	■	x	x	.	x	x	—	—	x	x	master from context
shared context	//O.MY	x	.	x	.	x	x	.	x	x	x	x	x	x	major family

Example 3: Shared Blues Context

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
transposed master	//ML	x	.	o	.	x	.	x	x	.	o	x	.	x	major home tonality
transposed master	//RL$^{\oplus}$	x	.	x	x	—	—	x	x	.	x	x	■	x	minor home tonality, master from context
shared context	//RM.L	x	.	x	x	x	x	x	x	.	x	x	.	x	blues family

BRIDGE MODE TABLES

The following tables summarize the bridge modes independently (they're repeated in Appendix D with more details). The tables only for reference because the modes are easily created without them. The prefix "//" is inherited from classical modes, where it's shorthand for "parallel." For the bridge modes, it identifies six primary words transposed by single alphabet steps, not all of which identify parallel modes. Any primary mode may constructed from the double tritone determined by the mode signature, plus a transposed master tonic (highlighted in blue) determined by counting a fifth for each alphabet step between the master word and the signature word (**alt** modes are offset by a tritone from this). Modes that are not parallel come from inter-tritone arcs in the circular loop that cross the home tonic in a way puts in it an incompatible scale position. Modes marked ✖ have one compatible position; one mark ✖✖ have none.

Melodic Modes

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	//LO	x	.	x	.	o	.	x	.	x	x	.	o	x	Lydian-#5
✖	//YP	.	x	x	.	o	x	.	x	.	o	.	x	.	Ionian-#*1*
	//ML	x	.	o	.	x	.	x	x	.	o	x	.	x	Lydian-*b7*
>	//RY	x	.	o	x	.	x	.	o	.	x	.	x	x	Ionian-*b3*
	//OM	o	.	x	.	x	x	.	o	x	.	x	.	o	Mixo-*b6*
	//PR	o	x	.	x	.	o	.	x	.	x	x	.	o	Dorian-*b2*

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	altLO	x	.	x	x	.	o	x	.	x	.	o	.	x	Locrian-#*2*
✖	altYP	.	x	.	o	.	x	.	x	x	.	o	x	.	Phrygian-*b1*
	altML	x	x	.	o	x	.	x	.	o	.	x	.	x	Locrian-*b4*
✖	altRY	.	o	.	x	.	x	x	.	o	x	.	x	.	—
✖	altOM	.	o	x	.	x	.	o	.	x	.	x	x	.	—
✖	altPR	.	x	.	x	x	.	o	x	.	x	.	o	.	—

The formally non-parallel modes identified by **YP** are so close to the parallel modes (one sharps the tonic and the other flats it) that they're often used as ornamental substitutes.

Harmonic Modes

The modes are covered by six words, of words containing **L** provide over all half. No altered classical modes are here because they follow from removing an internal note of the filled minor third x x x x The harmonic modes can be expanded next into fourteen 7-note minor and major modes (Appendix D) but, to me, the musical substance of most of them emerges only in combination with other modes to form families.

		@	P	O	R	M	Y	L	$	.	.	.	.	@
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	//LR⊕	x	—	—	x	x	.	x	x	x	x	.	o	x
✖	//YO⊕	x	x	x	.	o	x	—	—	x	x	.	x	x
✖✖	//MP⊕	—	x	x	.	x	x	x	x	.	x	x	—	—
	//RL⊕	x	.	.	x	—	—	x	x	.	x	x	x	x
>	//OY⊕	x	.	x	x	x	x	.	o	x	—	—	x	x
	//PM⊕	o	x	—	—	x	x	.	x	x	x	x	.	o

		@	P	O	R	M	Y	L	$	.	.	.	.	@
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	altLR⊕	x	x	x	x	.	o	x	—	—	x	x	.	x
✖✖	altYO⊕	—	—	x	x	.	x	x	x	x	.	o	x	—
✖	altMP⊕	x	x	.	o	x	—	—	x	x	.	x	x	x
	altRL⊕	x	x	.	x	x	x	x	.	o	x	—	—	x
✖✖	altOY⊕	.	o	x	—	—	x	x	.	x	x	x	x	.
✖✖	altPM⊕	.	x	x	x	x	.	o	x	—	—	x	x	.

EXAMPLE: *SUMMERTIME*

I first encountered bridge modes in harmony in a variation of *Summertime* presented as an exercise in Susan Muscarella's piano comping course at the then Jazz School in Berkeley. The familiar melody line of this piece is in the Dorian mode of home tonic D, but the strongly chromatic harmony of this variation has twists that go deep into bridge mode territory that's complex in music notation. When I later came across the book *Modalogy* — which explains these modes in 50 or so difficult pages — I made it my mission to find a simpler way of knowing them.

The following presentation has a mode-change line (marked ◒) that does the job. This variation has four downbeats per bar.

♫ 5 p3

◒ ┌//R ┌altML
⚓ R+1 Y Y Y Y Y Y M
♫ | 5 —— | — , 4 p3 4 5 p3 | 1 5 | —— , 5 p3 |

◒ ┌//O ┌//Y.P
⚓ Y O Y
♫ | 4* —— | — , p3 1 p3 1 p3 |—— | —— , 5 p3 |

◒ ┌//R ┌//O
⚓ R+1 R O
♫ | 5* —— | — , 4 p3 4 5 p3 | 1 5 | — , 5 |

◒ ┌//O ┌//Y.P ┌//R ┌//Y.P
⚓ M O Y R+1 Y
♫ | p7 5 p7 1 p3 | 5 4 p3 — | 1 —— | — , 5 p3 |

The simple details of the bridge modes and associated chords are shown next. Deep expertise in chord notation is needed to infer that the two dominant-seven-sharp-nine chords are from parallel modes of the melodic minor. At the time, I knew about tritone-substitute chords (which these chords are) but had not encountered these modes as sources of them.

	D		E	F		G		A		B	C		D		
	@	P	O	R	M	Y	L	$	x	x	x	x	@		
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
altM.L	x	x	.	o	x	.	x	.	o	.	x	.	x		
	*	–	.	x	x	.	–	.	–	.	x	.	x	I7-#9	*(+ is #9)*
//Y.P	.	x	.	o	.	x	.	x	x	.	o	x	.		
	.	–	.	–	.	x	.	*	–	.	+	x	.	V7-#9	*(+ is #9)*

Here how the harmony looks on the keyboard. The voicings of chords provided by the colored shapes without their internal notes are rootless because the roots are implied by context. There's a strong contrast between the simplicity of the shapes (the same symbols always mean the same thing on the keyboard) and the complexity of the corresponding chord symbols (the same notes on the keyboard are represented by different suffixes in the chord symbols).

		`$        core harmony        $`		
		`A     B C     D     E F     G     A`		
		`$ x x x x @ P O R M Y L $`		
		`5 p6 6  p7 7 1 p2  2 p3 3  4 p5 5`		
bar 1	R^{+1}	`x . . . . * . . R . . . .`	*I-m*	R^{+1} *is augmented fifth*
	Y	`* . . . x . . . + . Y . .`	*V7-#5*	*+ is #5*
2	Y	`. . . x . * . . – . Y . .`	*I-m7*	
	Y	`* . . . x . . . + . Y . .`	*V-7#5*	*+ is #5*
3	Y	`. . . x . * . . – . Y . .`	*I-m7*	
	Y	`* . . . x . . – . . Y . .`	*V-7*	
4	Y	`. . . x . * . . . . Y . .`	*I-m7*	
	M	`. . . x . * . . + M . . .`	*I-7#9*	*+ is #9*
5	R	`. x . . . – . . R . * . .`	*IV-m*	
6		`. . . . . . . . . . . . .`		
7	O	`. x . . . – . O . . . . .`	*II-m7b5*	
8	Y	`* . . + x . . – . . Y . .`	*V-7#9*	*+ is #9*
9	R^{+1}	`x . . . . * . . R . . . .`	*I-m*	R^{+1} *is augmented fifth*
10		`. . . . . . . . . . . . .`		
11	R^{+1}	`x . . . . * . . R . . . .`	*I-m*	R^{+1} *is augmented fifth*
12	R	`. x . . . * . . R . * . .`	*IV-m*	
	O	`. x . * . . . O . . . . .`	*pVII-7*	
13	M	`. . x . . . – . . M * . .`	*IV-M*	
14	O	`. x . . – . . O . . . . .`	*II-m7b5*	
	Y	`* . . + x . . . . . Y . .`	*V-7#9*	*+ is #9*
15	R^{+1}	`x . . . . * . . R . . . .`	*I-m*	R^{+1} *is augmented fifth*
16	Y	`* . . + x . . – . . Y . .`	*V-7#9*	*+ is #9*

Working out these details in music notation requires dealing with the tangled complexity of different sharps and flats in bridge modes, e.g.,

```
D7#9        D–Eb-F-F#–G#-A#-C-D
A7#9        A-Bb-C-C#-D#-F-G-A
```

Mode signatures replace this by 2-letter words that identify keyboard patterns, such sequences of whole tones here, that do an end run around this tangled complexity.

<u>EXAMPLE: *LAURA*</u>

My source is *The Jazz Book*: *Today's Easy Adult Piano*, John Brimell, CPP/Belwin, 1989, p24. The melody home tonic is C. The "easy" part of the source title is an empty key signature and a low density of notes on the page. The not-so-easy part is getting a handle on the changes, due to the often-sparse and ambiguous melody line, and to some irregular-looking relationships between the melody lines and the richly chromatic harmony. The following summary of melody plus harmony assumes the home harmony octave is **@$@**. The mode changes (lines marked ☯) are between harmonic-minor-major modes with tonics going down by whole tones in the sequence **5-4-p3-1**. The dashes in the harmony lines (lines marked ⚓) are placeholders for fifos determined by the modes. Phrase (d) is shown with different modes for melody and harmony to bring that the melody here in actual pentatonic major.

<u>Laura (original in C)</u>

(a) ☯ ┌//R..L⊕

⚓ — RL —

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

(b) ☯ ┌//P..M⊕

⚓ — PM — R

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

(c) ☯ ┌//Y..O⊕ ┌//R.L

⚓ OY — Y — L RL

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

(d) ☯ ┌//L.O ┌//O..Y⊕

⚓ LO L — — Y OY

☯ ┌//M

♫ | — , 6 | 2 — | — , 4 1 — 2 |

<u>repeat (a)-(b) and then go to (e)-(f)</u>

(e) ☯ ┌//O..Y⊕ ┌//LO

⚓ — Y• — L

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

(f) ☯ ┌//O..Y⊕

⚓ L.O O..Y Y O..Y — —

♫ | p3 p3 | — , 3 p3 2 6 7 | 1 —

The piece sounds like each melody section is from a fully defined parallel mode of its own, which is certainly not a classical mode because of the adjacent half tones. I looked for an interpretation in terms of non-classical modes and found the following one in terms of the harmonic-minor-major mode determined by double tritones in the harmony going down by whole tones (master tonics highlighted in blue). There's a regularity about this that fits the elegant regularity of the melody phrases to the ear. In this interpretation, the melody notes in (e)-(f) identified by "+" are passing notes — note **6** is held over from (d) and note **p3** sounds like a passing note in the otherwise major context of (d)-(e)-(f).

		1	p2	2	p3	3	4	p5	5	p6	6	7	7	1	
		@	P	O	R	M	Y	L	$	x	x	x	x	@	parallel tonality
(a)	melody notes	.	.	.	.	.	.	x	x	.	x	x	x	.	
	from //RL⊕	x	.	x	R	—	—	L	x	.	x	x	x	x	minor
(b)	melody notes	.	.	.	.	x	x	.	x	x	x	.	.	.	
	from //PM⊕	x	P	—	—	M	x	.	x	x	x	x	.	x	major
(c)	melody notes	.	.	x	x	.	x	.	x	x	.	x	.	.	
	from altYO⊕	—	—	O	x	.	Y	x	x	x	.	x	x	—	minor
(d)	melody notes	x	.	x	.	x	.	.	.	.	x	—	—	x	
	from //M	x	.	x	.	M	—	—	x	.	x	—	—	x	major
(e)	melody notes	x	.	x	.	x	x	.	x	x	x	.	x	x	
	from //OY^{ma}	x	.	O	.	x	Y	.	x	x	+	—	x	x	major
(f)	melody notes	x	.	x	x	x	.	.	.	.	x	.	x	x	
	from //OY^{ma}	x	.	O	+	x	Y	.	x	x	+	—	x	x	major

CHAPTER 5: THE TOP OF THE MODE HIERARCHY

The mode hierarchy provides a way of organizing the increasing chromaticism that appears in music as it departs farther and farther from the scales of key signatures. The pieces, *Traumerai* and *Backwater Blues (revisited, this time harmonized by classical modes)* provide examples. New blues pieces are deferred to the next chapter.

```
                           atonal modes
this chapter:           /                \
                 minor & major              blues family
                 families |  \            /  |
                          |    bridge modes  |
                          |                  |
                   classical modes      basic blues
                            \            /
                           pentatonic modes
```

MAJOR AND MINOR FAMILIES

Minor and major families follow from sharing pentatonic modes, and melodic and harmonic bridge modes as follows. The superscript ⊕ on the mode signatures is a shorthand for filling-in minor thirds (it's needed on the family modes to makes signatures unambiguous). The minor and major family modes have visibly simple, asymmetric forms. They're close to the chromatic scale but are unambiguously tonal because of asymmetry.

