Subatomic Speed Scales

by

Ron Anderson

Foreward

I originally wrote this in 1995. A lot has changed, but not this content.

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Ron Anderson

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Introduction

Why 'Sub-Atomic'?

Over the years, I have observed the profound creativity and ingenuity of scientists, engineers, and inventors who have constantly labored to improve the comforts and conveniences of life and in my opinion, the very best of man's creations are those which borrow heavily from the inventions of God. The wing, the propeller, the auto-iris lens, the hinge, feedback control loops, waves and many other familiar modern concepts all appear in nature revealing the awesome mind of the Creator.

This book is inspired by one of His most basic inventions: The Atom It is amazing to me to realize that everything we see, smell, taste, feel, and breathe whether they be gases, liquids, or solids, are all constructed of the same three identical subatomic particles: protons, neutrons, and electrons. By simply rearranging these little things, it's possible to turn water into wine!

So, we see in nature a hierarchical (holy order) structure of matter from the simple to the complex. In the same way, the focus of this book is to boil down the complexities of speed lead guitar into the most basic of constituents, to make it easy, nay, trivial to acquire these skills.

Speed lead seems at first to be amazingly difficult. That's why we have guitar heroes. We hold deep respect for those remarkable prodigies who have drilled the basics for years, woodshedding until their chops are so polished that they blind us with their brilliance. It's not my intention to undermine those who have worked so hard to achieve excellence, but much of the difficulty with speed lead is an illusion. There are some very simple things that we can learn and master, which we can weave together to create rich sonic tapestries in much the same way that God created an incredible material universe with just a few simple sub-atomic particles!

Before we introduce any of these simplifying exercises, I believe that it's important to lay a foundation of basic music theory so that you know where we're going, and how the pieces fit into the big picture. By giving you a short history of how I discovered the structure of music and derived these visual mnemonics, I'm paving the way for you to learn them much more efficiently, with considerably less pain, and to retain it indefinitely.

About 22 years ago, I began to be discouraged when I noticed a surge of outstanding new guitarists who were pushing the envelope of speed, and I was frustrated because it seemed to be unobtainable. I wanted to play fast lead guitar but was stuck on a plateau of mediocrity. I had spent about a year taking guitar lessons playing inane little nursery tunes, and several more teaching myself by playing Ventures LPs at 16 RPM. I didn't really know the neck of the guitar very well, knew I had to, but didn't have a clue as to where to begin. I began to develop a strategy for reaching my goal.

The first thing I did was to separate the issues of reading music and playing fast. I like reading music, but I placed a much higher priority on learning to play fast. The reason is, from my perspective, that when I see a musician playing somewhere from a written score, there seems to be a certain absence of passion.

Also, even if I became the best sight-reader possible, there are things I can do that I'll never be able to sight-read at full speed. My eye-brain-finger circuit is simply slower than my finger-only circuit.

That's because there's a phenomenon I've noticed in which there is an intelligence seemingly built-in to my fingers, through the habit of practice. I don't think about each note. I think about a series, or patterns of notes, and my hand just knows how to pull it off (pause for groans).

My son was recently amazed when I carried on a conversation with him without stopping or even slowing down my speed-picking exercises, and I was a little amazed myself (I don't usually chat with people while I'm practicing) to realize that I wasn't really thinking about what notes my fingers should play. They were virtually autonomous! But really, it's not that amazing. As children learning to walk, we struggled to maintain our balance and move forward without falling. But now, we don't even think about it. We just do it. Like breathing. Baseball legend Yogi Bera put it this way: "You can't think and hit at the same time."

I want to introduce easy ways to think about the neck of the guitar, and to train your fingers to carry out short snippets of basic musical phrases that can be pieced together like [insert name of your favorite children's construction set] without tying down your brain with the task of micro-managing your fingers.

There's another gotcha with speed sight-reading guitar music. Conventional music is written using symbols that dictate the frequency (pitch) and timing of a series of notes. The guitar is one of those unfortunate instruments that suffer from the problem of ambiguity: there is often more than one place to play a given note. With speed playing, it is sometimes critical which fingering you choose. From a statistical point of view, it is virtually impossible to choose the optimal fingering of a complex piece sight-reading on the fly without suffering some significant loss of speed. So even if we spend a lot of time learning to read, we still must spend more time optimizing the actual execution of each complex phrase.

I've come to the conclusion that reading and writing music is fine as a medium of creation, communication and documentation, but it's rather tangential to the goal of playing fast, which is the subject of this booklet. In any case, I've included the treble staves in this work where appropriate.

Derivation Of the Modes

The Note Maps

Being somewhat of an analytical thinker, it occurred to me that fundamental to playing fast is knowing which notes to play. Because I'm a visual learner, I set out to map the natural notes on what looked like a chord chart the full length of the fretboard:

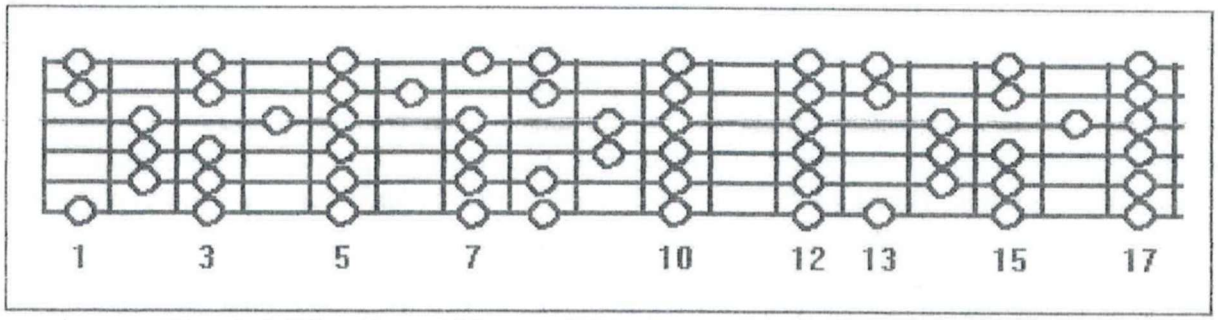


Fig. 2-1 The Set of Natural Notes on the Guitar Fretboard

All I did was extrapolate what I knew of the natural notes in the first position, and their relationships with each other down the rest of the neck. What is shown here is the equivalent of all the white keys on a piano. There are no sharps or flats in this diagram.

I didn't start out to create scales, but to map the pattern of notes in each key (in this example, the key of C). So, this is like a road map. Staying on the road is analogous to playing notes in the key. The sequence, or order in which the notes are played, is not important. But knowing this pattern is a valuable aid to playing fast.

Learning presents a challenge, but like many difficult obstacles in life, breaking it down into digestible pieces greatly simplifies the process. I reasoned that if I divided them into groups each containing three notes per string (about the maximum I could comfortably stretch my fingers), I would have seven smaller items to deal with rather than one monstrous one.

Most scales I've seen over the years sacrifice symmetry to maintain fret position. It's always been my contention that symmetry is essential for speed. If some strings have three notes per string and others have only two, the right-hand picking pattern must change for the split second. This costs time and/or continuity. If the only thing that must change is the left-hand fingering, there is less confusion and fewer flaming hoops for your fingers to leap through.

There is also an inherent speed advantage when notes are grouped in proximity rather than linearly on, say, one string. Whatever the speed limit is, I'm going to be able to squeeze more notes into a second of

time if all I must move is my finger, and not my whole arm. As we'll learn when we get to sweep picking, sometimes we can play even faster if we move our fingers *slower*!

Modes: Compare and Contrast

Without further ado, these are the scale sets I came up with:

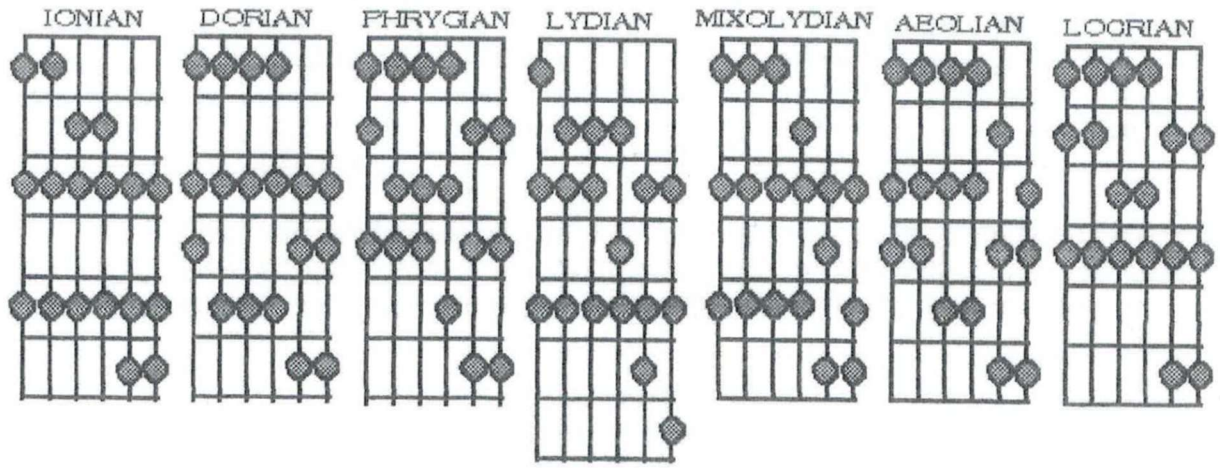


Fig. 2-2 The Diatonic Modes

I derived these while working the midnight shift as a young Airman baby-sitting the Strategic Air Command's computer communication system, and providentially, the guy working with me, Sgt. Larry Wakeman, knew something about music theory. When he asked me what I was doing, I explained that I was creating scale subsets that started with different notes of the same scale. His face immediately lit up, and he informed me that I had just discovered 'The Modes' and told me their ostentatious names (which have been borrowed from ancient Mediterranean cities)

The Ionian mode is simply what you get when you sing Do-Re-Me-Fa-So-La-Ti-Do (a simple major scale) starting with Do. Dorian mode starts with Re. Phrygian starts with Me. And so on. We can now set aside any apprehension we have that we will never understand this arcane musical science. The mystique gone! The secret's out: Modes are no big deal!