Minor Family

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
pentatonic minor		x	—	—	x	.	x	.	x	—	—	x	.	x	
melodic minor	//RY	x	.	o	x	.	x	.	o	.	x	.	x	x	Ionian-*b3*
harmonic minor from //OY⊕ from context		x	.	x	x	.	x	.	o	x	—	—	x	x	Aeolian-*b6*
minor family	//OR.Y⊕	x	.	x	x	.	x	.	x	x	x	x	x	x	a.k.a. "bebop melodic minor"

Major Family

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
pentatonic major		x	.	x	—	—	x	.	x	.	x	—	—	x	
melodic major	//OM	x	.	x	.	x	.	o	x	.	x	.	.	x	Mixolydian-*b6*
harmonic major from //OY⊕ from context		x	.	x	.	x	x	.	o	x	—	—	x	x	Ionian-*b6*
"bebop major" variation		x	.	x	.	x	x	.	x	x	+	.	x	x	Ionian-*13*
major family	O.MY⊕	x	.	x	.	x	x	.	x	x	x	x	x	x	

Blues Family

A notable difference between the blues family mode and minor and minor famjly modes just presented is shown next.

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
pentatonic mashup (ends up same)		x	.	x	x	x	x	.	x	.	x	x	.	x	
transposed //RY→	//ML	x	.	o	.	x	.	x	x	.	o	x	.	x	Lydian-*b7*
transposed //OY⊕ →	/RL⊕	x	.	x	x	—	—	x	x	.	x	x		x	Mixolydian-*b3*
shared context	//RM.L⊕	x	.	x	x	x	x	x	x	.	x	x	.	x	blues family

The locations of long sequences of adjacent half tones are different places, namely in the bottom fifth for the blues and in the top fourth for minor and major modes. Blues is more chromatic in the bottom fifth where tonality is determined, which fits the mixed blues tonality. Minor and major family modes are more chromatic in the top fourth, where tonality is not determined, leaving the bottom fifth to establish it

MAJOR FAMILY EXAMPLE: *TRAUMERAI*

Schumann's *Traumerai* is from the *Classical Fake Book*, 2nd Edition, Hal Leonard (2013)). The home tonic is F. Again, the absence of inversions in the anchor line follows from selecting octave **@$@** as the harmony home octave on the keyboard. Lead-in note **5** of the opening melody line is in this octave, but is itself not harmonized, and goes directly to the next octave, so there's no interference.

***Traumerai* : Melody Plus Harmony (original in F)**

[a] ⚓ **@ Y M^{+1} Y M^{+1} O^{+2} M^{+1} O^{+2}**

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

[b] ⚓ **@ O M^{+2} R^{+2} O^{+2} PM ■L Y**

♫ **| 1 , 7 1 3 | 5 3 3 , 2 1 7 | 1 3 6 1 7 — p7 | 6 7 5 , 5 :||**

[c] ⚓ **@ Y M O PM O M O P O @**

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

[d] ⚓ **Y Y^{+2} O■ M^{+1} OY M^{+1} Y M M^{+1} O Y Y**

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

[a] repeat

[e] ⚓ **@ ■L ■$ ■Y O P^{+1} O Y @**

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

The melody line is straight Ionian (**//Y**) with a mashup of it and Mixolydian in [b]-[c] that adds one note in a few places (**p7**). The harmony is strongly chromatic, suggesting the major family **//O.MY**⊕, with tritones **P** and **L** providing ornamental harmonic transitions. Thinking in terms of the family mode helps in remembering the different harmonic resolutions after the melody peaks in the second bar of each section. Skip the augmented fifths and major sixths identified by superscripts in the harmony until the rest is "in the fingers."

The following explains the harmony. The chords in the fake book are all over the map, so I used them more as suggestions than specifications. I first learned this piece from a score on the grand staff and then forgot the details, but this harmony sounds as I remembered it.

F G A Bb C D E F

```
[a]        1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
           @ . O . M Y . $ x x x x @
F          @ . . . – . . X . . . . .
Bb         . . . . . Y . . . . . . x
F/C        . . . . M . . . . . . . *
C7         . . . . . Y . * . . . x .
F/A        . . . . M . . . – . . . *
C          . . O . . . * . . . . x .
F          . . . . M . . . . . . . *
C          . . O . . . * . . . . x .
```

@ / Y / M^{+1} augmented fifth / Y / M^{+1} / O^{+2} major sixth / M. / O^{+2}

```
[b]        @ . O . M Y . $ x x x x @
F          @ . . . – . . X . . . . .
A7/C#      . . O . * . . . x . . . .
Dm         . . . . M . . . . * . . x
Fm         . . . R . . . – . . . . *
C/G        . . O . . . * . . . . x .
F#dim7     . P . . M . . x . . x . .
G7         x . * . . . L . . – . . .
C7         . . . . . Y . * . . . x .
```

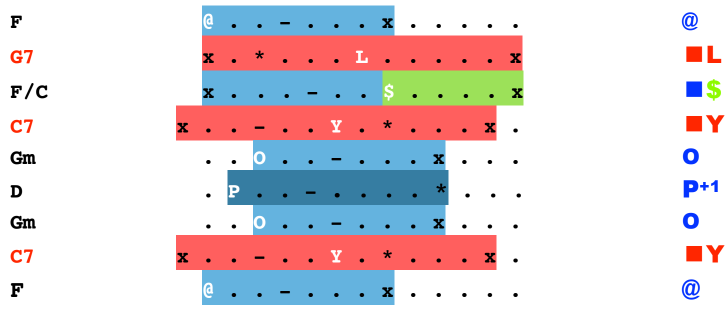
@ / O / M^{+1} / R^{+2} / O^{+1} / PM / ■L / Y

```
[c]        @ . O . M Y . $ x x x x @
F          @ . . . – . . X . . . . .
Cm7        . . . – . Y . * . . x . .
D          . . . . M . . . . * x . –
Gm         . . * . . – . . . X . . .
F#dim7     . * . . M . . x . . x . .
Gm/D       . . * . . – . . . x . . .
Adim/Eb    . . . . M . . x . . x . .
Gm/D       . . O . . – . . . x . . .
D7         . P . . – . . x . x . . .
Gm         . . O . . – . . . x . . .
F          @ . . . – . . x . . . . .
```

@ / Y / M tritone implied by flow / O / PM / O / M / O / P / O / @

```
[d]        @ . O . M Y . $ x x x x @
Bb         . . . . . Y . . – . . . x
Gm         . . . . . Y . . . – . . . . O
A          . . O . – . . . x . . – . . O
Dm         . . . . M . . . . – . . x
C#dim7     . . O . . Y . . x . . x .
Dm/A       . . . . M . . . . – . . x
Edim       . . – . . Y . . . . . x .
Dm/A       . . . . M . . . . – . . x
A7         . . O . – . . . x . . – .
Bb         . . . . . Y . . – . . . x
C7         . . . . . Y . – . . . x .
[e]        @ . O . M Y . $ x x x x @
```

Y / Y^{+2} / O■ tritone implied by flow / M^{+1} / OY / M^{+1} / Y / M^{+1} / O / Y / Y



This is satisfyingly rich music that I found difficult to learn and remember from the original score on the grand staff, without chord symbols. It's difficult even with the fake-book chords, which look misleadingly simple but are actually complex in aggregate due to a mix of different chord types in different inversions, on a jumpy bass line formed of some chord roots and some bass notes of inversions. This interpretation replaces the jumpy bass line by a smoothly flowing core anchor line that represents both building blocks and outer intervals of compound shapes (augmented fifths or major sixths). The main challenge is remembering how the melody and harmony go together after the melody peaks in bar 2 of each section, where the resolution patterns are different.

BLUES HARMONIZED BY CLASSICAL MODES

The following table is an adaption of a table of chord progressions for tonic F handed out in a blues piano workshop at the then-Jazz School in Berkeley. Tritone chords are represented by their anchors and fifo anchors are represented by placeholder dashes, leaving fifos to be faired in from context. The two highlighted anchor lines are representative of the two parts of the table.

The first highlighted line shows the original harmony of *Backwater Blues*, assembled from segments of different lines. The second highlighted line is a *bebop blues* line, in which the harmonic sequences are provided by cascaded classical modes. This illustrates both the rigorous harmonic logic that underlies much of bebop, and also why the result often doesn't doesn't sound much like blues.

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

Shown next is the original melody harmonized by the bebop blues line. Fifos are faired in between fixed tritones by morphing in a visibly obvious way.

Backwater Blues **: Bebop Variation (original in F)**

⚓ M M R O P L Y M
♫ | 5 4 p3 1 | , 5 4 p3 1 | , —— | —— |

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

⚓ Y Y Y O P Y Y
♫ | p7 p7 —— 5 | 1 p7 5 p5 4 p3 1 | , —— | —— |

Here is how the harmony looks on the keyboard.

			F		G		A	Bb		C		D		E	F	F major (for reference)
			@	P	O	R	M	Y	L	$	x	x	x	x	@	
			1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
1st 4 bars	1	M	.	*	.	.	M	.	.	.	.	.	.	x	.	pII-*m7*
		M	.	.	.	.	M	.	*	.	.	.	x	.	.	pV-7
	2	R	*	.	.	R	.	.	.	.	x	.	.	.	.	I-*m7*
		O	.	.	O	.	*	.	.	.	x	.	.	.	.	III-7
	3	P	.	P	.	*	.	.	x	.	.	.	.	.	.	VI-*m7*
		L	x	.	*	.	.	.	L	.	.	.	.	.	.	II-7
	4	Y	.	.	.	.	.	Y	.	*	.	.	x	.	.	V-m7
		M	*	.	.	.	M	.	.	.	.	.	x	.	.	I7
2nd 4 bars	5	M	.	.	.	.	M	*	.	.	.	.	.	.	.	IV-*M7*
	6	R	.	.	.	R	.	*	.	.	.	.	.	.	.	IV-*m7*
		O	.	.	O	.	.	.	.	.	.	.	*	.	.	pVII-7
	7	O	.	.	O	*	.	.	.	.	.	.	.	.	.	pIII-*M7*
	8	P	.	P	.	*	.	.	.	.	.	.	.	.	.	pIII-*m7*
		L	x	.	.	.	.	.	L	.	*	.	.	.	.	pVI
turnaround	9	I	.	*	.	.	.	Y	.	.	.	.	.	.	x	pII-*M7*
	10	I	.	.	*	.	.	Y	.	.	.	.	.	.	x	II-*m7*
		I	.	.	.	.	.	Y	.	*	.	.	.	x	.	V-7
	11	O	.	.	O	.	*	.	.	.	.	.	.	.	.	III-*m7*
		P	.	P	.	.	.	.	.	x	.	*	.	.	.	VI-7
	12	I	.	.	*	.	.	Y	.	.	.	.	.	.	.	II-m7
		I	.	.	.	.	.	Y	.	*	.	.	.	.	.	V-7

As shown next, pairs of tritone substitute dominant-seventh chords are used extensively (same tritone, root offset by a tritone, all non-tritone notes different). Strikethroughs identify four unused tritone substitutes out of a total of twelve.

	F		G		A	Bb		C		D		E	F	F major (for reference)	
	@	P	O	R	M	Y	L	$	x	x	x	x	@		
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1		
L	.	.	*	.	.	.	L	.	*	.	.	.	.	II-7	pVI-7
Y	.	*	.	.	.	Y	.	*	.	.	.	.	.	~~pII-7~~	V-7
M	*	.	.	.	M	.	*	.	.	.	.	.	*	I-7	pV-7
R	.	.	.	R	.	*	.	.	.	.	.	*	.	~~VII-7~~	~~IV-7~~
O	.	.	O	.	*	.	.	.	.	.	*	.	.	III-7	pVII-7
P	.	P	.	*	.	.	.	.	.	*	.	.	.	~~pIII-7~~	VI-7

Complex as such bebop blues chord progressions are in music notation, 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 to me: they need a melody line to provide a blues sound.

ATONAL MODES

The focus of PKP is tonal music but atonal modes at the top of the hierarchy are included because shared letters of their defining words make them conceptual parents of scales lower down in the hierarchy; and also because they may be used ornamentally in tonal music. Atonal scales have no inherent 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 has no tritones but is determined by tritones because it's morphed from the tritones of **O.M.L**. There are no all-atonal example pieces in this document.

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 by morphing creates related home-tonic scales from different families.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
word	name	@	P	O	R	M	Y	L	$	.	.	.	.	@	observations
ORMY	no name	—	—	O	R	M	Y	—	—	x	x	x	x	—	parent of minor & major family
P.R.Y	whole tone	.	P	.	R	.	Y	.	x	.	x	.	x	.	close to minor family
O.M.L	"	x	.	O	.	M	.	L	.	x	.	x	.	x	close to blues
P.RM.L	diminished	x	P	.	R	M	.	L	x	.	x	x	.	x	close to blues
PO.MY	"	.	P	O	.	M	Y	.	x	x	.	x	x	.	close to major family
OR.YL	"	x	.	O	R	.	Y	L	.	x	x	.	x	x	close to minor family
PMY	augmented	x	P	—	—	M	Y	—	—	x	x	—	—	x	morphed from **OML**, close to major family

Other possibilities for family modes (including new blues modes) developed from these atonal modes are open for exploration.

CHAPTER 6: 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.

I have heard it said, and believe it to be true, that composition is frozen improvisation. Both require 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 following pieces, in no particular order, explore a wide variety of home tonics, modes and key signatures. There are distinct differences in style between the different pieces that range from loose and somewhat ambiguous, to systematic and unambiguous. The placements of the harmony home octave relative to the melody line are as they occurred to me when I first approached each piece; the ones that overlap illustrate the importance of avoiding overlaps for maximum simplicity. Some examples go all the way to full chords, others go only as far as tritone skeletons, leaving enrichment to context.