The Ionian mode is that scale created by the pattern (repeat it out loud):

whole-step, whole-step, half-step,
whole-step, whole-step, whole-step, half-step

where a half-step is the note one-fret away (technically, two notes whose frequencies are related to each by a factor of 2 raised to the 1/12th power. . . in an equally tempered scale), and a whole-step is equal to 2 half steps, or 2 frets away.

What we would like to know for curiosity's sake is how these scales compare & contrast to each other, i.e.,

- What do they have in common, and
- What's different about them?

Let's compare each mode to our "Do-Re-Me" Ionian.

This puzzle is easy to solve graphically. We draw a line of circles that represent all 12 notes in the octave. We shade the circles for the seven notes in the scale (the key).

Ionian is given to be whole-step (C to D), whole-step -(D to E), half-step (E to F), whole-step (F to G), whole-step (G to A), whole-step (A to B) , and half-step (B to C).

Dorian is simply the same pattern, but the entire row has been shifted left until the shaded D is in the leftmost circle. (another D is shifted in from the right).

Notice that most of the Ionian notes line up with the Dorian notes: R (root), 2,4,5,6, and 8 (the octave). The notes that are different are the 3rd and the 7th. We call the flatted third a "minor" 3rd, as opposed to Ionian's major 3rd, and the flatted 7th is dubbed the 'dominant' 7th, as opposed to Ionian's major 7th.

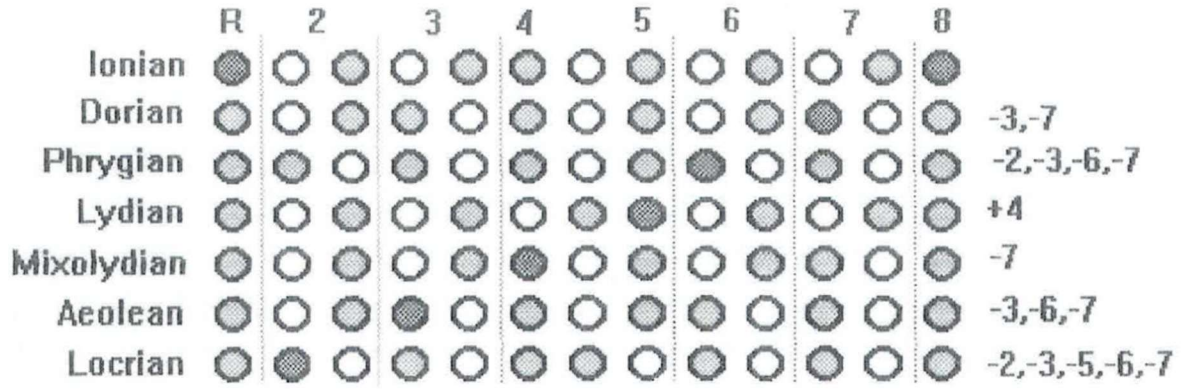


Fig. 2-3 Mode Structure Contrast

These are all listed in their natural order. Dorian begins with the 2nd note of Ionian's scale. Phrygian begins with Ionian's 3rd. Lydian, the 4th, and so on. The sharp eye will notice that by rearranging these, we notice a stronger correlation between the scales separated from each other by a 4th or 5th: For example, Mixolydian is identical to Ionian except it has a dominant (flatted) 7th. Dorian is identical to Mixolydian except it has a minor 3rd. Aeolian is identical to Dorian except it has a minor 6th. And so on.

V	Mixolydian		-7
ii	Dorian	-3	-7
vii	Aeolean	-3	-6 -7
iii	Phrygian	-2 -3	-6 -7
viii-	Locrian	-2 -3	-5 -6 -7
IV	Lydian	+4	

Fig. 2-4 Mode Correlation

The exception to this pattern seems to be the Locrian-Lydian comparison, but as we'll see later (graphically), the difference is only one of semantics. Lydian /looks identical to the Locrian mode except for (surprise!) the root, or 1st note of the scale.

These observations have great potential for simplifying the learning process. Once we've overcome the initial obstacle of committing the Ionian pattern to memory, all we have to do is modify one note of the scale to learn the next most similar modal pattern. The same goes for the next, and the next, until we know them all. So, after we get over the first hurdle, the rest is a cakewalk.

However, there is an even easier way to learn and retain the mode patterns. . .

Sub modal Pattern Sequence
Mnemonic Derivation

At first, the mode patterns may still look complicated, but again, we can break down this difficult problem into simpler ones. An observation that helps is that there are only three repeating patterns that make up all 7 scales:

1. **Whole step, Whole step (dark gray notes)**
2. **Half step, Whole step (white notes), and**
3. **Whole step, Half step (light gray notes)**

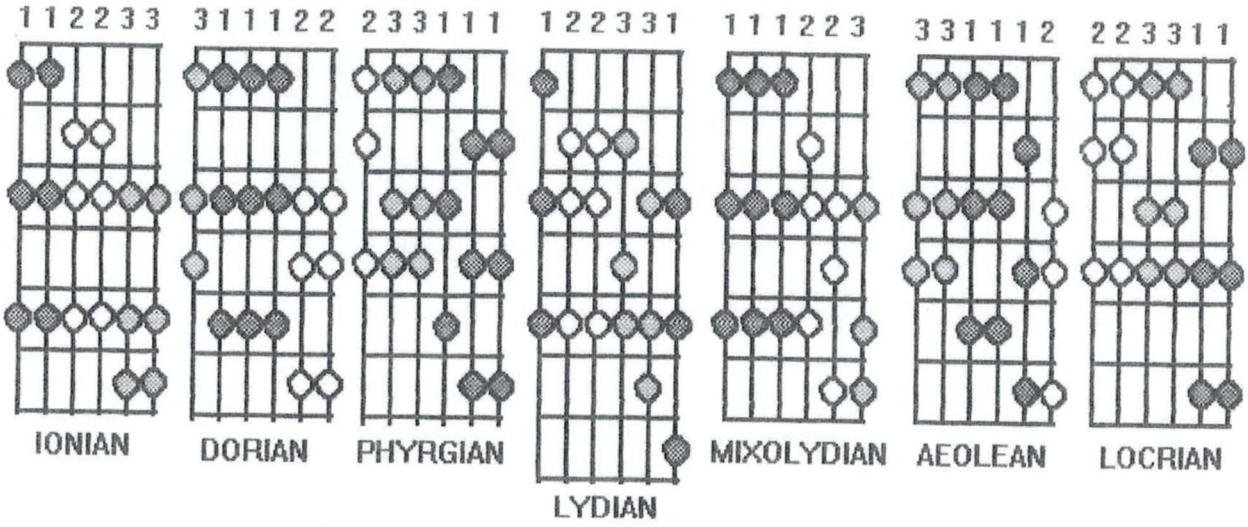


Fig. 2-6 Diatonic Mode Subscale Sequences

These subscales are the **protons**, **neutrons**, and **electrons** of the elemental scale modes. Put them together in different ways, and you have different animals. The Ionian mode is created by playing them in the sequence: 1-1-2-2-3-3. Lydian mode happens when played in this order: 1-2-2-3-3-1. Tabulating all of them, we have:

IONIAN: 1-1-2-2-3-3
DORIAN: 3-1-1-1-2-2
PHRYGIAN: 2-3-3-1-1-1
LYDIAN: 1-2-2-3-3-1
MIXOLYDIAN: 1-1-1-2-2-3
AEOLIAN: 3-3-1-1-1-2
LOCRIAN: 2-2-3-3-1-1

OR

MIXOLYDIAN: 1-1-1-2-2-3
IONIAN: 1-1-2-2-3-3
LYDIAN: 1-2-2-3-3-1
LOCRIAN: 2-2-3-3-1-1
PHRYGIAN: 2-3-3-1-1-1
AEOLIAN: 3-3-1-1-1-2
DORIAN: 3-1-1-1-2-2

Fig. 2-7 Pattern Correlation

What do these have in common? I know, I know! You despise guessing games. Let me put it together for you in a way that you will *NEVER* forget. A friend of mine in the phone business told me that vanity numbers that are easy to remember are in big demand because businesses know that the probability is higher that you will call them when you're in the market for their product or service. Numbers like

1 1 1 - 2 2 3 3

are worth BIG BUCKS because even the mentally challenged don't have to study it for more than a few picoseconds to see an easily remembered pattern. It may take slightly longer to notice that 6 of these 7 numbers appear in the same order in each of the sub-scale patterns for the modes!

If we rearrange these in a circle, we see that we can reconstruct each mode map by substituting our subclass for the numbers, clockwise corresponding to an ascending scale. For example, a Dorian scale has a sub scale sequence: 3-1-1-1-2-2 which we get by starting at the Dorian entry point and going clockwise around the circle. Likewise, Lydian is 1-2-2-3-3-1, and so on.

I call this the 2nd Circle of 5ths because there's already a Circle of 5ths. This circle has some remarkable similarities with the conventional one (the relationships between the left and right neighbors is a 5th and a 4th respectively), but they are really different creatures. This one looks more like a Wankel engine cycle, or the sequence of tightening the bolts when you change your tire, and has strange numbers and words instead of notes, but it's a GREAT visual mnemonic to help keep the mode patterns right at the tip of our fingers!