Blues Family

When Sunny Gets Blue
Prelude to an Afternoon of a Faun (interpreted as a blues)
Straight No Chaser
Blue Monk

Minor or Major Family

Here's That Rainy Day
You Must Believe in Spring
Round Midnight
All of Me
All the Things You Are
No Greater Love
Body and Soul
Every Time We Say Goodbye
All the Things You Are
Chelsea Bridge
Lush Life
The Peacocks

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, which goes with the mostly-blues melody line. The written melody line is straight **//RM.L** blues in [a] with a diversion to nearby **//L** for four bars in [b], segueing back to the blues in a repeat of [a]. The written harmony of the blues parts seems to me to be confusingly irregular, so I have modified it in skeleton form.

The melody line starts a whole tone below the pitch center of the home octave and goes up and down above that, but never below it, suggesting placing the core harmony in the inverted home octave going down from the pitch center, with the harmonic skeleton determined by inverted tritones going down from the anchor line.

$ melody . . .
$ core harmony $

When Sunny Gets Blue : Melody Plus Harmony (original in G)

[a] ⚓ M R L R M R L Y
♫ 4 ||: 2 1 2 4 , — 4 | 4 p3 p7 p5 4 p3 | — 2 1 p7 6 4 1 | 6 , |
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^*

⚓ M R O P L Y
♫ | 5 p7 1 p7 p2 p7 1 p7 , | 4 p7 1 p7 p2 p7 1 p7 , |
^ ^ ^ ^ ^ ^ ^ ^ ^

⚓ M R L M R M L
♫ | 5 p7 1 p7 4 — p3 p7 | 2 , 5 :|| p2 , |
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[b] ⚓ $ $ L L $ $ L L
♫ | 5 1 7 1 2 3 | p5 2 2 2 7 7, | 7 5 6 7 1 | 2 , |
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^^

⚓ Y Y M M $ $ L M R
♫ | p7 1 p7 1 2 p3 | 3 1 1 1 6 6 , | 6 4 5 6 p7 | 2 , 5 |
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[a] repeat

[d] repeat twice

⚓ R R M R M R
♫ | 2 4 5 4 p6 4 p2 | 1 , | |
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

Here's what this harmony looks like on the keyboard (non-blues tritones are shown in a darker shade of red).

```
           D     E F   G     A Bb  C     D
           $ . . . . . @ P O R M Y L $
           5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5
[a]
1  M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .
2  L       . . . . . x . . . . . L .
   R       . . x . . . . . R . . . .
3  M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .
   L       . . . . . x . . . . . L .
4  Y       . . . . x . . . . . Y . .

5  M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .
   O       . x . . . . . O . . . . .
6  P       x . . . . . P . . . . . .
   L       . . . . . x . . . . . L .
   Y       . . . . x . . . . . Y . .

7  M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .
8  L       . . . . . x . . . . . L .
   M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .
9  M       . . . x . . . . . M . . .
   L       . . . . . x . . . . . L .
```

```
           D     E F   G     A Bb  C     D
           $ . . . . . @ P O R M Y L $
           5 p6 6 p7 7 1 p2 2 p3 3 4 p5 5
[b]
1  $       . . . . . . . x . . . . $
   $       . . . . . x . . . . . . $
2  L       . . . . . x . . . . . L .
   L       . . . . x . . . . . . L .
3  $       . . . . . . . x . . . . $
   $       . . . . . x . . . . . . $
4  L       . . . . . x . . . . . L .
   L       . . . . x . . . . . . L .

5  Y       . . . x . . . . . . Y . .
   Y       . . . x . . . . . . Y . .
6  M       . . . x . . . . . M . . .
7  M       . . x . . . . . . M . . .
   $       . . . . . . . x . . . . $
8  $       . . . . . x . . . . . . $
   L       . . . . . x . . . . . L .
   M       . . . x . . . . . M . . .
   R       . . x . . . . . R . . . .

[d]
1    R     . x . . . . . . R . . .
     R     . . x . . . . . R . . .
2,3  M     . . x . . . . . . M . .
     R     . . x . . . . . R . . .
```

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 the PKP mode hierarchy. 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 is, it's written in C# minor with accidentals that bring in Db major, a combination that's inherently complex in music notation (recall footnote 1 in the opening chapter). The melody line is from the **//RM.L** blues scale.

The disposition of harmony and melody is as follows. The melody starts on tonic and descends to a a half tone below the pitch center. Its range after that is from this low point up. The harmony home octave is offset below that range.

@ core harmony @ . . . . . . $ melody . . .

Prelude to an Afternoon of a Faun **: Melody Plus Harmony (original in C#)**

[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] ⚓ ■L ■M ■L ■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 1 p3 5 p7 — | — p7 1 6 — |

^ ^ ^ ^ ^ ^ ^ ^

[c] ⚓ O▼ — O▼ R M.L

♫ | — 1 2 7 — 6 3 | 5 — p6 — |

^ ^ ^ ^ ^ ^ ^ ^

⚓ — — — R■

♫ | 6 p6 3 5 p7 1 | 6 5 3 5 p7 1 |

^ ^ ^ ^ ^ ^ ^ ^

[d] ⚓ ■L R▲

♫ | 5 p7 1 5 p7 1 5 p7 1 | ↓5 p7 1 5 p7 1 5 p7 7 | 1 —— |

^ ^ ^ ^ ^ ^ ^ ^ ^*

The written time signature of 9/8 divides each bar into 3 groups of 3 eighth notes, but playing it in 4/4 time sounds very close to the original timing and leads naturally to a swing-feel blues. The "**—**" entries in [c] are placeholders, to be filled in, if desired.

This representation is faithful to the written melody notes but takes some liberties with the harmony. Getting a handle on the piece is helped by the following identification of the melody scales. The piece uses all the notes of the chromatic scale for both melody and harmony, but organized in a way that implies **//RM.L** blues with ornamental passing notes **p6** and **7** for the melody (they're passing notes because omitting them, while maintaining the same timing, has no substantive effect on the sound).

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

The original harmony is mostly from the blues scale, with the striking exception of note **p2** as the root of a major triad in the opening bars of [b]. This is striking not only because this note is not in the melody scale, but also because it's dissonant with the melody note it harmonizes (the tonic). Note **p2** is common in blues as the root of tritone substitute chord **pII*7(11)*** for chord **V-*7*** containing the **Y** tritone. Less common is the appearance of **pII-*M7(11)*** as a tritone substitute for **V-*M7(11)*** containing the **L** tritone, but it occurs (recall its appearance in *Goodbye Porkpie Hat*). Taking the harmonized melody into account, this enables replacing original bar 5-6 sequence by a more obvious blues sequence, as follows.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
		@	P	O	R	M	Y	L	$	x	x	x	x	@	
orig. bar 5	**pII**	.	*	.	.	.	x	.	.	x	.	.	.	o	**chord plus melody o**
orig. bar 6	**pVII*dim*/pII**	.	x	.	.	x	.	o	.	.	.	*	.	.	**chord plus melody o**
new bar 5	**pII-*M7(11)***	.	*	.	.	.	.	L	.	.	.	.	.	x	**voices tritone sub. V chord**
orig. bar 6	**pVII*dim*/pII**	.	x	.	.	M	.	.	.	.	.	*	.	.	**voices original chord**

Here follows an explanation of the harmony, including the written chords and the new blues-based harmony. The scale and the flow prompt the shapes, and the result sounds fine. The proof is in the playing.

					C# D# E F# G# A B C#	<—written key sig.
					1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1	
		as written		here	@ P O R M Y L $ x x x x @	
[a]	1-4	—		—	. . . .	
[b]	5	pII	P▲	■L	. x . . . . L x	
		pVII*dim*/pII	■M	■M	. x . . M . . . . . x . .	
	6	pII	P▲	■L	. x . . . . L x	
		pVII*dim*/pII	■M	■M	. x . . M . . . . . x . .	
	7	II*dim*	O•	R■	. . . R . . . . . x x	
		pVII*7*	O■	M■	. . . . M . . . . . x x	
	8	IV*dim*	Y•	M•	. . . . M . . x . . x . .	
		—	—	R•	. . . R . . x . . x . . .	
[c]	9	IV/II	O▼	O▼	. . O . . x . . . x . . .	major triad
		V	O^{+2}	—	. . O . . . . x . . . x .	major seventh
		IV/II	O▼	O▼	. . O . . x . . . x . . .	
	10	VII^{+}	R^{+1}	R^{+1}	. . . R . . . x . . . x .	aug. fifth
		pVII*7b5*	M.L	M.L	. . . . M . L . . . x . x	
	11	VI	M^{+2}	—	. . . . M . . . . x . . . x	
		pVII*6*	Y^{+2}	—	. . . . . Y . . . . x . . . x	
	12	VI	M^{+2}	—	. . . . M . . . . x . . . x	
		IV*dim*	I•	R■	. . . R . – . . . x x	
[d]	13	—	—		. . . .	
	14	—	—	■L	. x . . . . L x	
	15	pIII*6*	R▲	R▲	. . . R . . . $ . . x . .	minor triad

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* for *Backwater Blues* in 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. 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.

Backwater Blues with the Walking Bass Line of Straight No Chaser

♫ | **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** are ornamental passing notes. To be concrete, the corresponding notes of music notation are shown on top for tonic F blues.

	F		G	Ab	A	Bb	B	C		D	Eb		F	<==F home tonic			
	1	**p2**	**2**	**p3**	**3**	**4**	**p5**	**5**	**p6**	**6**	**p7**	**7**	**1**				
	@	P	O	R	M	Y	L	$	x	x	x	x	@				
//RML	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 home tonic F using this walking bass line (the original in the Monk fake-book has home tonic Bb but I learned it in F). The transition to Bb is easy, simply replace the F Dorian scale in the table below by the corresponding Bb scale. In either case, the key signature identifies the Dorian melody mode **//R** of the home tonic which is altered to **//RM** by an accidental. This is not the full blues scale because **p5** is missing.

Straight No Chaser with the Same 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	<== Dorian of tonic F
1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
@	P	O	R	M	Y	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 home tonic makes clear that the appearance of all notes of the chromatic scale follows from insertion 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  Y  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 major or minor third down from it. The thirds are determined by a simple rule illustrated on the next page: 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). 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 (illustrated on the next page).

The walking bass line is on downbeats.

Blue Monk : Melody Plus Harmony (original in Bb)

```
♫ | 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).

```
                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 Y 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-----o .
                . . . . . . . . . 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 few appearances 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.

HERE'S THAT RAINY DAY

This evocative piece in home tonic G is from *The Ultimate Jazz Fakebook*. Working through the details is an instructive exercise in figuring out chromatic music that sounds coherent but looks incoherent in music notation on the page. The piece is squarely in the chromatic classical domain, in which a sequence of parallel modes determines melody and harmony. In the following summary, annotations marked " ⌐ " identify the governing mode as mainly Ionian (major, **//Y**), except for two short segments in Phrygian (minor, **//P**). Ornamental passing notes and harmony shapes in both these modes give a misleading sense of notational incoherence, when expressed in music notation, but the mode context provides coherence in PKP notation. The minor segments give this mostly major piece a sad-happy vibe.

The disposition of harmony home octave relative to the melody is as follows. The range of the melody line is from the pitch center up. The adjoined harmony home octave is inverted, determining the tritone inversions.

`$ core harmony $ melody . . .`

Play the melody line and the tritones to get a sense of the sound of the piece. Fill in the fifos later to smooth the flow and add depth.

[A] ◒ ⌐ **//Y** ⌐ **//P** ⌐ **//Y**

⚓ M P● PR $ Y Y Y● PY $ Y M

♫ | 5 5, — 5 | 5 p7 p3 5 | 5, 4 3 | 4, | 5 5, 5 | 5 7 2 4 | 3 | — , — |

[B] ◒ ⌐ **//P** ⌐ **//Y**

⚓ R O M P R Y Y OY M Y Y

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

[A] repeat

[C] ◒ ⌐ **//Y**

⚓ M Y Y $ M$ OL L Y Y Y OY M$ M M$ Y

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

The melody modes identified above are as follows, with passing notes identified by plus signs.. The home octave is inverted because the melody lines mostly start below the tonic.

	D					G							D
	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5
	$	x	x	x	x	@	P	O	R	M	Y	L	$
Phrygian //P	x	x	.	x	.	x	x	+	x	.	x	.	x
Ionian //Y	x	.	x	+	x	x	.	x	.	x	x	.	x

Deriving the harmony from the written chords starts with identifying tritone chords relative to the home tonic (red text). Their tritones are provided by a table in Appendix C. Roots are identified by asterisks, for reference only, because most may be omitted. The tritones establish fixed points in the flow that provide references for filling in overlapping fifos to voice the non-tritone chords.

[A]

			D					G							D	
			5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
			$	x	x	x	x	@	P	O	R	M	Y	L	$	
bar 1	I-*M9*	M	.	.	.	.	x	*	.	–	.	M	.	.	.	⌐ //Y
2	pIII-*7*	P●	x	.	.	x	.	.	P	.	*	.	.	.	.	⌐ //P
	VI-*7b5*	PR	x	.	*	.	.	.	P	.	R	.	.	.	.	
3	pVI-*M7*	$	.	*	.	.	.	x	.	.	–	.	.	.	$	
4	pVI-*6*	Y	.	*	.	x	.	–	.	.	–	.	Y	.	.	
5	II-*m7*	Y	.	.	–	.	.	x	.	*	.	.	Y	.	.	⌐ //Y
6	V-*7*	Y●	*	.	.	.	x	.	.	x	.	.	Y	.	.	
	V-*7b5*	PY	*	–	.	.	x	.	P	.	.	.	Y	.	*	
7	I-*M7*	$	.	.	.	.	x	*	.	–	.	M	.	.	.	
8	V-*m7*	Y	*	.	.	x	.	.	.	–	.	.	Y	.	*	
	I-*7*	M	.	.	.	x	.	*	.	.	.	M	.	.	.	

[B]

			D					G							D	
			5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
			$	x	x	x	x	@	P	O	R	M	Y	L	$	
bar 1	IV-*m7*	R	.	x	.	.	.	–	.	.	R	.	*	.	.	⌐ //P
2	pVII-*9*	O	.	x	.	*	.	–	.	O	.	.	–	.	.	
3	IV-*M7*	M	.	.	x	.	.	–	.	.	.	M	*	.	.	
	VI-*9*	P	x	.	*	.	–	.	P	.	.	.	.	.	.	
4	pVI-*M7*	R	.	*	.	.	.	–	.	.	R	.	.	.	*	
5	II-*m7*	Y	.	.	–	.	.	x	.	*	.	.	Y	.	.	⌐ //Y
6	V-*9*	Y	*	.	–	.	x	.	.	–	.	.	Y	.	.	
	V-*7b9*	OI	*	x	.	.	x	.	.	O	.	.	Y	.	*	
7	I-*M7*	M	–	.	.	.	x	*	.	.	.	M	.	.	.	
8	II-*m7*	Y	.	.	.	.	.	x	.	*	.	.	Y	.	.	
	V-*7*	Y	*	.	.	.	x	.	.	.	.	.	Y	.	*	

[C]

			D					G							D	
			5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
			$	x	x	x	x	@	P	O	R	M	Y	L	$	
bar 1	IV-*M7*	M	.	–	.	.	x	.	.	.	.	M	*	.	.	⌐ //Y
2	II-*m7*	Y	.	.	–	.	.	x	.	*	.	.	Y	.	.	
	V-*7*	Y	*	.	.	.	x	.	.	x	.	.	Y	.	*	
3	III-*m7*	$	.	.	.	.	.	.	.	x	.	*	.	.	$	
	VI-*m7*	M$	.	.	*	.	.	x	.	.	.	M	.	.	$	
4	II-*7b5*	OL	.	x	.	.	.	x	.	*	.	.	.	L	.	
	II-*7*	L	.	.	–	.	.	x	.	*	.	.	.	L	.	
5	II-*m7*	Y	.	.	–	.	.	x	.	*	.	.	Y	.	.	
6	V-*7*	Y	*	.	.	.	x	.	.	–	.	.	Y	.	*	
	II-*m7*	Y	.	.	.	.	.	x	.	*	.	.	Y	.	.	
	V-*7b9*	OY	*	x	.	.	x	.	.	O	.	.	Y	.	*	
7	I	M$	.	.	x	.	.	*	.	.	.	M	.	.	$	
	VI-*m7*	M	.	.	x	.	.	–	.	.	.	M	.	.	.	
8	I	M$	.	.	*	.	.	*	.	.	.	M	.	.	$	
	V-*9*	Y	*	.	–	.	x	.	.	–	.	.	Y	.	*	

YOU MUST BELIEVE IN SPRING

My source for this piece is *The Michel Legrand Songbook*, 1997, Warner Bros. Publications. The strongly systematic organization of this piece is difficult to see in the written music, which is a full arrangement spread over 3 pages with 2 key signatures (2 sharps, 3 flats) and 32 tritone chords of many varieties (next page) that establish two parallel modes with all notes a half tone apart (bottom of this page). The range of the melody line goes up from a minor third below the lower tonic (D). The harmony home octave overlaps the bottom part of this range.

@ melody @ . . . .
@ core harmony @

*****check harmony alignment

***You Must Believe in Spring* (home tonic = D)**

[a] ◒ ┌ //**O.MY** **(bebop major)**

⚓ Y OY OY Y Y OY

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

^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[b] ◒ ┌**transition** ┌//**O.MY** **(bebop major)**

⚓ L RL M PM Y Y O

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

^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[c] repeat [a]

[d] ◒ ┌**transition** ┌ //**R.YL** **(bebop major 1/2 tone up)**

⚓ L RL Y OY L L R

♫ | — p7 1 2 3 p5 p3 | — 6 p7 7 p3 4 2, | — p5 6 p7 2 p7 1 6 | p5 4 p3 2 p3 , |

^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[e] ◒ ┌ //**R.YL** **continued**

⚓ L RL RL L L

♫ | — p3 4 p5 p7 p5 6 4 | p3 p2 p3 1 p3, | — p5 p6 p7 p2 p7 1 p6 | p5 4 p5 p3 4,|

^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[f] ◒ ┌ //**R.IL** **with some variations**

⚓ P PM Y OY L L R

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

^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

[g] ◒ ┌ //**R.YL@p7** **(relative mode)**

⚓ L L R

♫ | 4 p3 p2 1 p7 6 | p7, |

^ ^ ^ ^ ^*

The modes are summarized next.

	D		E		F#	G		A		B		C#	D	
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	Y	L	$	.	.	.	.	@	
//O.MY	x	.	x	.	x	x	.	x	x	x	.	x	x	bebop major of tonic
//R.YL	x	x	.	x	.	x	x	.	x	x	x	.	x	same up a 1/2 tone
//R.YL@p7	x	x	.	x	.	x	x	.	x	x	x	.	x	relative mode resolves to **p7**

The tritone chords provide skeleton core harmony to be filled in from context (* marks roots).

			D	.	E	.	F#	G	.	A	.	B	.	C#	D	
			1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
			@	P	O	R	M	Y	L	$	.	.	.	.	@	
[a]	1	C#m7b5	.	.	x	.	.	x	.	.	.	x	.	*	.	Y
		F#7b9	.	.	x	.	*	x	.	.	x	.	.	x	.	OY
	2	F#7b9/B	.	.	x	.	*	x	.	.	x	x	.	x	.	OY
	3	A7	.	.	x	.	.	x	.	*	.	.	.	x	.	Y
	4	A7b9/D	x	.	x	.	.	x	.	*	x	.	.	x	.	OY
[b]	1	G#m7b5	.	x	.	.	x	.	*	.	.	x	.	.	x	L
		C#7b9	.	.	.	x	.	.	x	.	.	x	.	*	x	RL
	2	F#m7b5	.	.	x	.	*	.	.	x	.	.	x	.	.	M
		B7b9	.	x	.	.	x	.	.	x	.	*	x	.	.	PM
	3	A7	.	.	x	.	.	x	.	*	.	.	.	x	.	Y
	4	C#m7b5	.	.	x	.	.	x	.	.	.	x	.	*	.	Y
		F#7	.	.	x	.	*	.	.	.	x	.	.	x	.	O
[a]	repeat															
[c]	1	G#m7b5	.	x	.	.	x	.	*	.	.	x	.	.	x	L
		C#7b9	.	.	.	x	.	.	x	.	.	x	.	*	x	RL
	2	Gm7b5	.	.	.	x	.	*	.	.	x	.	.	x	.	Y
		C7b9	.	.	x	.	.	x	.	.	x	.	*	x	.	OY
	3	Bb7	x	.	.	x	.	.	x	.	*	.	.	.	x	L
	4	Dm7b5	*	.	.	x	.	.	x	.	.	.	x	.	.	L
		G7	x	.	.	x	.	*	.	.	.	x	.	.	x	R
[d]	1	Dm7b5	*	.	.	x	.	.	x	.	.	.	x	.	.	L
		G7b9	x	.	.	x	.	*	x	.	.	x	.	.	x	RL
	2	G7b9/C	x	.	.	x	.	*	x	.	.	x	x	.	x	RL
	3	Bb7	x	.	.	x	.	.	x	.	*	.	.	.	x	L
	4	Bb7b9/Eb	x	x	.	x	.	.	x	.	*	x	.	.	x	RL
[e]	1	Am7b5	.	x	.	.	.	x	.	*	.	.	x	.	.	P
		D7b9	*	x	.	.	x	.	.	x	.	.	x	.	.	PM
	2	Gm7b5	.	.	.	x	.	*	.	.	x	.	.	x	.	Y
		C7b9	.	.	x	.	.	x	.	.	x	.	*	x	.	OY
	3	Bb7	x	.	.	x	.	.	x	.	*	.	.	.	x	L
[g]	1	Dm7b5	*	.	.	x	.	.	x	.	.	.	x	.	.	L
		Dm7b5/G	*	.	.	x	.	x	x	.	.	.	x	.	.	L
		G7	x	.	.	x	.	*	.	.	.	x	.	.	x	R

ROUND MIDNIGHT

The sources for this evocative piece in Eb minor by Thelonius Monk are *The Ultimate Jazz Fakebook*, Hal Leonard, 1988, p. 322 for the main body of the piece (shown first) and the *Standards Real Book*, Sher Music, 2000, p. 369 for an optional introduction/conclusion (next page). The following summary is easy to play without a downbeat line if you've ever heard the tune. The melody home octave is inverted.The harmony home octave offset down a fifth is straight, so no building-block inversions.

@ core harmony @ . . . . $ melody . . . .

***Round Midnight* : Melody Plus Harmony (original in Eb)**

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

⚓ O▾ O @▾ R ⊕ L Y @▾
♫ | , 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 Y R L Y
♫ | p3 2 1 2 1 | 7 5 , 1 2 | p3 2 1 2 1 | 7 5 , ↑5 |

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

⊕ ⚓ L Y 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 sequences that fit the flow (e.g., **L-Y**, **Y-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	Y	L	$	x	x	x	x	@
//OR.Y⊕	@	.	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 **LYMROP**. The final 2-bar segment is a rhythmic pattern with no specific melody notes. The up arrows say go up an octave.

⚓ **L** **Y**

♫ | **— 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** **Y.P**

♫ | ——— | ——— |

^* ^*

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 range of the melody line is over an octave. The skeleton harmony is spread over two octaves below it (and so is not "core") — it contains a mix of un-inverted and inverted tritones.

			@	melody
@ skeleton	@	harmony	@	

The melody line is from the major family mode **//O.MI**⊕, with two appearances of minor note **p3** as ornamental passing notes. The 3-note harmony shown here are incomplete versions of the 4-note open voicings (top notes omitted) — the open voicings are shown on the following pages. Harmony tritones **P** and **L** are ornamental substitutes for **O** and **Y**. Many of the voicings are "interesting" — some are 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.

All of Me (home tonic = C)

⚓ **M■ Y■ M■ O■ MO P■ P[4] @[4] P[4] @**

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

⚓ **O[2] OY @■ OY @■ $[4] L[4] Y[4] Y■ Y[4]**

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

repeat first 8 bars

⚓ **L■ L[4] O[2] P■ P[4] Y[4] Y■ Y[4] M■ P[4] $[4] Y[4]**

♫ **| 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 **U\V** notation identifies stacks of non-overlapping building blocks. 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 shown 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 Y – $ x + x x @ – O – M Y – $ x + x x @	
1	M \ O	. . . . M . . . . . x . . – . O . . . . . $	I-6(9)
	Y \ M	. . . . . Y . – . . . . x . . . . . M . . . . . x . . .	V-9(13)
2	M \ O	. . . . M . . . . . x . . – . O . . . . . $	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 \ Y^{-1}	. . . . x . – . . . . P . . . Y . . . . x . . .	VI-7b13
7	@ \ M	. . . . x . . . . . @ . – . M . . . . . x . . . II-m9	
	P \ Y^{-1}	. . . . x . – . . . . P . . . Y . . . . 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 \ Y	. . . . x . . . . . . O . . Y . . . . . . x .	III-7b9
11	@ \ M	. . . . x . – . . @ . . . . M . . . . . x . . .	VI-m7
	O \ Y	. . . . x . . . . . . O . . Y . . . . . . 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	Y \ M	. . . . . Y . . . . @ . – . M . . . . . x . . .	II-m9
16	Y \ M	. . . . . Y . – . . . . x . . . . . M . . . . . x . . .	V-9
	Y \ R	. . . . . Y . – . . . . x . . . R . . . . . x	V-7b9b13

Bar 17-24 - repeat bars 1-8

Bars 25-32

		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	Y	–	$	x	+	x	x	@	–	O	–	M	Y	–	$	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 \ Y	.	.	.	.	.	.	.	$	.	–	.	.	.	P	.	.	.	I	.	.	.	.	x	.	.	VI-7b9b13
29	Y \ M	.	.	.	.	.	Y	.	.	.	.	.	.	x	.	–	.	M	.	.	.	.	x	.	.	.	II-m9
30	Y \ M	.	.	.	.	.	Y	.	–	.	.	.	x	.	.	.	.	M	.	.	.	.	x	.	.	.	V-13
	Y \ R	.	.	.	.	.	Y	.	–	.	.	.	x	.	.	.	R	.	.	.	.	x	.	.	.	.	V-b9(13)
31	M \ O	.	.	.	.	M	.	.	.	.	x	.	.	–	.	O	.	.	.	.	x	.	.	.	.	.	I-6(9)
	P \ Y	.	.	.	.	.	.	.	x	.	–	.	.	.	P	.	.	.	Y	.	.	.	.	x	.	.	VI-7b9b13
32	$ \ M	.	.	.	.	.	.	.	$	.	.	.	.	@	.	–	.	M	.	.	.	.	x	.	.	.	II-m9(11)
	Y \ R	.	.	.	.	.	Y	.	–	.	.	.	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 the same piano comping course as *All of Me*. It uses the same major family mode but is interestingly different. The melody range is up from the home tonic, and the core harmony is in the next octave down. The core harmony is un-inverted except for two instances of a double tritone in the bridge that are half inverted to anticipate the melody line.