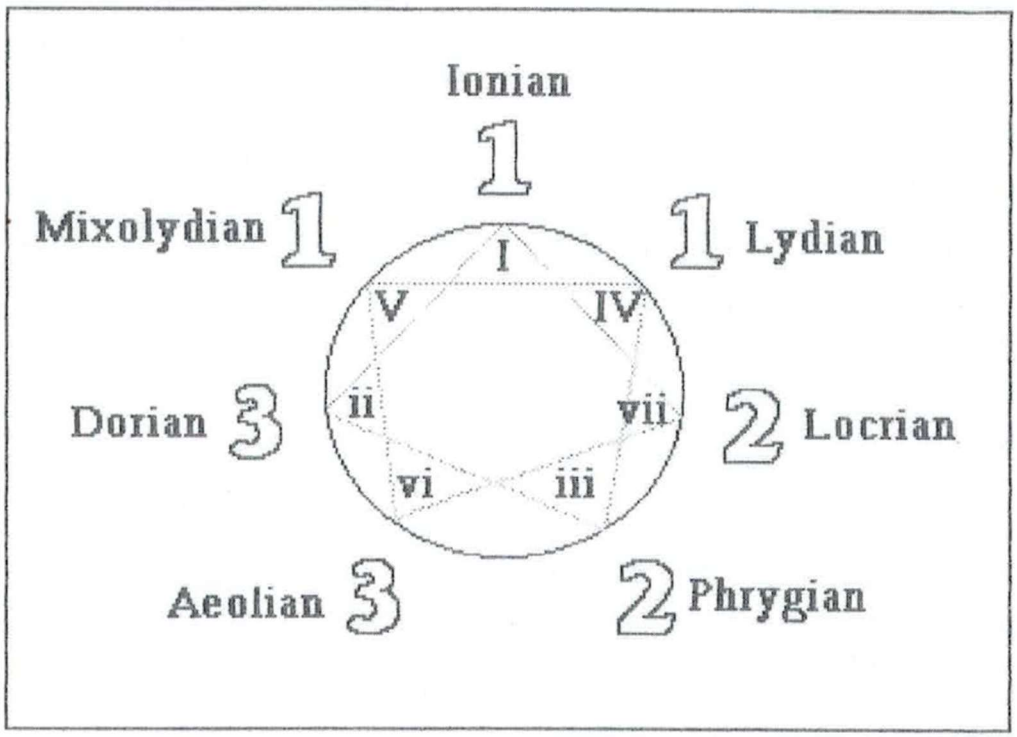


Fig. 2-8 The 2nd Circle of 5ths

The only thing that you need to watch out for is where (what fret) to play the subscale. This info is not embedded in this chart. There is an interval that is not accounted for between the subclasses (I purposely left it out for simplification), which affects where these guys go. So, there's some familiarization with the scales that must happen before this mnemonic can do any good.

The real benefit from this mnemonic is being able to shift mode patterns all the way up the neck without hurting your brain. For example, if you are playing in the key of F with an Ionian pattern starting on the

1st fret, the Ionian subscale pattern is 1-1-2-2-3-3. Pick any note in that pattern and slide up to the Dorian pattern (which in the key of F, starts on the 3rd fret). The new subscale sequence is 3-1-1-1-2-2 which is 2 'hours' earlier on our mode pattern 7-hour clock dial. If you want to think of it linearly instead of circularly: consider this:

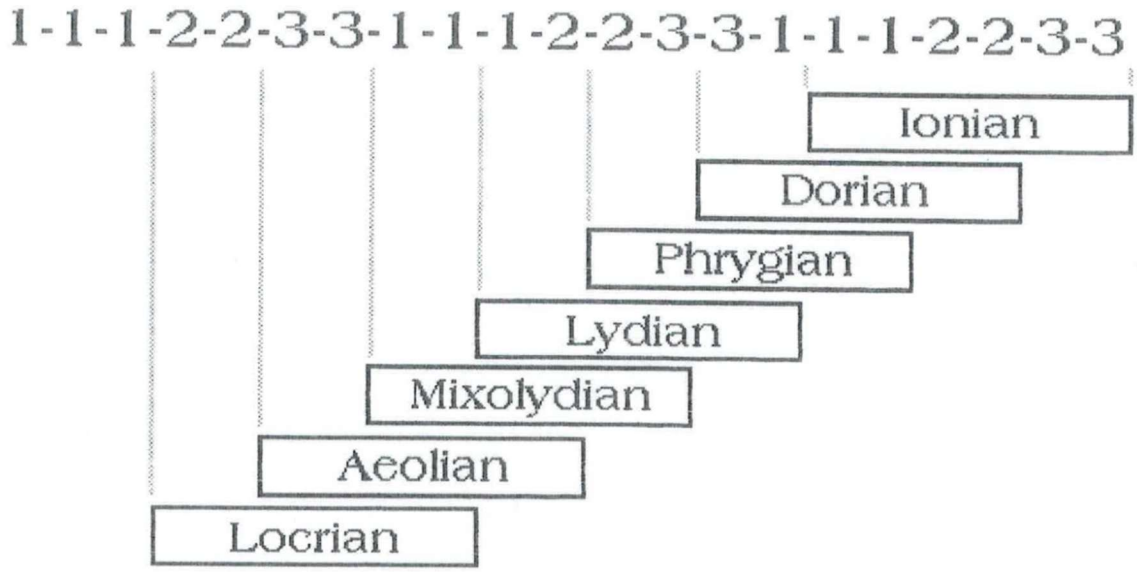


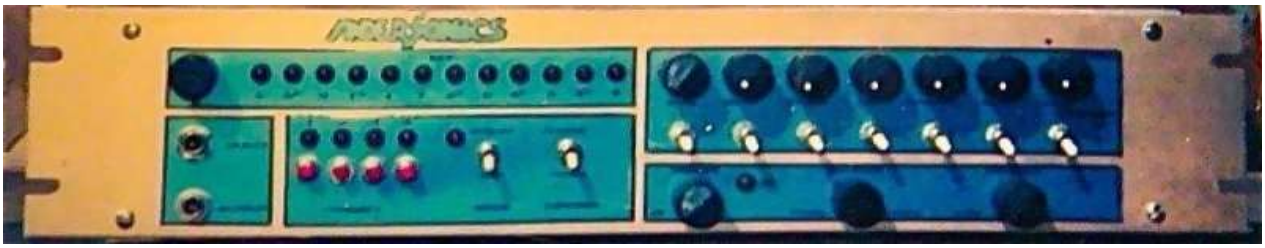
Fig. 2-9 The Line of 5ths

So, knowing this little secret enables you to play all up and down the neck without ever hitting a sour note by simply rotating around the circle as we shift positions.

Foundation For Harmony

What else will the modes do for us besides providing a roadmap of the notes in a key in each position?

They were invaluable to me when I designed the world's first (to my knowledge) intelligent real-time harmonizer for my Electronic Engineering Sr. Project at Cal Poly State University (San Luis Obispo) back in 1981, several years before Eventide locked their engineers in the basement until they could come up with a good idea. They let them out after they figured out how to add an intelligent harmony engine to their pitch shifter!



But you don't have to be an engineer or even a musical egghead to gain from this analysis. By simply using these charts and patterns, it is trivial to work out Allman Brother's genre harmonies with another guitarist

GRAPHICALLY! You simply learn the same melody in each mode pattern, and then one of you shifts two modes and scale positions up (or down). A piece of cake! When one guitarist plays an Ionian scale, and another one plays the Phrygian scale two positions higher, they end up harmonizing 3rds (Or for that matter, if one plays the Dorian and the other plays Lydian,
and so on).

What happens is that the distance between the bottom "melody" and the upper 3rd 'harmony' changes with the scale position: The distance between DO & ME, FA & LA, and SO & TI are MAJOR thirds. The distance between RE & FA, ME & SO, LA & DO, and TI and RE are minor thirds.

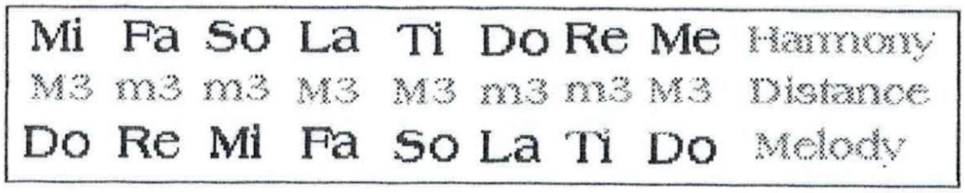


Fig. 2-10 3rd Harmony Distances

SO, as you play a major scale 3rd harmony, the interval follows the pattern (repeat it out loud):

MAJOR 3rd, minor 3rd, minor 3rd, MAJOR 3rd,
MAJOR 3rd, minor 3rd, minor 3rd, MAJOR 3rd.

The other intervals are also modulated by the scale position as well.

		Scale Step								Legend	
		1	2	3	4	5	6	7	8	P, M	d, m, a
2	Dorian	P	P	d	P	P	P	d	P	Perfect	diminished
3	Phrygian	M	m	m	M	M	m	m	M	Major	minor
4	Lydian	P	P	P	a	P	P	P	P	Perfect	augmented
5	Mixolydian	P	P	P	P	P	P	d	P	Perfect	diminished
6	Aeolian	M	M	m	M	M	m	m	M	Major	minor
7	Locrian	M	d	d	M	d	d	d	M	Major	dominant

Fig. 2-11 Scale Harmony Intervals

Sliding Mode Patterns

So far, we have confined our mode scales mostly to a single position. As mentioned earlier. The guitar suffers from ambiguity (having more than one place to play a given note) but let's put a positive spin on it. Ambiguity can help us. We are not forced to stay in one position, or mode pattern. We can slide freely

between patterns. In fact, here are some versions of the mode patterns that slide to a new pattern every time you change a string:

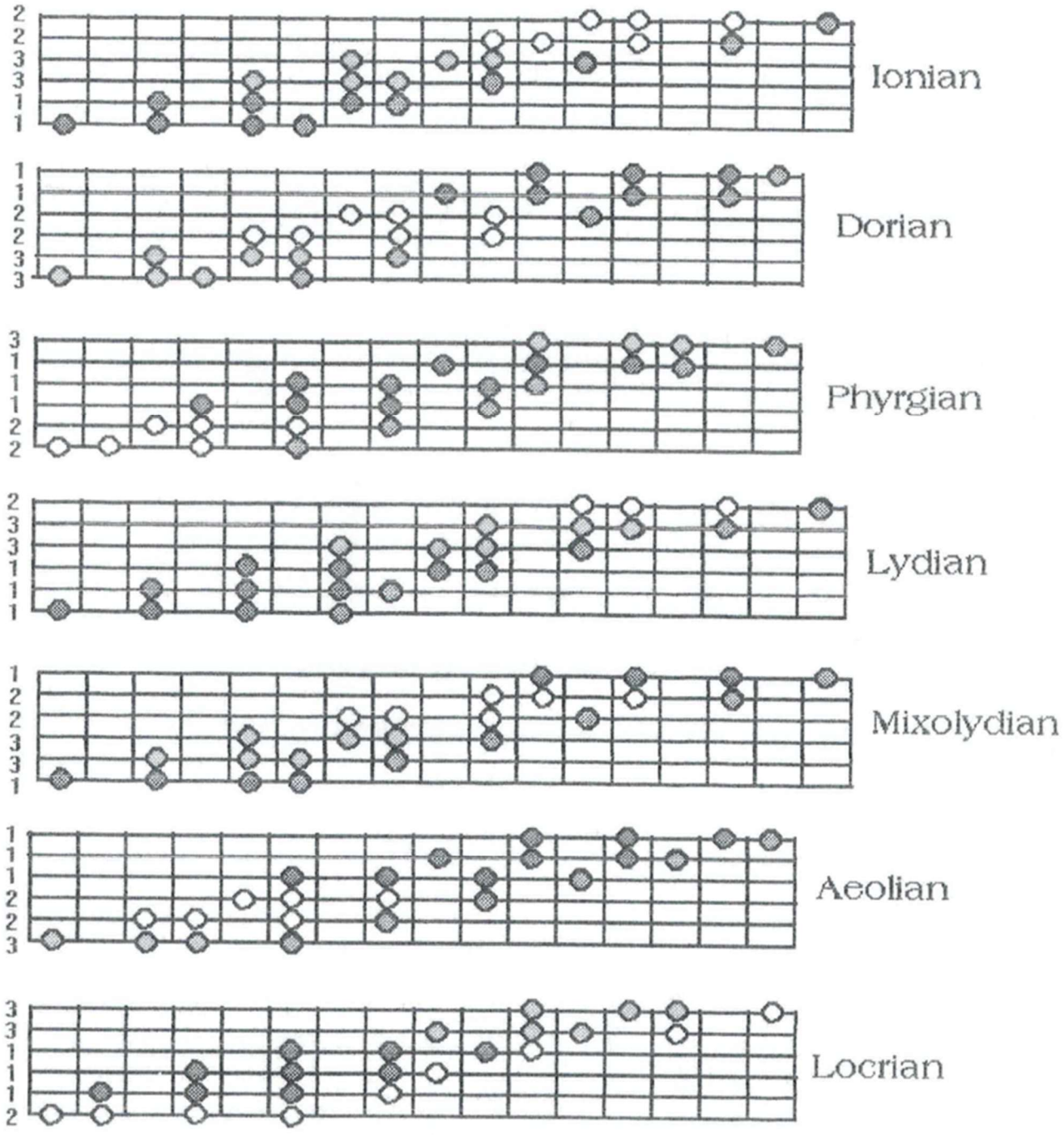


Fig. 2-12 The Sliding Diatonic Mode Maps

This buys us range. We can start out in the growling lower registers and work our way easily to the glass-breaking, screaming treble notes or vice versa.

Notice that the subscale pattern for these sliding scales follows the *mirror* image of the static pattern in the 2nd Circle of 5ths. It's scary when the light shines down and you see such simple order in something that looks at face value to be like the random arrangement of the starry skies.

Let's dub this mirror image to be the Circle of *4ths*. Obviously, we can shift the same mental gears we did before to slide our way up and down the neck of the guitar as easily as 1-3-2!

Rather than memorizing two different mnemonics, it is sufficient to realize that by simply going counterclockwise around one is the same as going clockwise around the other. So, if you are reconstructing an ascending scale in *one* position, go clockwise. If you are reconstructing the *sliding* ascending scale patterns, go counterclockwise.

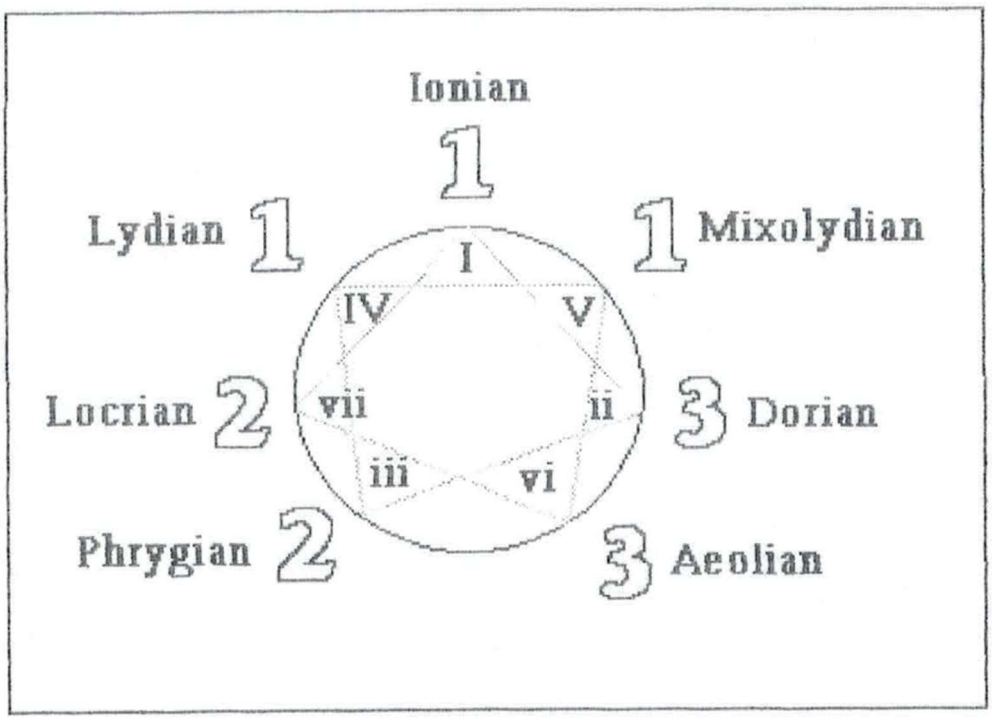


Fig. 2-13 The Circle of 4ths

Mono Pattern Scales

If three subscale patterns are too much for you to bite off all at once ('destroyed too many brain cells in your stupid years), or you're like me, and you're always looking for the easier way to do something, we can make ANOTHER simplifying observation about the scale patterns:

We can play the Ionian, Mixolydian, Aeolian, and Locrian scales using only one sub-scale pattern each!

Start with one of the three sub-scales: Play it on two (or three) consecutive strings; slide up two frets (adding a slight timing hiccup) and repeat.