@ melody . . .
@ harmony @

No Greater Love (home tonic = Bb)

♫ 7 1 2

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

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

⚓ OY $[3] YO $[3] YO $[4] L[4] Y[3]
♫ | 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	Y	L	$	x	x	x	x	@
//O.MY⊕	@	.	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	.	.	.	.	.

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: A 5 flats (Db-Ionian); B 2 sharps (D-Ionian); 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 B). The obvious home tonic is Db because A starts and ends the piece. The large distance between A and B is more than compensated by the simplicity of every note of B being a half tone up from every note of A.

The different melody lines move within the un-inverted octave plus a bit. The skeleton core harmony is within the next home octave down.

@ melody @

@ harmony @

Body and Soul (home tonic = Ab)

A ┌ //Y (Ionian@1)

⚓ O P M M R LR

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

1

⚓ O Y O M YO Y

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

B ┌ altL@p2 (Ionian@p2)

2

⚓ L M L

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

C ┌ altM@p2 (Dorian@p2)

⚓ 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 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 — much of it is ornamental.

		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	Y	L	$	x	x	x	x	@	
A	**//Y**	@	.	x	.	x	x	.	$	.	x	.	x	@	**Ionian of tonic 1**
B	**altL@p2**	x	x	.	x	.	x	x	.	x	.	x	.	x	**Ionian of tonic p2**
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 understated major-minor changes that go well with words about love and loss. My source for the written music is *The Ultimate Jazz Fakebook*, Hal-Leonard (1988). The home tonic is Eb and the key signature is 3 flats, identifying Ionian as the resolution mode. Much of the strongly chromatic melody line is in the major family mode **//O.MY**⊕. Minor or minor-ish segments appear, indicated in the harmony by the fourth-fourth sequence **M-R**, going from major (c) to minor (d), and appearing in otherwise major (f). Play the harmony as anchor-centered octave shapes (in other words, complete the shapes going down from the building blocks. The straight harmony octave determines no building block inversions.

@ melody @

@ harmony @

Every Time We Say Goodbye (original in Eb)

(a) ⚓ M Y Y M P..M Y Y

♫ | 3 3 3 — | — 3 3 3 | 3 — — 3 | 4 — 2 1 7 |

(b) ⚓ M P..M Y Y M M R O

♫ | — 5 5 5 | — 5 5 5 | 5 — — 3 4 5 | p6 — 4 3 2 |

(c) ⚓ R R O Y R M M

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

(d) ⚓ R O O O L L O Y

♫ | — p6 p6 p6 | p6 5 — 1 2 | p3 p3 — 1 p3 2 | ——— |

(e) repeat (a)-(b)

major to minor

(f) ⚓ $ R..L O Y M M R O

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

(g) ⚓ M M L Y M R..L O..Y

♫ | 3 3 3 — | — 2 1 7 | 1 —— | —— —— |

The major to minor harmony bars in (f) are shown next.

			1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
			@	.	O	R	M	Y	.	$	x	+	x	x	@
(f)	**M**	***I-7***	*	.	.	.	M	.	.	.	.	.	x	.	.
	M	***IV-M7***	.	.	.	.	M	*	.	.	.	x	.	.	.
	R	***IV-m7***	.	.	.	R	.	*	.	.	x	.	.	.	.
	O	***pVII-7***	.	.	O	.	.	.	.	.	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 **Y-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. Play the building blocks going up from the anchor line as anchor-centered octave shapes going up and down from the anchor line.

The lowest melody note is a whole tone above the tonic. The harmony octave is the next octave down.

@ **harmony** @ **melody** @

All The Things You Are (home tonic = Ab)

(a)//**Y** ⚓ **$ Y Y M M**

♫ **1 | 4 1 | 7* | 7 3 7, | 6*|**

(b)**altR** ⚓ **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, | — |**

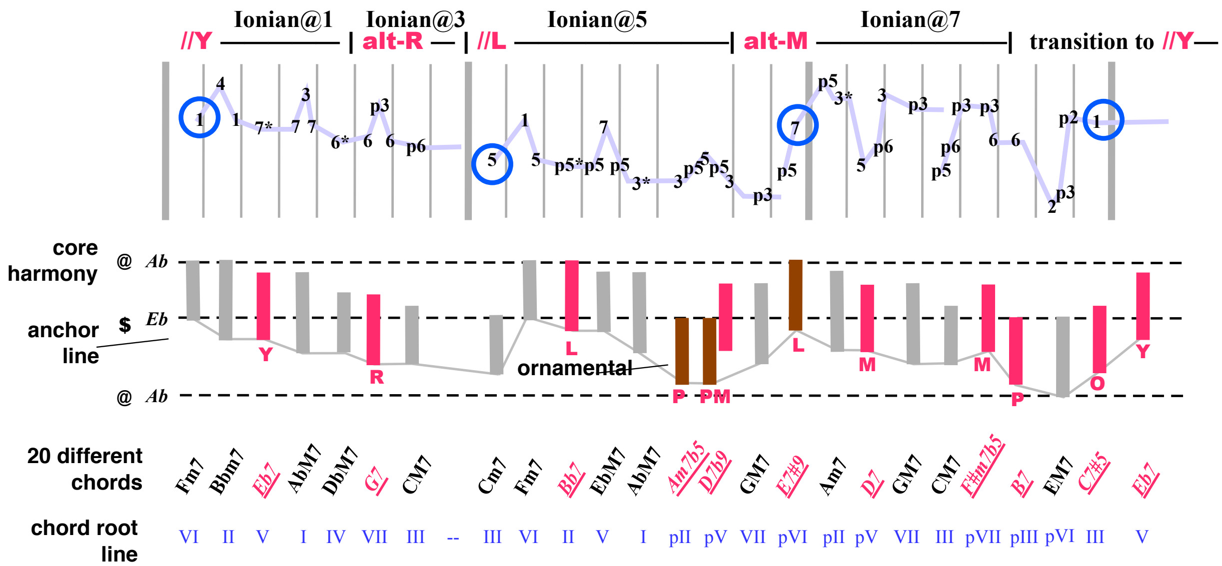
⚓ **M**

♫ **| — p5 7 p3 | p3 p2*, |**

(e)trans. ⚓ **P @ O ... Y**

♫ **| — 2 p3 p2 | 1 | — |**

The following overview picture is helpful in getting a handle on the piece as a whole. This begs the question, Why not always show the Lego-like harmony vertically so it can be easily aligned by eye wih the melody? The answer is showing it horizontally corresponds with the simple concept of a mode table that presents everything about the home octave to the eye as it looks on the keyboard when sitting in front of it. Mode tables represent figuring things out on the keyboard. Inevitably this spreads vertically downward, which would translate into spreading out horizontally in the view suggested by the question. There's no free lunch.



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	Y	L	$	x	x	x	x	@	
(a)	**notes**	x	.	.	.	x	x	.	.	.	x	.	x	x	
	//Y	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)	**//Y**	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 shares 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	Y	L	$	x	x	x	x	@	
(d)	[3]M	.	x	.	.	M	.	.	.	.	.	x	.	.	pVII*m7b5*
(e)	P ■	.	P	.	–	.	.	.	x	.	.	.	.	x	pIII*7*
	@ ■	@	.	.	.	.	.	.	x	–	.	.	.	x	pVI*M7*
	O[4]	.	.	O	.	–	.	.	.	x	.	.	.	x	III*7#5*
(f)	[3]Y	.	.	x	.	.	Y	.	–	.	.	.	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 thought that anything that sounds this good must have simple musical logic behind it. Digging it out was a struggle. The result is valid for any home tonic, and shines a light on useful patterns that are obscured by the "clothes" of music notation

The lowest melody note is the home tonic. The harmony octave is the octave going down from it.

@ harmony	@ melody	@

Chelsea Bridge (home tonic = Db/C#)

(a) ♫ | — 6 7 1 2 3 4 5 | //Y
^ ^ ^ ^

(b) @+1 L+1 @+1 L+1 aug. fifths (hold anchor)
⚓ L.O M.L L.O M.L P major modes
♫ ||: p6 ——, 6 p5 | ——, 5 p6 | — , 6 p5 — 5 p2 | —, | ambiguous by itself
^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^

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

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

(e) ⚓ P Y
♫ | p2 — p3 4 | 5 — p6 p3 p2 7 | p7 p2 ——, 7 p7 | alt-YP (Phrygian-*b1*)
^ ^ ^^ ^ ^ ^ ^ ^ ^ ^^^ ^

(f) ♫ 6 p5 6 p2 p5 p2 segue to (g) via **alt-L** (Locrian)
^ ^ ^ ^

(g) ⚓ M R O P
♫ | p5, 6 7 1 2 3 4 5 | //Y (Ionian)
^ ^ ^ ^

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 Y L $ x x x x @		
(a)	x . x . x x . x . x . x x	**//Y**	**Ionian**
(b)	x . x . x . x . x x . x x	**//L.O**	**major mode Lydian-*#5***
	@ . . . . x		**imply by aug. fifth @$^{+1}$ (hold anchor)**
	x . x . x . x x . x x . x	**//M.L**	**major mode Lydian-*b7***
	x . . . . L		**imply by aug. fifth L^{+1} (hold anchor)**
(c)	x . . . x . . x x	**//Y**	**major triad**
	goes to minor of home tonic		
	@ . . . . x . . . x		**segue to minor via aug. fifth @$^{+1}$**
(d)	x . x x . x . x x . x . x	**//O**	**Aeolian**
(e)	. x . x . x . x x . x x .	**alt-Y.P**	**minor mode Phrygian-*b1***
(f)	. x . . . . . x . x		**ambiguous. but it and (g) suggest Locrian**
	x x . x . x x . x . x . x	**alt-L**	**Locrian transposes down 1/2 tone to Ionian**
	goes to major of home tonic		
(g)	x . x . x x . x . x . x x	**//Y**	**Ionian**

<u>LUSH LIFE</u>

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 (Ionian 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 **//ORMY** minor-major mode in [A] and [C]; the other is the tonic-less **//IP** mode (Ionian#*1*) in [B].

******placement of core harmony octaves

<u>Lush Life (original home tonic = Db)</u>

[A] ⚓ @ O M O M O M Y O R
♫ 5 ||: 1* 2* | 3* 2* | 3* 2* | 3* 4* 5* p6*|
1________ 2________
⚓ Y Y O Y M M R
♫ | p7*— p6 p7 p6 | 5* p7 p3*| 2*, — 5 :|| 2*, — 7 |

[B] ⚓ Y 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*
⚓ Y M MP RL OY
♫ | 6 7 5 6 7 3 | — | — , 5 4 3 | 2 | — , 2* 3 1 | 5 — , | — |

[C](a) ⚓ M^{-1} Y M^{-1} Y R O M L Y
♫ | 5 p7 p3 p6 | 5 7 p3 p7 | 6 5 1 3 4 5 | p7 — p6 |
(b) ⚓ M R P O
♫ | <u>repeat bars 1-2 of (a)</u> | 6 5 1 3 5 p6 | 7 — 1 |
(c) ⚓ O L RL M O P L Y
♫ | 2 3 4* — p3 | 2 3 4* p3 | p6 p7 7* — p7 | p6 p7 7 6|
(d) ⚓ RY OY P
♫ | <u>repeat bar 1-2 of (a)</u> | 6 5 1 3 4 5 | 6 — 3 |
(e) ⚓ O L Y RL P
♫ | 5 4 5* 4 | 3 2 3 7 | 2 1 2 — 2 1 | 1 p7 6 — 3 |
(f) ⚓ O L Y 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-YP** morphs into **//Y** halfway through [B] by altering one note.

From time to time, the harmony of the different sections substitutes **P** and **L** for **O** and **Y**, but thinking of these as ornamental relative to the **//ORMY** 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].

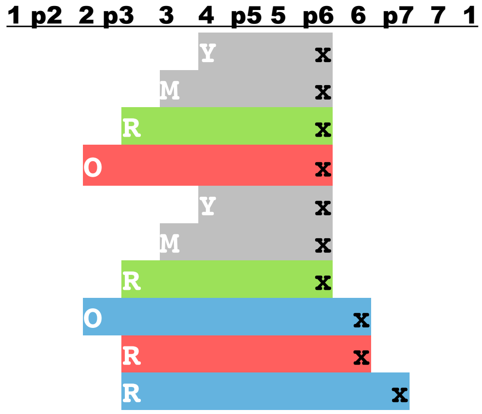
The double tritones **P..M**, **O..Y** and **R..L** that appear in many places in the harmony are diminished seventh chords, commonly used ornamentally in any context in which they sound good. The double tritones have circular symmetry (all intervals are minor thirds), so only three of them with different 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.

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 **ADI** to be understood as **ORY**). The piece sounds so “right” as written that jazz improvisations rarely stray far from it (it’s a poster child for the concept of “frozen improvisation”). 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. ******placement of core harmony octaves

The core harmony in opening bars is visibly from the **//ORMY** 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. These are better remembered in terms of simple patterns shown by **x** entries in a mode table than from note sequences of any kind.

The two groups of four sixteenth notes in bars 11-15 follow a repeated pattern of down a minor third, down a half tone, and up a minor third (net down a half tone).

```
                @ P O R M Y L $ x x x x @
                1 p2 2 p3 3 4 p5 5 p6 6 p7 7 1
bar 11          . . . x . . x . . . . . .     down
                . . x . . x . . . . . . .     up
                . x . . x . . . . . . . .     down
                x . . x . . . . . . . . .     up
bar 13          same, up a whole tone
bar 15          same, up a minor third
```

The eighth note triplets of bar 16-17 follow a repeated pattern of down a minor seventh and up a half tone, (net down a major sixth).

CHAPTER 7: 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 can say 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 that 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 simple mode hierarchy 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. **PORMYL** words are "expressed" as building blocks of scales and harmony. Biological DNA is "extracted" from biological samples and interpreted by sophisticated machines called "sequencers." **PORMYL** scales and building blocks are "extracted" and "sequenced" from musical lines by sophisticated machines called human eyes. Biological DNA is "inherited" from parents. **PORMYL** 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 and symmetry-breaking.
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 at once painstakingly accurate and overwhelmingly complex because it sticks to representations based on sharps and flats.
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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I did not take this musical journey alone. I received comments and help from many people while the ideas were germinating and consolidating.

Music theorist Paul Steinbeck encouraged me to continue writing at a time when I was becoming discouraged. Jazz pianist, teacher and composer Taylor Eigsti has been an inspiration to me. Although I have never been a piano student of his, I have learned much from him in sporadic discussions in person and by email. I am deeply grateful for his willingness to take time away from a busy schedule to engage in these discussions. A short series of piano lessons from SF jazz pianist Michael Parsons helped me to see more clearly the relationship between my ideas and standard jazz-piano practice.

Thanks to SMT (Society for Music Theory) members Charise Hastings, Peter Shultz and Neil Newton for insightful email comments and encouragement following announcements of my website on an SMT mailing list. Thanks to music professor Robert Rawlins for email encouragement, and for helpful examples and comments. Aaron Blumenfeld and Susan Muscarella gave helpful courses at the Jazz School in Berkeley (now the Jazz Institute) that provided many examples to chew on (including, from Susan Muscarella's course, some interesting variations on *Summertime* in D minor that helped me understand ornamental scales). Amateur pianist and Jazz School Board Chair Susan Brand, and concert pianist and music entrepeneur Robert Taub, provided early encouragement.

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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 her 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:** alphabet letter identifying a building block by the position of its bottom end relative to the home tonic (underlining identifies an inversion).
- **anchor line:** anchor sequence oif harmony written above the melody line
- **alphabet: PORMYL** identifies tritone anchors by reference to the names of classical modes containing the tritones. The mode names and corresponding letters in tritone order are **P**hrygian, Ae**O**lian, **D**orian, **M**ixolydian, **Y**onian (**I**onian with **Y** pronounced "e**Y**e") and **L**ydian/Locrian.
- **alphabet words** identify keyboard shapes formed of combinations of or split building blocks
- **building block:** tritone or fifo (fifth or fourth) anchored at alphabet positions; sizes are determined by color coding: red for tritones, blue for fifths, green for fourths).
    - **annotations on** building blocks are:
        - **superscript: ±n** identifies a building block shrunk or expanded by **n** half tones while holding its anchor fixed (restricted to shrunk fourths or expanded fifths)
        - **superscript:** ▼(minor), ▲(major), ● (dim) identify split building blocks that form triad chords
        - **attachment:** ■, ■, ■ identifies an octave completion building block
        - **attachment:** ■ identifies a building-block-like interval smaller than a fourth determined by context
        - **attachment: [n]** means the same as above except the size is **n=1-4** half tones
- **chromatic scale: 1-p2-2-p3-3-4-p5-5-p6-6-p7-7-1** mirrors the look of the C-octave and its meaning in interval terms; **p** stands for "phlat" and means the note a 1/2 tone down in a whole tone gap of the **1-2-3-4-5-6-7-1** scale.
- **chord roots:** same scale with RN (Roman Numeral) symbols
- **context:** provided by **mode** and by **flow**
- **core harmony:** sequence of shapes formed of building blocks within the home octave.
- **family:** a set of sub-scales of a family scale defined by a single master mode
- **fifo:** fifth or fourth that are opposite inversions (add up to an octave)
- **flow:** formed by morphs and slides of building blocks
- **frame:** of a home octave, defined by **@-$-@** where **@** is the tonic and **$** the pitch center; the home of the alphabet is in the **@-$** fifth
- **framework:** of core harmony, sequence of tritones going up or down from anchors
- **morph:** change in the size of a building block by a half tone or whole tone
- **mode signature:** word prefixed by **//** or **alt** identifying a parallel mode of the home tonicc
    - a rotated mode signature identifies a relative mode, e.g., **//I@6**
    - a transposed mode signature identifies a transposed mode, e.g, **tr[//I]@6**
    - a circled plus superscript identifies a family mode determined by a fill-in note
- **outside:** not in a given tonic scale, as distinct from "chromatic" meaning not in a key-signature scale
- **pattern:** organized arrangement of intervals on the keyboard or over time

- **pitch center:** note identified by a fifth/fourth octave split, symbolized by **$**
- **shape:** an object on the keyboard determined by split or combined **building blocks**
- **slide:** size-preserving movement of a building block
  - **wobbly slide:** combined slide and morph
- **phlat:** prefix **p** identifies chromatic-scale notes corresponding to the black keys of the C octave
- **tonic pointer:** symbol of form **@t** indicating a secondary tonic
- **universal home octave:** combination of
  - **1-p2-2-p3-3-4-p5-5-p6-6-p7-7-1**
  - **@PORMYL$xxxx@**
- **word:** set of alphabet letters in alphabet order in the alphabet as a circular loop
  - optional dots indicate skipped letters
  - underlining indicates inversions of building blocks
  - backslashes indicate non-overlapped building blocks

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 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).

Major and minor scales have a fundamental note in the lower fifth of the scale that's a major or minor third above the tonic (PKP makes this explicit by symbols **3** and **p3** for these note positions).

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 other uses than this (e.g., ornamental passing notes, identifying scales that originate in no key signature). Sorting out the possibilities requires considerable head-scratching at a very low conceptual level.

CROSS REFERENCES

The following table cross-references music notation and PKP's universal home octave. 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**	**Y**	**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

This table is useful for many things, for example figuring out the key signature that's closest to a blues for a given tonic. The **x** entries below identify the notes of the 9-note blues family mode for tonic Eb and the **o** entries identify the notes of the Eb Mixolydian scale, which is a relative of mode of the Ionian mode of tonic Ab (4 flats). The scale has 7 of the 9 notes of the blues scale. So 4 flats would be a good key signature for an Eb blues. However, the 3 flats of Eb Ionian is more usual. Key signatures with multiple sharps tend to be avoided for blues pieces but there are always exceptions.

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

APPENDIX C : ABOUT CHORDS

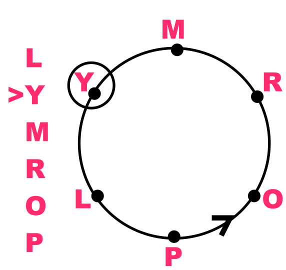
TABLE OF TRITONE CHORDS

Building blocks — tritones and fifos (fifths and fourths) — are the core of harmony in PKP. Tritones are central because fifos are morphed tritones. Therefore understanding a chord progression begins with extracting its tritone content, using the following the table of tritone chords. Little knowledge of chords is required beyond looking up chord symbols in this table. The objective is to determine the anchor of each tritone relative to the home tonic of a piece, which only requires converting the offset from the root into an offset from the tonic. The building-block view of harmony that results may have a different chord interpretation from the original, because of insight provided by context, but will have the same tritone content.

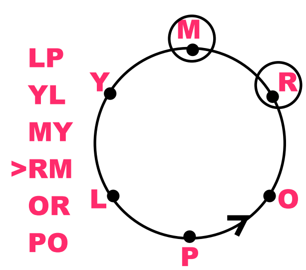
offset of tritone anchor note above root	suffixes on root symbol										
	7	7♯9(13)	9♭13 (or ♯5)	7♭9	7♭5 (or ♯4 or ♯11)	dim7 (or o7)	m7♭5	m6	M7(11)	♭9	M7♯11 (or ♭5)
fourth (5h)									x		
major third (4h)	x	x	x	x	x						
minor third (3h)		x				x		x			
whole tone (2h)			x								
half tone (h)				x						x	
0					x	x	x				x

The left column shows anchors of tritones of chords containing them as offsets in half notes from the written chord root. This corresponding anchor the letters of the home tonic @ of a found using the picture of the alphabet as circle loop shown in The four modes marked ✖✖ provide none., repeated below.

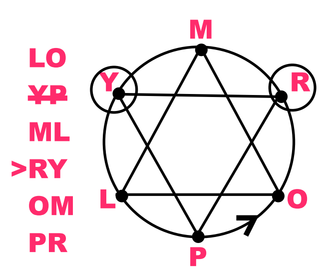
classical



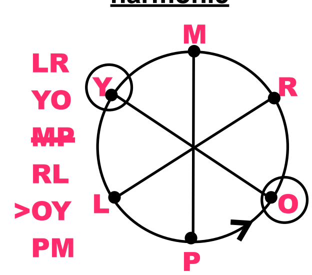
blues



melodic



harmonic



The correspondences are as follows (tritone inversions identified by underlined letters):

offset from written root	**0**	**h**	**2h**	**3h**	**4h**	**5h**	**6h**	**0**				
in home tonic alphabet	**@**	**P**	**O**	**R**	**M**	**Y**	**L**	**$**	**.**	**.**	**.**	**. @**
corresponding home tonic roots	**I**	**pII II**	**pIII**	**III**	**IV**	**pV**	**V**	**pVI VI**	**pVII VII**	**I**		

The table only includes chords with four or more notes, which are seventh chords or sixth chords that are inversions of them (same notes, different roots). These are the "workhorse" chords of progressions shown above in staff in fake books that show only melody notes on a single staff, or in sheet music shows also the full music on the grand staff. Seventh and sixth chords are visually recognizable on the keyboard as combinations of building blocks identifiable by the anchor alphabet of the home tonic. Simpler triad chords are split building blocks that are as recognizable as sub-intervals of seventh and sixth chords, identified by a tweak of the alphabet best covered separately.

Conventional wisdom says that the "strongest" interval of a seventh chord — the interval which keep must be in any of voicing of it — is the 3rd-7th interval of its chord scale. This correctly identifies tritones of the most common tritone chords as "strongest" (until-altered dominant seventh chords) but fails for other tritone chords that have tritones in different scale positions (altered dominant seventh, major seventh, and minor seventh chords; and altered sixth chords that are inversions of them). Unaltered dominant chords may the most numerous of individual types of tritone chords, but the profusion of many types is confusing if many of them not recognized as tritone chords — for example, CM7(11), Dm6, Dm6(9), FM7b5, G7, G9, G9(13) and Bm7b5, all white-key chords of tonic C *with the same tritone* (some are mutual inversions with the same notes). If nothing else demonstrates the utility of tritones for understanding music, this does — a "tritone hammer hits many tritone nails."

Sus chords (typically V-7#3) are not in the table because they have no tritones (a Vsus-V-I progression is a substitute for a II-V-I progression in which only one note is altered between the first two steps).

The table stops at double tritones they're the normal upper limit for tritone content of chords encountered above the staff in fake books and sheet music (examples beyond this are dissonant splashes of notes formed by banging both hands or a forearm on the keyboard, which are too tonally complex to bother identifying by chord symbols, and least in tonal music)\

A BUILDING-BLOCK VIEW OF CHORDS

The above table in from a building-block view of chords from parallel classical modes with only single tritones and non-classical modes with double-tritones. None-classical *modes* may contain more tritones but formal *chords* with more tritones are too rare and complex in tonal music to be worth including.

Seventh & Sixth Chords

Chord symbols represent chords in terms of chord scales going up from roots, which ignores the context in they which appear in actual tonal music that provides they provides their actual notes. Tritones in chords are identified by the positions of their anchors relative to roots, which does not involve the alphabet. Tritones in context are identified by the positions of their anchors relative to home tonic of a piece, which requires the alphabet relative to the home tonic.

Because tritone anchors in the universal-home tonic alphabet are identifiers of parallel modes — if you still don't believe it, this appendix verifies it in depth — the trick in identifying in-mode tritones is locating the tritone anchor in the parallel alphabet scale (not shown but implied). The interval between root note "**1**" and a tritone note establishes the note as the anchor if note within the alphabet, and otherwise as the other tritone note if it's not (which means tritone is in the opposite inversion from the in-mode anchor). A feature of this way of establishing the anchor is its independence of the actual in-mode chord root, which frees the harmony from the straightjacket of chord symbols — in this way of doing things, chord fifos are morphed tritones and chord roots are add-ons that may omitted if implied by context (this goes also for other notes implied by context).