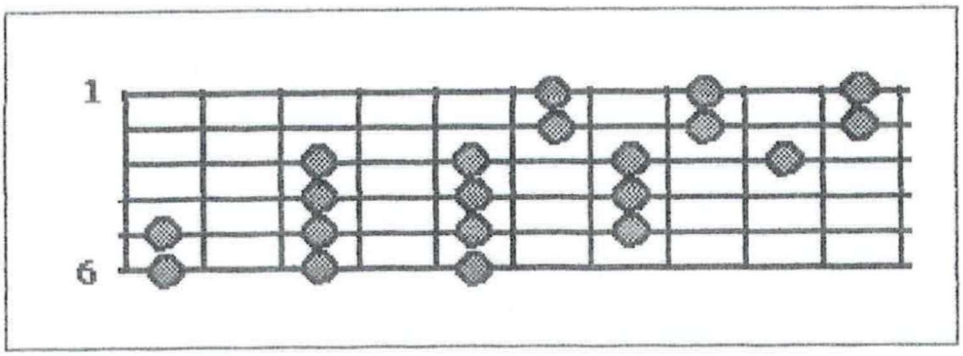


Fig. 2-14 Ionian Mono-pattern Sliding Scale

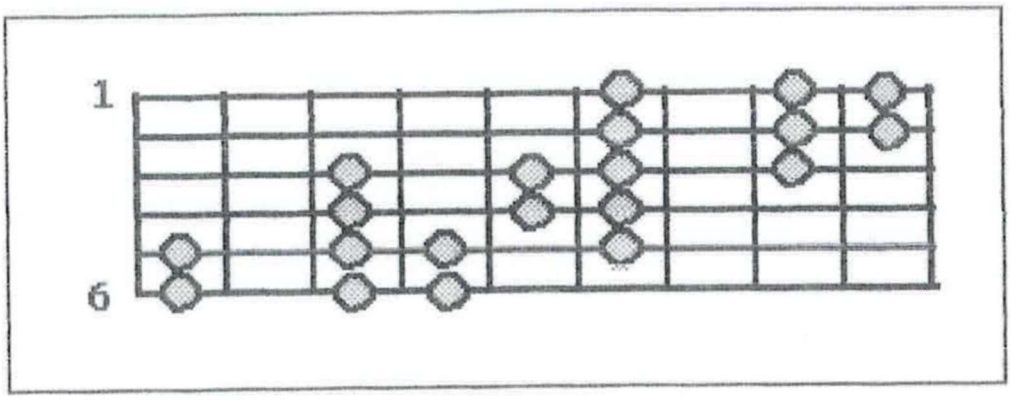


Fig. 2-15 Aeolian Mono-pattern Sliding Scale

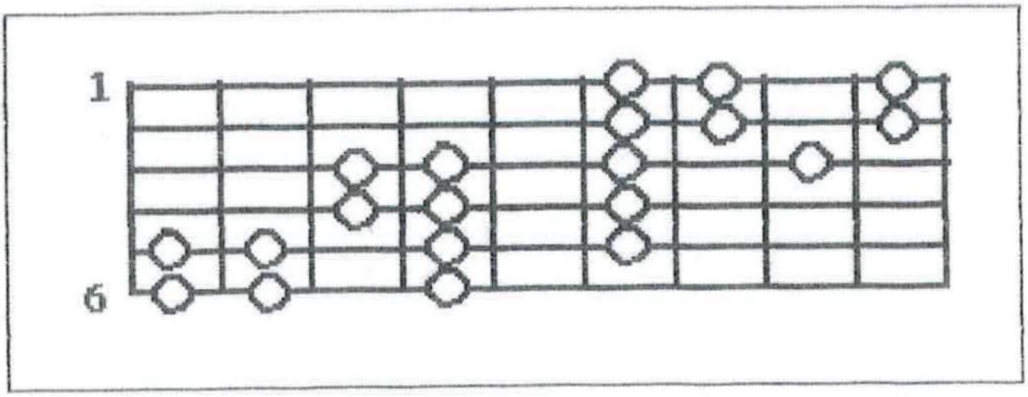


Fig. 2-16 Locrian Mono-pattern Sliding Scale

Aside from being a sneak-preview of hybrid picking (using more than one speed technique in the same musical phrase--in this case, sliding and sweeping), we have introduced three scale modes which are so

simple, they don't even NEED to be memorized. The frosting on the cake is that these sliding scales have more range than the 3-note-per-string mode patterns, i.e., you can start out with a very low note and play scale up to a very high note very quickly, but they don't quite have the range of the 4-note-per-string sliding modes.

If we draw a higher-level map of the subscale patterns in the modes (neglecting the overlapping), we see these and many other simplifying patterns.

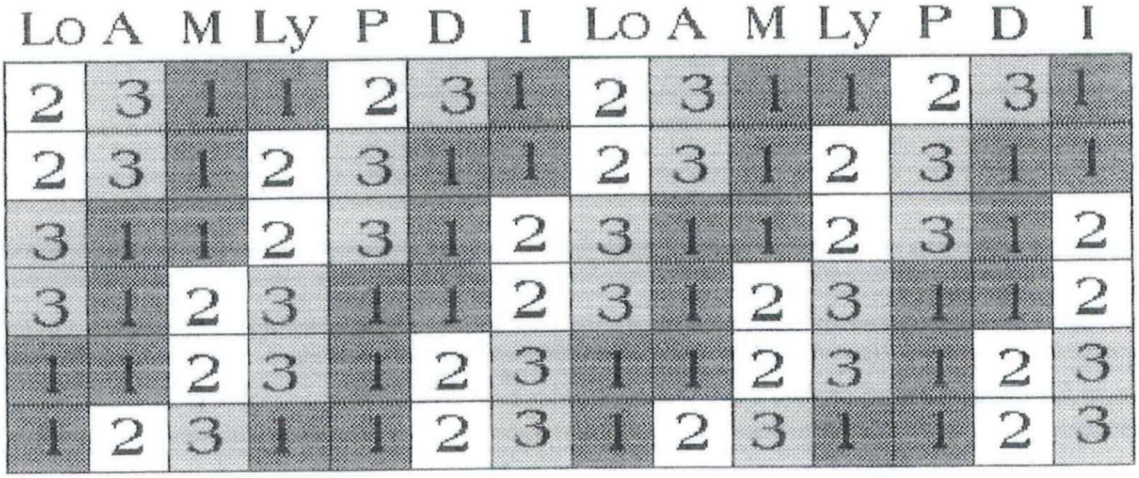


Fig. 2-17 The Subscale Roadmap

Notice that each subscale pattern repeats in a general direction of diagonally up the neck, and that as you progress up each string, the pattern alternates between 1-3-2-1 and 1-3-2-1-1. If we study this map, we can find a smaller, easily memorized repeating block that covers the *entire neck of the guitar!*

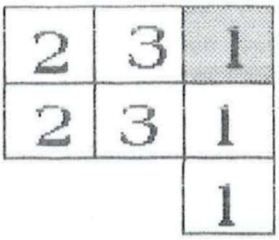


Fig. 2-18 The Essential Subscale Block

Spend a few minutes studying this picture, and pay particular attention how the blocks interconnect, and how to get from one anchor brick (the shaded '1') to another.

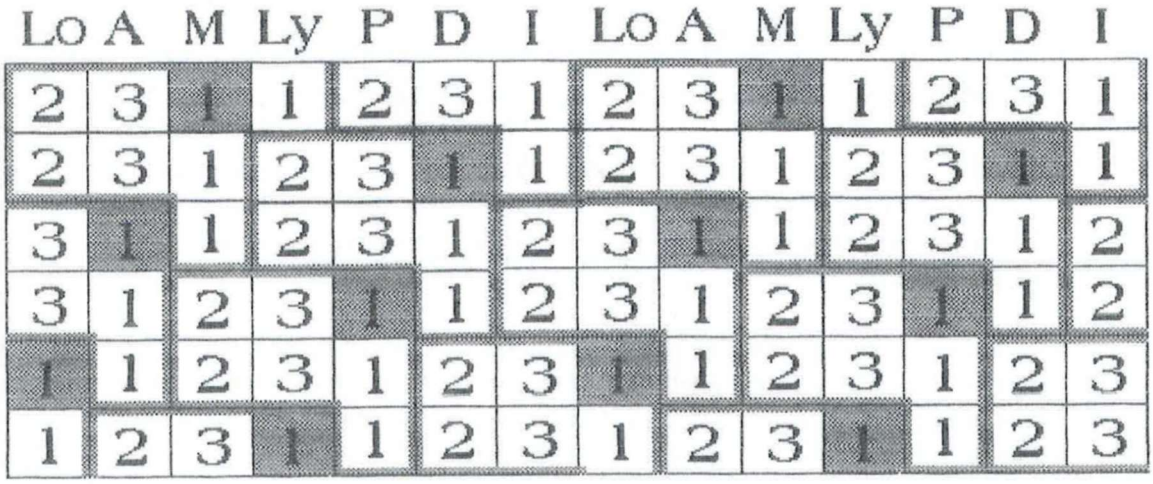


Fig. 2-19 The Paved Brick Roadmap

Knowing this is a great crutch if you really don't want to memorize much, but you still want the benefit of navigating the neck of guitar quickly! Study it carefully and you will never be lost for direction.

Review

The mode patterns are simply the set of notes in each key in a convenient location on the neck. We simply choose where on the neck we want to play (for comfort, tone color, spectral synergy, or whatever), find the nearest modal pattern and improvise from the notes in that 'palette'. I have introduced some very simple ways to get around without memorizing every note in every key (vertical pattern: 1112233, horizontal patterns: 132 or 1321, the mono sliding patterns: 111111, 222222, and 333333, the diagonal sliding pattern: 1113322, and the repeating brick mnemonic). I have also covered how to effortlessly create lock-step harmonies!

Sweep-Picking

So far, we have covered the basic set of what notes to play. This is a good beginning. But what the right hand does (apologies to you southpaws) affects exactly one-half of the speed equation. By clever planning for economy of motion (that's *less* motion for those of you with damaged braincells), we can extract optimal performance out of our manual mechanics.

When I was learning the basics of guitar, I picked every note in the same direction: down. I learned that I could play faster by picking every other note on the upstroke, which I had to do anyway while getting ready for the next downstroke. This technique, known as 'alternate picking', immediately doubles your speed.

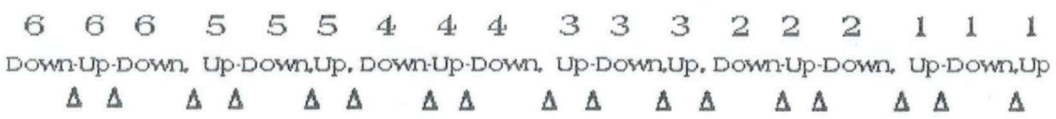
Another quantum leap in speed can be had by a technique that has come to be known as sweeping or raking. The mental image we get from those words helps us to grasp this simple concept. All the applications of sweeping I have seen can be boiled down to a simple statement:

Whenever playing a phrase or scale where two or more sequential notes fall on adjacent strings, simply ***pick them in the same direction****.*

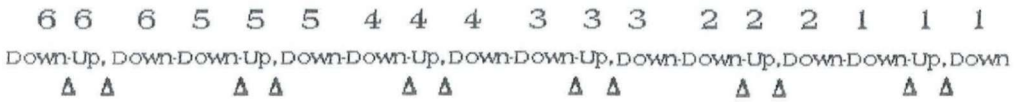
Speed is lost whenever your pick changes direction, so **minimize pick direction changes** where possible.

Everyone who can strum a guitar can play faster lead than Eddie Van Halen. Strumming is simply taking sweep-picking to its limit. You are playing a sequence of notes so fast that it sounds like one percussive hit. Think about that. You're playing six notes in such a blur that it sounds like one! The problem then is not how to play fast, but rather how to slow it down with enough finesse that it sounds like a burst of percussive hits and hopefully, a recognizable melody as well.