Tritone Chords

The following table of tritone seventh chords is fundamental to understanding harmony in PKP terms. Same-kind combinations of building blocks are shown in line for conciseness. Different-kind combinations are offset for clarity. Numbers in the suffixes of the chord symbols are degree numbers that count notes in assumed 7-note scales off the end of the main octave up into the next octave. Counts in the next are shown here as harmonically equivalent notes in the main octave. Sharped or flatted degree numbers identify notes not in the assumed 7-note scales. Some of the extended or altered chord symbols can be confusing but all you need are the tritone anchors.

dominant seventh chords and variatIons

symbol	name	chord scale												
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
I7	dominant seventh	.	.	.	.	x	.	.	.	.	.	x	.	.
		*	.	.	.	.	.	.	x	.	.	.	.	.
I9 (7 assumed)	dominant ninth	*	.	.	.	x	.	.	.	.	.	x	.	.
		.	.	x	.	.	.	.	x	.	.	.	.	.
I9(13) (7 assumed)	dominant thirteenth	*	.	.	.	x	.	.	.	.	.	x	.	.
		.	.	x	.	.	.	.	.	.	x	.	.	.
I7(#9)	dominant seven sharp nine	.	.	.	.	x	.	.	.	.	.	x	.	.
		*	.	.	x	.	.	.	x	.	.	.	.	.
I7b5	dominant seven flat five	*	.	.	.	x	.	x	.	.	.	x	.	.
I7b9	dominant seven flat nine	*	x	.	.	x	.	.	x	.	.	x	.	.
I7(9)b13	dominant nine flat thirteen	*	.	x	.	x	.	.	.	x	.	x	.	.
I7(#9)13	dominant nine thirteen	*	.	.	x	x	.	.	.	.	x	x	.	.

tritone variations of other seventh chords

symbol	name	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
Im7b5	half diminished seventh	*	.	.	.	.	.	x	.	.	.	.	.	.
					X	.	.	.	.	.	.	X		
Idim7	diminished seventh	*	.	.	X	.	.	x	.	.	X	.	.	.
IM7(11)	major seventh eleven	.	.	.	.	.	x	.	.	.	.	.	x	.
		*	.	.	.	–	.	.	x	.	.	.	.	.
IM7(#11)	major seventh sharp eleven	.	.	.	.	.	.	x	.	.	.	.	.	x
		*	.	.	.	–	.	.	x	.	.	.	.	.

tritone variations of sixth chords

symbol	name	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
Im6	minor six	.	.	.	x	.	.	.	.	.	x	.	.	.
		*	.	.	.	.	.	.	x	.	.	.	.	.
Im6(9)	minor six nine	*	.	.	x	.	.	.	.	.	x	.	.	.
		.	.	x	.	.	.	.	x	.	.	.	.	.

Fifo Chords

Fifos (fifths or fourths) in PKP are morphed tritones, so painstaking analysis of fifo chords is not required to get a handle on the harmony. Instead, fifo combinations are formed to fit the current mode and harmonic flow, and only then interpreted as voicings of fifo chords. This summary of the main types of fifo chords is helpful for this enterprise.

symbol	seventh & sixth chords	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
IM7	**major seventh**	.	.	.	.	x	.	.	.	.	.	.	x	.
		x	.	.	.	.	.	.	x	.	.	.	.	.
IM7(9)	**major ninth**	x	.	.	.	x	.	.	.	.	.	.	x	.
		.	.	x	.	.	.	.	x	.	.	.	.	.
IM7(9)	**major ninth**	x	.	.	.	x	.	.	.	.	.	.	x	.
		.	.	x	.	.	.	.	.	.	x	.	.	.
Im7	**minor seventh**	.	.	.	x	.	.	.	.	.	.	x	.	.
		x	.	.	.	.	.	.	x	.	.	.	.	.
Im7	**minor ninth**	x	.	.	x	.	.	.	.	.	.	x	.	.
		.	.	x	.	.	.	.	x	.	.	.	.	.
Isus	**dominant seventh #3**	.	.	.	.	.	x	.	.	.	.	x	.	.
		x	.	.	.	.	.	.	x	.	.	.	.	.
I6, or IM6	**major six**	.	.	.	.	x	.	.	.	.	x	.	.	.
		x	.	.	.	.	.	.	x	.	.	.	.	.
I6(9), or IM6(9)	**major six nine**	x	.	.	.	x	.	.	.	.	x	.	.	.
		.	.	x	.	.	.	.	x	.	.	.	.	.

Inversions

Different inversions of the same combination of building blocks may have different chord symbols, increasing notational complexity without any increase in substance: for example, the inversion **I*6*/VI** is **VI*m7*** (the slash suffix indicates an inversion going up from a note identified by a root symbol); the inversion **II*m7*/IV** is **IV*M6***; the inversion **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 (but it may be given an altered chord symbol).

Classical Modes

A famous chord progression of the Ionian mode known as the "diatonic cycle has roots descending by fifths (zig-zagging down by fifths down and by fourths up in the home octave). Then cycle may be formed by without reference to the chord symbols, leaving them as optional add-on. The whole chord sequence is governed by the elegantly simple core anchor sequence **Y-Y-M-Y-Y-Y-M-Y** with the simple chord-completion fifos left to context. The full sequence could be written as **OY-OM-OY-OM-OY-@M-OY**, with the building blocks in alphabet order. However, this is often too much of a notational straight-jacket because the chord completion fifos **O-O-O-O-O-@-O** tend to obvious from context (they provide a simple a bass line as a starter). The chord roots **VII-III-VI-II-V-I-IV** zig-zag between roots and internal notes of the chords. The **IV** chord is at the end,   but it could open this sequence by going down a tritone (**IV-VII**).

Triad Chords

Seventh and sixth chords with four or more notes are combinations of building blocks. Triad chords with only three notes are simpler on the face of it, but can also be a source of considerable complexity when they're mixed in with seventh and sixth chords, simply because parsing chord sequences with more types of chords requires more effort. Triads are 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). The different forms of inversions add to the complexity.

Triad chords are split building blocks. Major or minor triads are *asymmetric* splits of fifths into a minor third and a major third in either order, symbolized by superscript "▲" indicating the larger interval is on the bottom, or superscript "▼" indicating the larger interval is on top. Diminished triads are *symmetric* splits of tritones, symbolized by superscript "●". Fourths enter the triad picture via inversions of fifths.

Here are some examples.

		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
chord		@	P	O	R	M	Y	L	$	x	x	x	x	@	P	O	R	M	Y	L	$	**split uilding block**
I	**major triad**	*	.	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	@▲
IIm	**minor triad**	.	.	*	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	O▼
IIIm	**minor triad**	.	.	.	.	*	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	M▼
IVdim	**diminished triad**	.	.	.	.	.	*	.	.	x	.	.	x	.	.	.	.	.	.	.	.	Y●
IV	**major triad**	.	.	.	.	.	*	.	.	.	x	.	.	x	.	.	.	.	.	.	.	Y▲
VIIdim	**diminished triad**	.	.	.	.	.	.	.	.	.	.	.	*	.	.	x	.	.	x	.	.	Y●

Seventh and sixth chords can be understood as combinations of triad chords that share two notes: **I***M7* is a combination of a major triad with root **I** and a minor triad with root **III**; **II***m7* is a combination of a minor triad with root **II** and a major triad with root **IV**; **V***7* is a combination of a major triad with root **V** and a diminished triad with root **IV**. Turning this around, a seventh or sixth chord may be implied by a sequence of triad chords.

It's sometimes useful to represent inversions of minor or major triads by outer intervals (not diminished triads because this would hide the mode-identifying tritone). The outer interval shown next is a major sixth symbolized by a fifth expanded by two half tones up or down from an anchor (superscript $^{+2}$). Shrinkage of fourths is symbolized by minus superscripts. Shrinkage of fourths or expansion of fifths creates building-block-like intervals without adding to the menu of building blocks for cases that occur infrequently. Note that expanding a fifth (for example) is different from adding a small interval to it.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	Y	L	$	x	x	x	x	@	
I	*	.	.	x	.	.	.	x	.	.	.	.	.	@▼
I/pIII	.	.	.	x	.	.	.	x	.	.	.	.	*	■@
	.	.	.	x	.	.	.	.	.	.	.	.	*	@$^{+2}$ **or** R^{+2} **— hold anchor and expand into major sixth**

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	Y	L	$	x	x	x	x	@	
.	.	.	.	.	x	.	.	.	.	.	x	.	**V***7*, **IIm***7(13)*, **I***M9(11)*
.	.	x	.	.	.	.	x	.	.	.	.	.	
.	.	.	.	.	x	.	.	.	.	.	x	.	**V***9(13)*, **IV***M7b5*

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

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

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

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

<u>Chords From Non-Classical Modes.</u>

This illustrates that non-classical modes provide many new chords. *****fix numeric prefixes

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	@	P	O	R	M	Y	L	$	x	x	x	x	@	
minor family	@	.	x	x	.	x	.	$	x	x	x	x	@	
OR	.	.	O	R	.	.	.	.	x	x	.	.	.	IV*7#9(13)*, VII*7#9(13)*
R.Y	.	.	.	R	.	Y	.	.	.	x	.	x	.	IV*7b5*, VII*7b5*
O..Y	.	.	O	.	.	Y	.	.	x	.	.	x	.	II*dim7*, IV*dim7*, pVI*dim7*, VII*dim7* rootless *7b9* rel. to roots a 1/2 tone down
③R♭	x	.	.	R	.	.	.	.	.	.	.	x	.	I*mM7*, pIII*M*+
④$	.	.	.	x	.	.	.	$	.	.	.	.	@	I*m* (minor triad @▼, spread out)
major family	@	.	x	.	x	x	.	$	x	x	x	x	@	
MY	.	.	.	.	M	Y	.	.	.	.	x	x	.	pII*7#9(13)*, V*7#9(13)*
O.M	.	.	O	.	M	.	.	.	x	.	x	.	.	III*7b5*, pVII*7b5*
O..Y	.	.	O	.	.	Y	.	.	x	.	.	x	.	as above
③$	.	.	.	.	x	.	.	$	.	.	.	.	@	I (major triad)
blues family	@	.	x	x	x	x	x	$	.	x	x	.	@	
RM	.	.	.	R	M	.	.	.	.	x	x	.	.	I*7#9(13)*, pV*#9(13)*
M.L	.	.	.	.	M	.	L	.	.	.	x	.	x	I*7b5*, pV*7b5*
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."

<u>Blues Chords</u>

Blues chords can be all over the map. This is because the classical modes that determine the symbols for seventh and sixth chords are different in kind from blues modes (different numbers of notes, no adjacent half tones, only single tritones). Blues chords in general are classical-mode chords altered to fit a blues mode (think "banging square pegs into round holes"). A sampling of such chords is provided next, to give a sense of the potential complexity of blues chord progressions in music notation. The chord symbols are intended only to illustrate the complexity — knowing them is not required to read on. The sharp and flat suffixes are degree numbers in the 7-note scales that define the basic chords, and are quite confusing relative to blues scales with more or fewer notes. The takeaway here is that combinations of building blocks *are* the chords in context. An amazing amount of chord-symbol complexity can be introduced by holding the tritone and changing the completion fifo (or vice-versa). Finding chord symbols to identify such combinations can sometimes be difficult.

Complex chords such as the ones on the right often boil down in context to a tritone plus a voicing interval that implies a completion fifo, or to two overlapped tritones (a double tritone). Roots on the right are all over the map, giving lie to the idea that blues is characterized by roots **I-IV-V**. The roots are indicated by * entries in the Lego-like representations of the chords. Color-coding of fifo completions in parentheses on the left is mirrored by color-coding of corresponding x entries.

	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	p2	2	p3	3	4	p5	5	
	@	P	O	R	M	Y	L	$	x	x	x	x	@	P	O	R	M	Y	L	$	**examples**
M•	.	.	.	.	*	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	**III*dim***
@M	x	.	.	.	M	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	**I7, III*m7b5#5*, III*m7b5b13***
MR	.	.	.	.	M	.	.	–	.	.	x	.	*	.	.	x	.	.	.	.	**I*7#9***
R•	.	.	.	*	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.		**pIII*dim***
RY	.	.	.	R	.	*	.	.	.	x	.	.	x	.	.	.	.	.	.	.	**IV*7***
RO	.	.	.	R	.	*	.	.	.	x	.	.	.	.	x	.	.	.	.	.	**IV*13***
(O)M	.	.	*	.	.	.	M	.	.	x	.	.	x	.	.	.	.	.	.	.	**II*7***
(O)Y	.	.	x	.	.	Y	.	*	.	.	.	x	.	.	.	.	.	.	.	.	**V*7***
Y($)	.	.	.	.	.	Y	.	*	.	.	.	x	.	.	x	.	.	.	.	.	**V*7***
L($)	.	.	.	.	.	.	L	*	.	.	.	x	x	.	x	.	.	.	.	.	**V*M7(11)***
L•	.	.	.	.	.	.	*	.	.	x	.	.	x	.	.	.	.	.	.	.	**pV*dim***
(P)L	.	x	.	.	.	.	L	.	–	.	.	.	x	.	.	.	.	.	.	.	**tritone substitute for V*M7(11)***
ML	.	.	.	.	M	.	*	.	.	.	.	x	.	*	.	.	.	.	.	.	**I*7b5*, pV*7b5***
RM	.	.	.	R	*	.	.	.	.	.	x	x	.	*	.	.	.	.	.	.	**I*7#9(13)*, III*7b9b5***
RL	.	.	.	R	.	*	L	.	.	x	.	.	.	*	.	.	.	.	.	.	**I*dim7*, IV*7b9***

Tritone-Substitute dominant seventh 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 * 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	Y	L	$	x	x	x	x	@		
L	.	.	*	.	.	.	L	.	*	.	.	.	.	F7	B7
Y	.	*	.	.	.	Y	.	*	.	.	.	.	.	E7	Bb7
M	*	.	.	.	M	.	*	.	.	.	.	.	x	Eb7	A7
R	.	.	.	R	.	*	.	.	.	.	.	x	.	D7	Ab7
O	.	.	O	.	*	.	.	.	.	.	x	.	.	Db7	G7
P	.	P	.	*	.	.	.	.	.	x	.	.	.	C7	Gb7

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)→ *←minor seventh (10h)→*

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

←fifth (7h)→ *←maj. seventh (11h)→*

XX & XX x x . . . . x x **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.