When we use alternate-picking with the mode scales, the picking pattern on each string is:



This is fine, and we can do it quickly, but notice that the pick changed direction a total of (count them) 17 times. That is a significant tax on speed. By simply changing the pattern to:



we reduce the number of times the pick must change direction to a mere 12. This is another 30% speed improvement. Fire engines, Stand-by!

Notice that, except for the first 'Down-Up' and the last 'Down' stroke, there is a repeating picking pattern or cycle. This **Down-Down-Up** pattern is the *Sine qua non* of sweeping the scale modes (and any other 3-note per string pattern). What follows are some exercises that are the essential building blocks of speed sweep-picking mode scales. Because they are only 3-note sequences, they are very simple and easy to learn. Not to be confused with the 3-note subscale patterns that we used to visualize the mode note sets, these are 3 different notes we group to grasp the right-hand speed picking cycle.

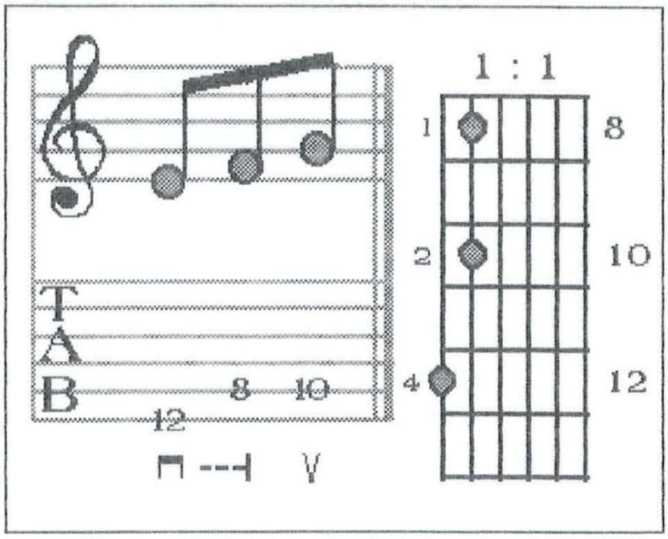


Fig. 3-1 1:1 Up-Sweep Sub-Atomic Scale

If the foundation of a building is laid crooked, the whole structure will lean. Because these are the simplest elements of the scale patterns, I urge you to take your time and practice these subscale patterns. Perfect them, and the scales will be almost as easy as losing your socks in the dryer.

Play very slowly at first, developing smooth, cyclic motion. The first two notes should be played in one fluid sweeping downstroke, followed by a snapping upstroke. Be careful not to separate the two consecutive downstrokes into two separate downstrokes but rather combine them into one uniform sweeping motion. Also, make sure you anchor the F note firmly. The first finger should not move.

I use a very thick pick, and find it helps to angle the pick so that it drags across the strings like the playing cards we used to put in our bicycle spokes. This requires one to change the angle on the upstroke so that it doesn't get caught in the strings. Thinner picks don't need the angle, but they lose power by releasing the string before the pick has a chance to develop maximum potential energy (like releasing an arrow before the bow is completely taut) An alternative is to keep the hard pick but choke up on it so that only a small tip is exposed. This minimizes the angle needed to release the string.

The first trio of notes are a subset of the Ionian *'whole-step, whole-step'* pair. These next two are subsets of the '*half-step, whole-step'* and '*whole-step, half-step'* pairs respectively. The right-hand picking pattern is identical I created three separate exercises to train the left hand to service these three patterns as they are needed when we combine them in the mode scales and to reinforce the right-hand sweeping cycle.

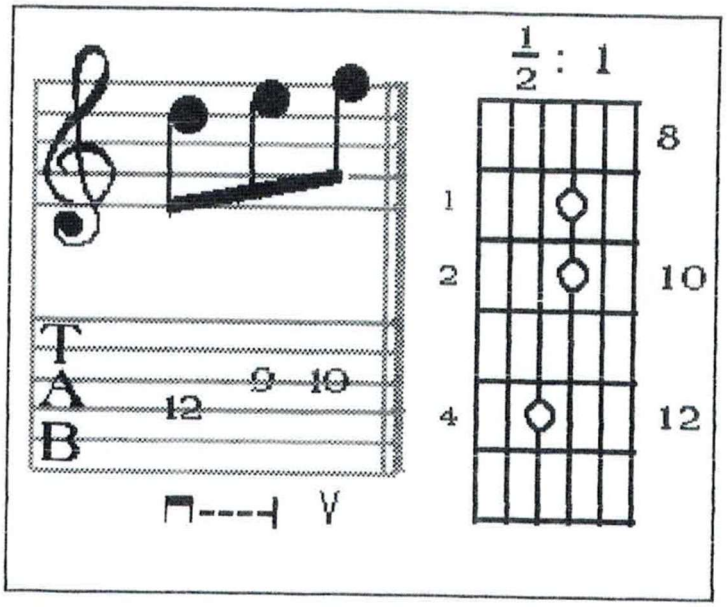


Fig. 3-2 1/2:1 Up-Sweep Subscale

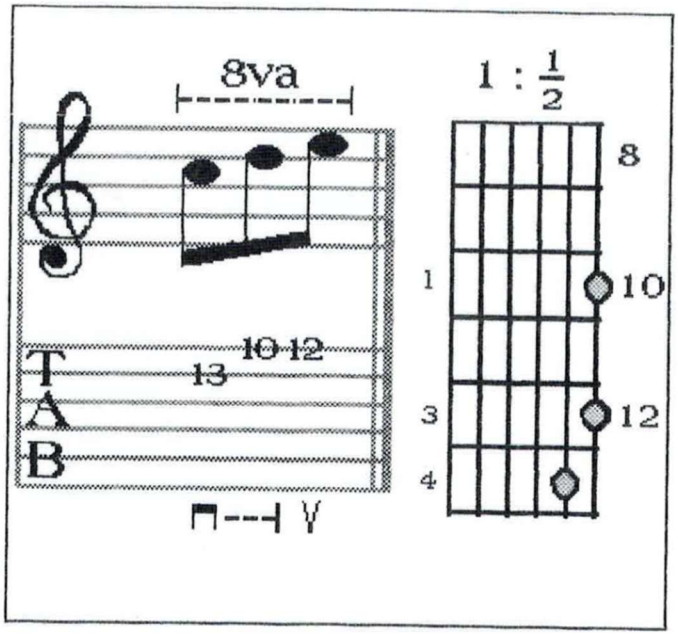


Fig. 3-3 1:1/2 Up-Sweep Subscale

Feel free to play all three patterns on different strings all up and down the neck as a *geometric* exercise until they become a habit. Don't worry that they are not real scales. Any athlete will tell you that pumping iron is just as important as actual physical competition. These exercises are the preparation for the race. The numbers on the left are the left-hand fingers that I recommend.