Chords Directly From Tritones on the keyboard

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

3-note chords	* . . x . . x	***dim***
	x . . x . . . . . *	***dim* (inverted)**
	x . . . . . . x . . *	***dim* (inverted)**
4-note chords	* . . . x . . . x . . x	***7 (3 note voicing omits inner note)**
	* . . x . . . . x . . x	***m6 (3 note voicing omits inner note)**
	x . * x	***7 (3 note voicing of inversion)**
	x . . x . . . x . *	***7 (inverted)**
	* . . x . . . x . . x	***m7b5**
	x . . . . x . *	***m7b5 (3-note voicing of inversion)**

FIGURED BASS NOTATION; EXTENDED CHORDS

Figured bass notation provides a simple representation of chords from classical modes. 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

APPENDIX D: ABOUT BRIDGE MODES

Key-signature notation forces thinking of every scale that departs from a classical mode as an altered classical mode, determined by accidentals. The suites of modes I have come to call **bridge modes** are cases in point. They're important suites of double-tritone parallel modes that are conventionally understood as enriched classical modes with one note altered by a half tone, but with no alteration of the basic properties of classical modes of 7 notes and no adjacent half tones. The modes have two tritones because the altered note forms a tritone with a scale note.

BRIDGE MODE TABLES

The following tables repeated from Chapter 4. The prefix "//" is inherited from classical modes, where it's shorthand for "parallel." For these modes, it identifies six primary words transposed by single alphabet steps, not all of which identify parallel modes. Any primary mode may constructed from the double tritone determined by the mode signature, plus a transposed master tonic (highlighted in blue) determined by counting a fifth for each alphabet step between the master word and the signature word (**alt** modes are offset by a tritone from this). Modes that are not parallel come from inter-tritone arcs in the circular loop that cross the home tonic in a way puts in it an incompatible scale position. Modes marked ✖ have one compatible position; one mark ✖✖ have none.

Melodic Modes

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	//LO	x	.	x	.	o	.	x	.	x	**x**	.	o	x	Lydian-*#5*
✖	//YP	.	x	**x**	.	o	x	.	x	.	o	.	x	.	Ionian-*#1*
	//ML	x	.	o	.	x	.	x	**x**	.	o	x	.	x	Lydian-*b7*
>	//RY	**x**	.	o	x	.	x	.	o	.	x	.	x	**x**	Ionian-*b3*
	//OM	o	.	x	.	x	**x**	.	o	x	.	x	.	o	Mixo-*b6*
	//PR	o	x	.	x	.	o	.	x	.	x	**x**	.	o	Dorian-*b2*

		@	P	O	R	M	Y	L	$	.	.	.	.	@	
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	
	altLO	x	.	x	**x**	.	o	x	.	x	.	o	.	x	Locrian-*#2*
✖	altYP	.	x	.	o	.	x	.	x	**x**	.	o	x	.	Phrygian-*b1*
	altML	x	**x**	.	o	x	.	x	.	o	.	x	.	x	Locrian-*b4*
✖	altRY	.	o	.	x	.	x	**x**	.	o	x	.	x	.	—
✖	altOM	.	o	x	.	x	.	o	.	x	.	x	**x**	.	—
✖	altPR	.	x	.	x	**x**	.	o	x	.	x	.	o	.	—

The formally non-parallel modes identified by **YP** are so close to the parallel modes (one sharps the tonic and the other flats it) that they're often used as ornamental substitutes.

Harmonic Modes

Six of these 8-note modes provide two 7-note modes each.

		@	P	O	R	M	Y	L	$	.	.	.	.	@
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	//LR⊕	x	—	—	x	**x**	.	x	x	x	x	.	o	x
✖	//YO⊕	x	x	x	.	o	x	—	—	x	**x**	.	x	x
✖✖	//MP⊕			x	**x**	.	x	x	x	x	.	x	x	—
	//RL⊕	x	.	.	x	—	—	x	**x**	.	x	x	x	x
>	//OY⊕	**x**	.	x	x	x	x	.	o	x	—	—	x	**x**
	//PM⊕	o	x	—	—	x	**x**	.	x	x	x	x	.	o

		@	P	O	R	M	Y	L	$	.	.	.	.	@
		1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1
	altLR⊕	x	x	x	x	.	o	x	—	—	x	**x**	.	x
✖✖	altYO⊕	—	—	x	**x**	.	x	x	x	x	.	o	x	—
✖	altMP⊕	x	x	.	o	x	—	—	x	**x**	.	x	x	x
	altRL⊕	x	**x**	.	x	x	x	x	.	o	x	—	—	x
✖✖	altOY⊕	.	o	x	—	—	x	**x**	.	x	x	x	x	.
✖✖	altPM⊕	.	x	x	x	x	.	o	x	—	—	x	**x**	.

The two marked modes ✖ provide one mode each. The four modes marked ✖✖ provide none. The total number of 7-note modes is fourteen, seven for each master mode. Words containing **L** provide over all half of them. No altered classical modes are here because they follow from removing an internal note of the filled minor third x x x x The harmonic modes can be expanded next into fourteen 7-note modes but their musical substance emerges only in combination with melodic modes (Chapter 4-5).

7-Note Modes

These are expanded next into 7-note modes, here for completeness. Two of them are identified by highlighting as anomalous because they fit no classical mode of the home tonic with only note altered by a half tone. There's no simple relationship between master-mode tonality (left column) and home tonality (right column), which makes splitting this into two tables, one for which each master mode, unhelpful. It's simpler to think in terms of the above table, leaving master tonality to context.

	@	P	O	R	M	Y	L	$	.	.	.	.	@		
	1	p2	2	p3	3	4	p5	5	p6	6	p7	7	1	altered classical	home tonality
//LR^{mi}	x	—	—	x	x	.	x	x	.	x	.	o	x	Lydian-#2	minor-major
//LR^{ma}	x	—	—	x	x	.	x	.	x	x	.	o	x	Lydian-#2#5	minor-major
altLR^{mi}	x	x	.	x	.	o	x	—	—	x	x	.	x	Locrian-#6	minor
altLR^{ma}	x	.	x	x	.	o	x	—	—	x	x	.	x	Dorian-*b5*	minor
//YO^{mi}	x	.	x	.	o	x	—	—	x	x	.	x	x	Ionian-#5	major
altMP^{ma}	x	x	.	o	x	—	—	x	x	.	x	.	x	Phrygian-*b4*	minor-major
//RL^{mi}	x	.	o	x	—	—	x	x	.	x	x	.	x	Dorian-#4	minor
//RL^{ma}	x	.	o	x	—	—	x	x	.	x	.	x	x	Lydian-*b3*	minor
altRL^{mi}	x	x	.	x	x	.	x	.	o	x	—	—	x	Locrian-*b4b7*	minor-major
altRL^{ma}	x	x	.	x	.	x	x	.	o	x	—	—	x	Locrian-*b7*	minor
//OY^{mi}	x	.	x	x	.	x	.	o	x	—	—	x	x	Aeolian-#7	minor
//OY^{ma}	x	.	x	.	x	x	.	o	x	—	—	x	x	Ionian-*b6*	major
//PM^{mi}	o	x	—	—	x	x	.	x	x	.	x	.	o	Phrygian-#3	major
//PM^{ma}	o	x	—	—	x	x	.	x	.	x	x	.	o	Mixolydian-*b2*	major7-Note Modes

MODALOGY VERSION

The melodic and harmonic modes are summarized next as developed in the book *Modalogy*, 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.

The purpose is twofold. One is to verify the correctness of the PKP view of these modes. The other is to highlight the complexity of the conventional way of knowing them.

One source of complexity is the clothes of music notation (sharps, flats, 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 theanchors.

A second source of complexity is 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.

A third source of complexity is grouping the modes according to the tonality of the master modes, which has no simple relationship to the contexts in which they may appear. The spelled-out parallel modes — only actual parallel modes — summarized below are correct, but a few of the names taken from Modalogy are unclear to me. In any case, the point of listing the names here is to show the complexity of trying to understand this in terms of them, not to explain the particular names. Besides which, the full usefulness of the modes emerges only from combining melodic and harmonic modes into families. Otherwise some modes tend to seem arbitrary.

Parallel Modes of the Melodic Minor

//LO	1-2-3-p5-p6-6-7-1	Lydian Augmented (Lydian-#5)
altLO	1-2-p3-4-p5-p6-p7-1	Aeolian Diminished (Aeolian-b5)
//ML	1-2-3-p5-5-6-p7-1	Lydian Dominant (Lydian-b7)
altML	1-p2-p3-3-p5-p6-p7-1	Jazz Altered (Locrian-b4)
//RY	1-2-p3-4-5-6-7-1	Melodic, or Jazz, Minor (Ionian-b3)
//OM	1-2-3-4-5-p6-p7-1	Jazz Mixolydian (Mixolydia-b6)
//PR	1-p2-p3-4-5-6-p7-1	Jazz Phrygian (Phrygian-#6)

Parallel Modes of the Harmonic Minor

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

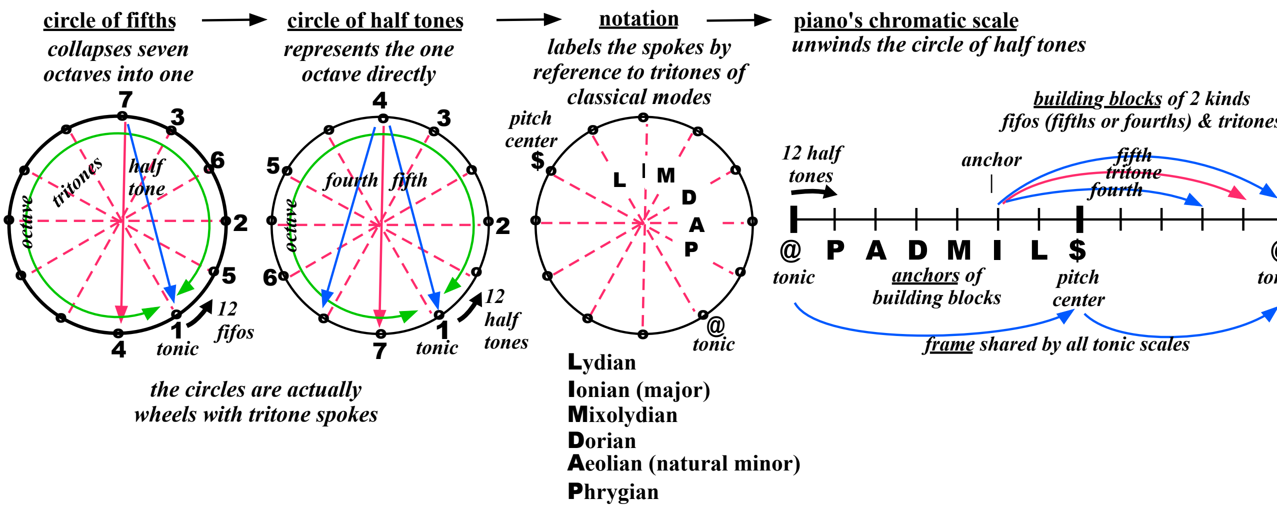
Parallel Modes of the Harmonic Major

//LR	1-p3-3-p5-p6-6-7-1	Lydian Blues Augmented, Lydian Augmented ♯2
altLR	1-2-p3-4-p5-6-p7-1	Jazz Minor ♯4, Lydian Diminished
//RL	1-2-p3-p5-5-6-7-1	Lydian Melodic Minor, Lydian b3
altMP	1-p2-p3-3-5-p6-p7-1	Altered Phrygian Dominant, Phrygian ♭4, Superlocrian ♮5, Superphrygian
altRL	1-p2-p3-3-p5-p6-6-1	Leading Tone Minor Diminished, Super Locrian 𝄫7
//OY	1-2-3-4-5-p6-7-1	Harmonic Major
//PM	1-p2-3-4-5-6-p7-1	Jazz Phrygian Dominant, Mixolydian ♭2

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 **ADI** with **ORY** to avoid confusion with other uses of the letters.)

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.

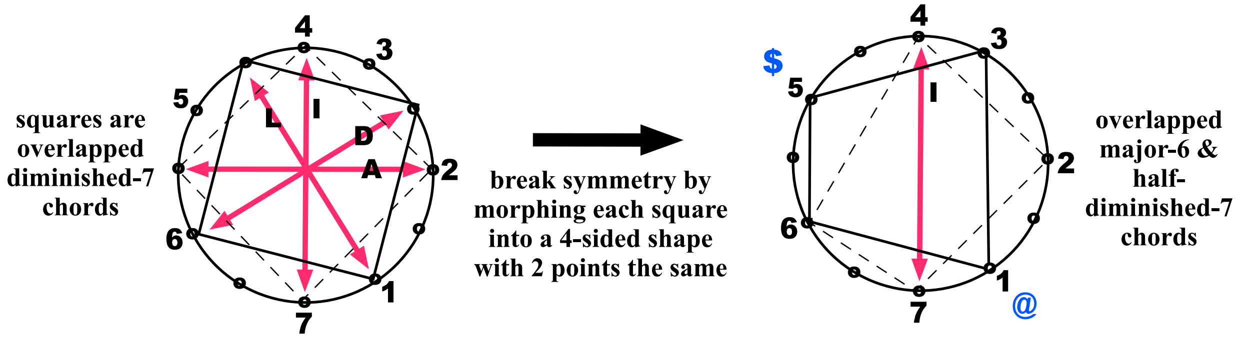
The circle of half tones rearranges the spokes of the circle to put the labeled points around it in scale order. Around the circle remains an octave and across any spoke remains a tritone. The half tones across the circle now go around it and the fifos around the circle now go across it.

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 seventh scale to yield a major scale that corresponds to an example on page 66 of the book (in the book, the scale is diminished, not diminished seventh, so the dotted square and its transformation are missing). No mention is made of tritones).



The symmetry-breaking takes place in progressive steps that morph tritones into fifos.