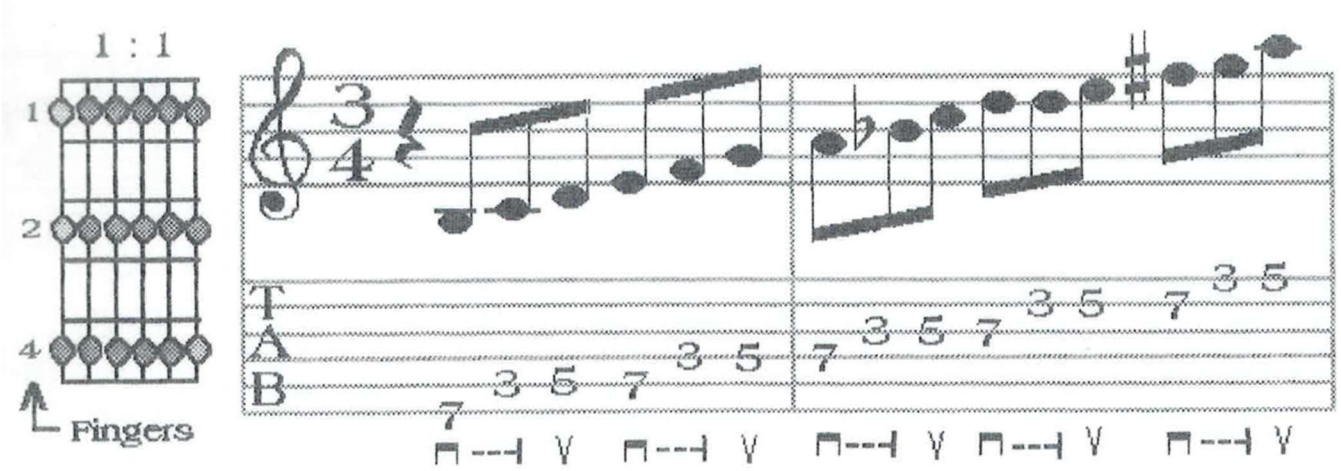


Fig. 3-4 1:1 Subscale Geometric Exercise

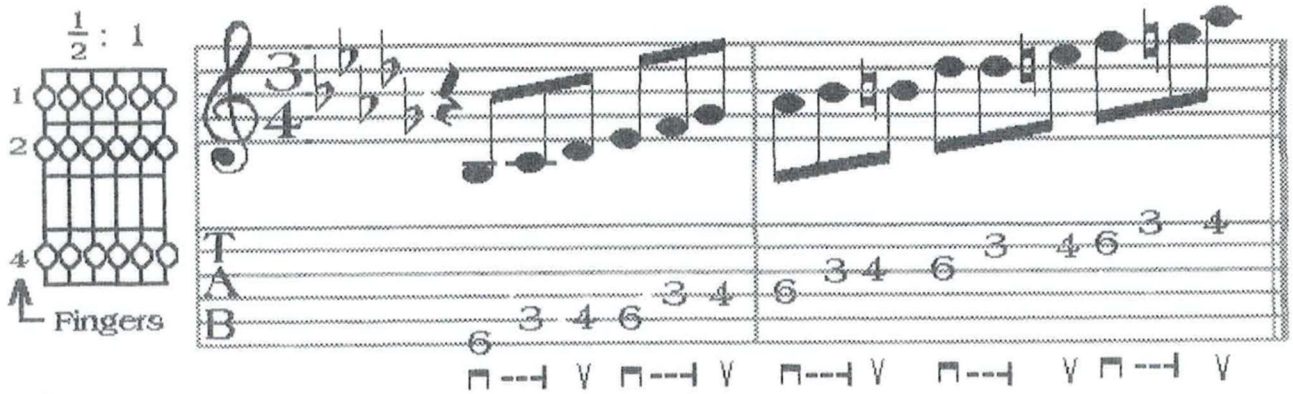


Fig. 3-5 1/2:1 Subscale Geometric Exercise

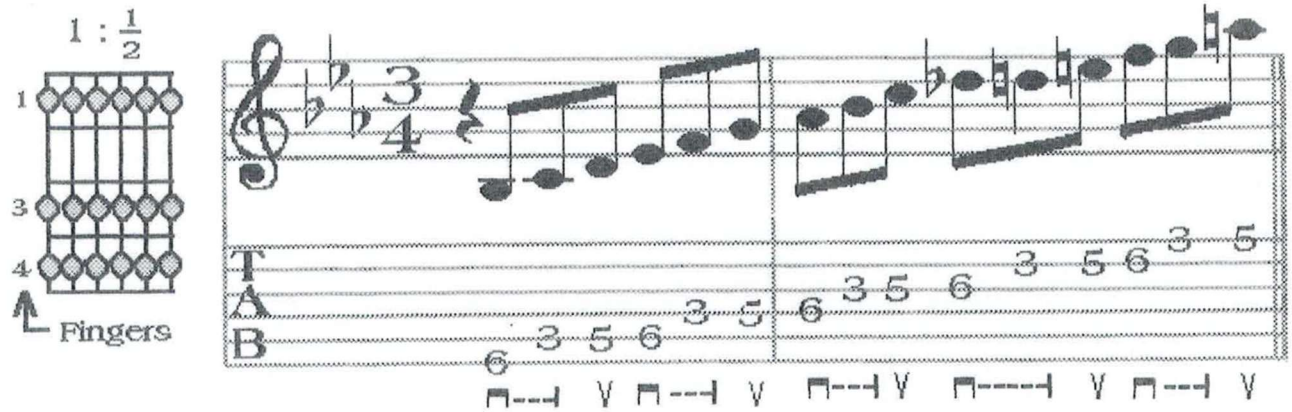


Fig. 3-6 1:1/2 Subscale Geometric Exercise

When you feel competent and comfortable with those three triplets, we are ready to lay the bricks onto our first wall: Sweeping the Ionian mode.

In this scale, I've omitted the first two notes because the right-hand pattern begins mid-cycle and I didn't want to confuse you by starting out with the exception to the rule. By starting with the 3rd note of the scale, we are technically playing the Phrygian mode, but since our omission is only temporary, I will continue to use the term "Ionian" loosely in describing the visual scale mnemonic diagram and the associated fingering positions. I've maintained my note shading convention, which may be confusing at first if you're accustomed to reading music and you're stumped as to what to do with an eighth-note triplet shaded white, but there is no implied timing difference in these examples. The shading is done so that you can more easily make staff/fretboard mental associations.

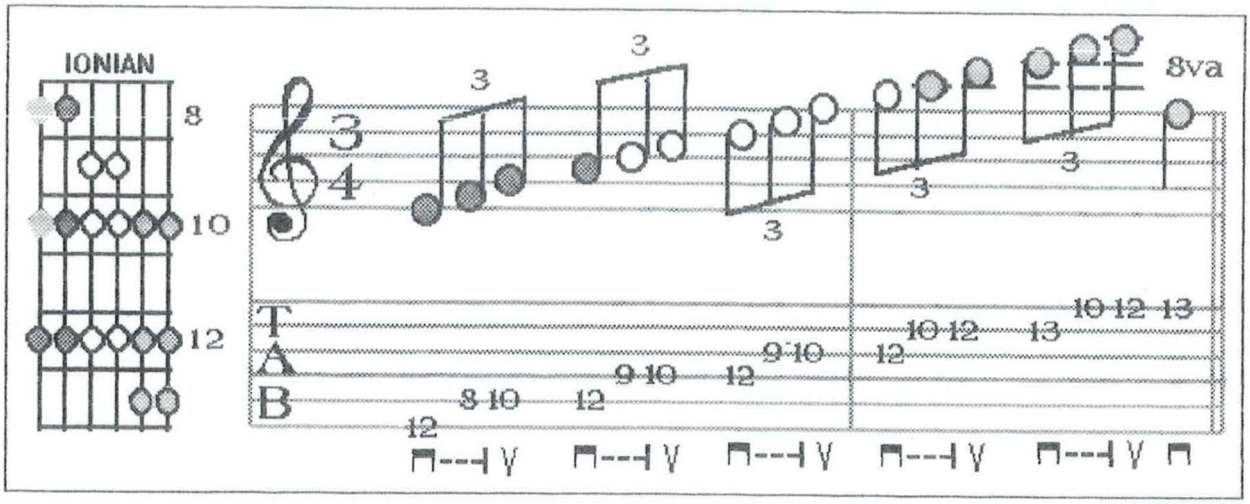


Fig. 3-7 Intermediate Sweeping Exercise

Again, practice slowly until the motion is natural and smooth. At some point, you will feel things begin to click and you will be ready to 'drop the hammer' and engage the turbo. You will soon notice that sweep picking becomes as trivial as drumming your fingers on the table. When this happens, we're ready to move on and learn the different modal patterns.

The Ascending Diatonic Modes

The casual observer will notice that in the following scales, the ascending modes are all written in the same key and in consecutive order, but the descending modes are all rendered in the same position, different keys, and the order is somewhat convoluted. In the first case, I wanted to illustrate how the modes dovetail together in each key. This is the most basic use of the mode maps.

In the latter (descending) set, I set the modes in different keys and rearranged the order to facilitate comparison and contrast (Note that the notes themselves are all identical, that the only things that change are the key signature (the accidentals) and the fret positions. Note also that the difference in key signatures between adjacent scales in this order is unit distance (i.e., they only differ by *ONE* note!!) except for the Locrian/Lydian set. If you look closer at this exception, we find it's not *that* exceptional: If you shift the Locrian mode up one fret, it is identical to the Lydian scale except for our *one* note difference.

Comparing the modes this way also highlights how quick and easy it is to change keys without changing positions.

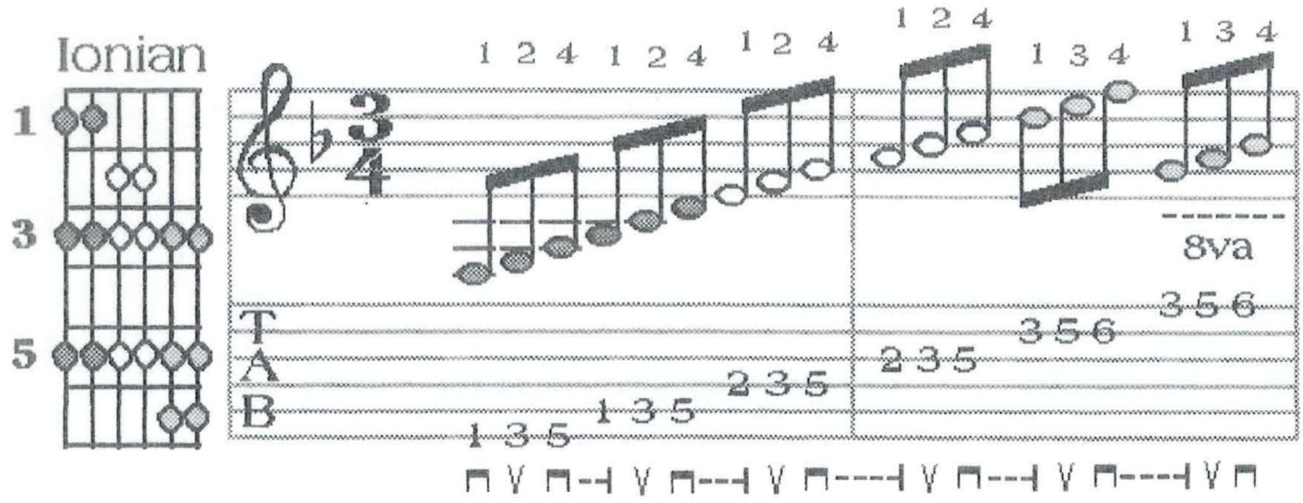


Fig. 3-8 Sweeping The Ascending Ionian Scale

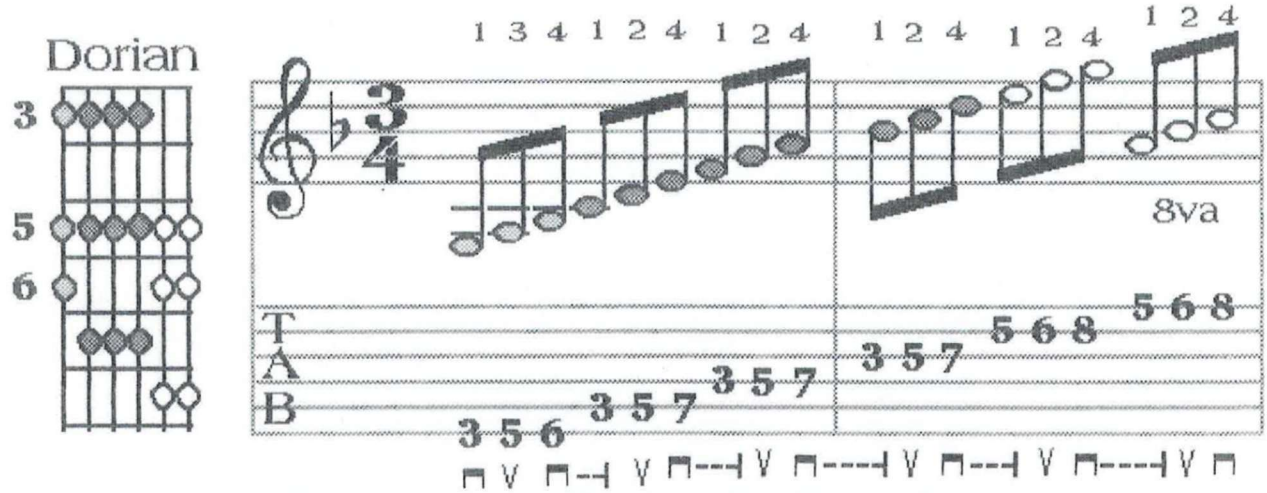


Fig. 3-9 Sweeping The Ascending Dorian Scale

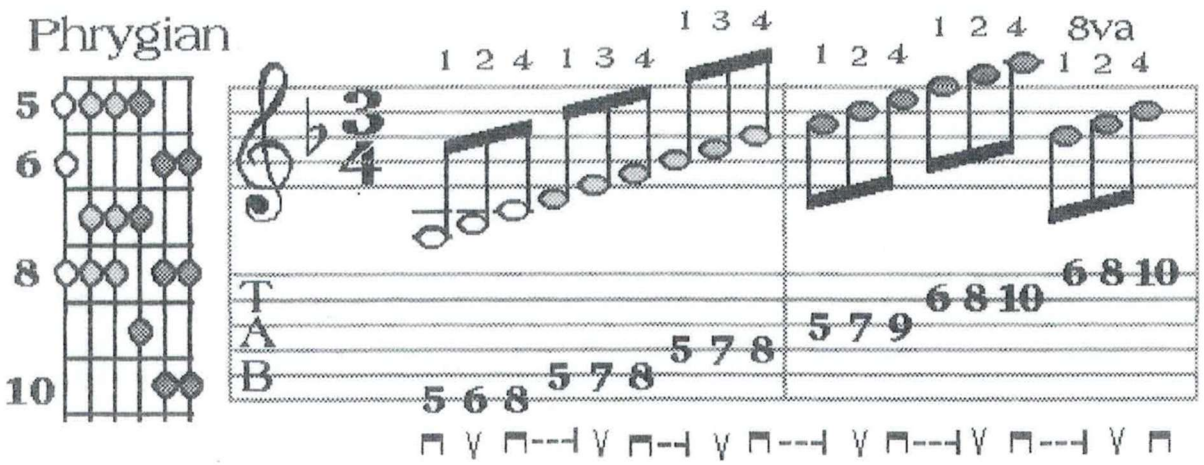


Fig. 3-10 Sweeping The Ascending Phrygian Scale

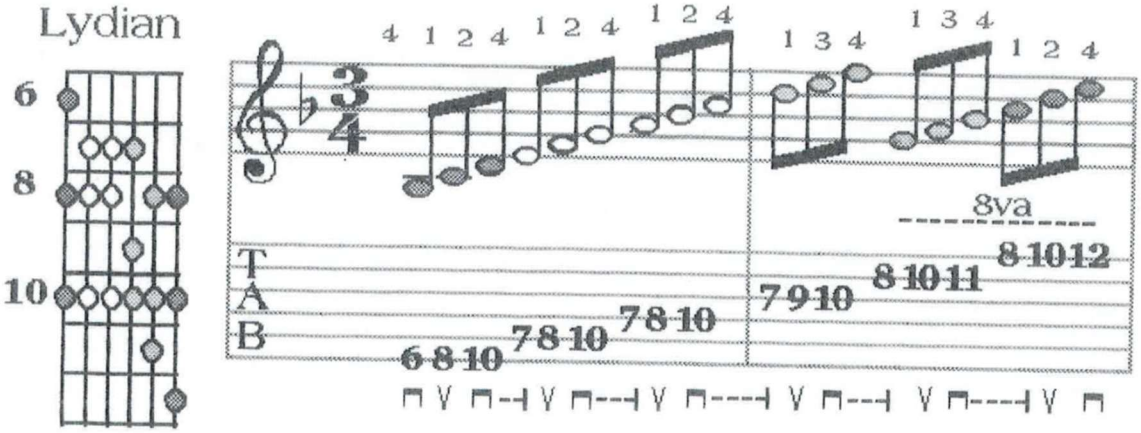


Fig. 3-11 Sweeping The Ascending Lydian Scale

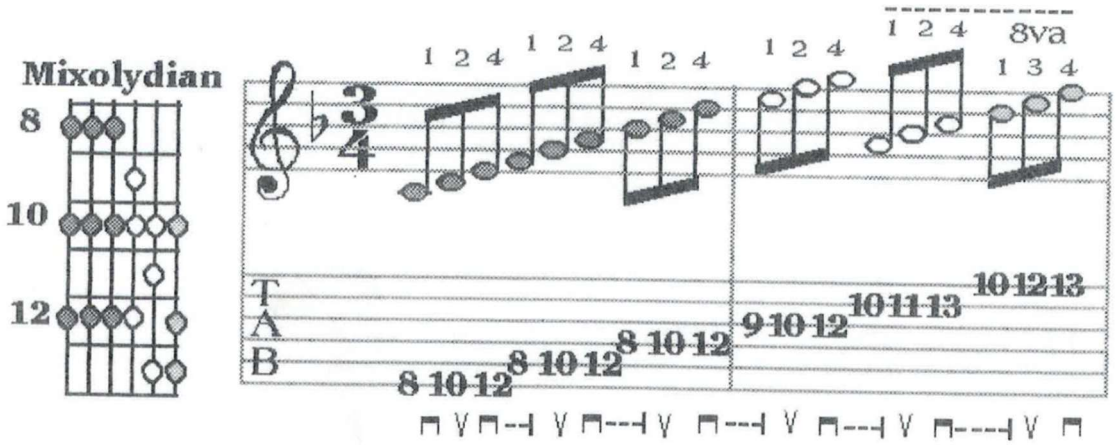


Fig. 3-12 Sweeping The Ascending Mixolydian Scale

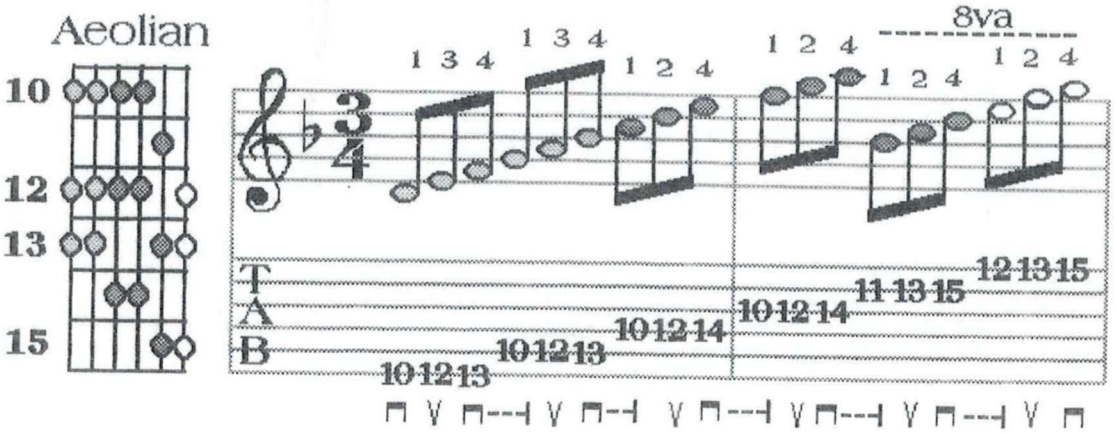


Fig. 3-13 Sweeping The Ascending Aeolian Scale

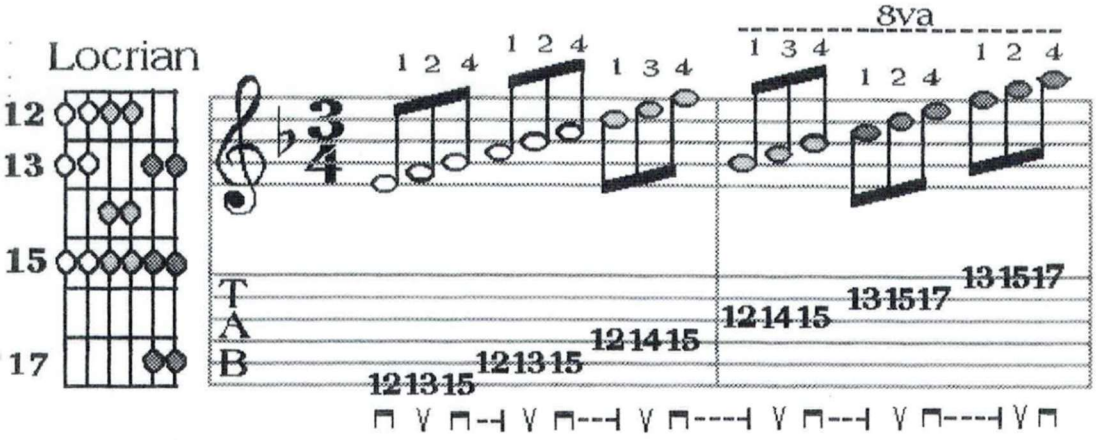


Fig. 3-14 Sweeping The Ascending Locrian Scale

The Descending Diatonic Modes

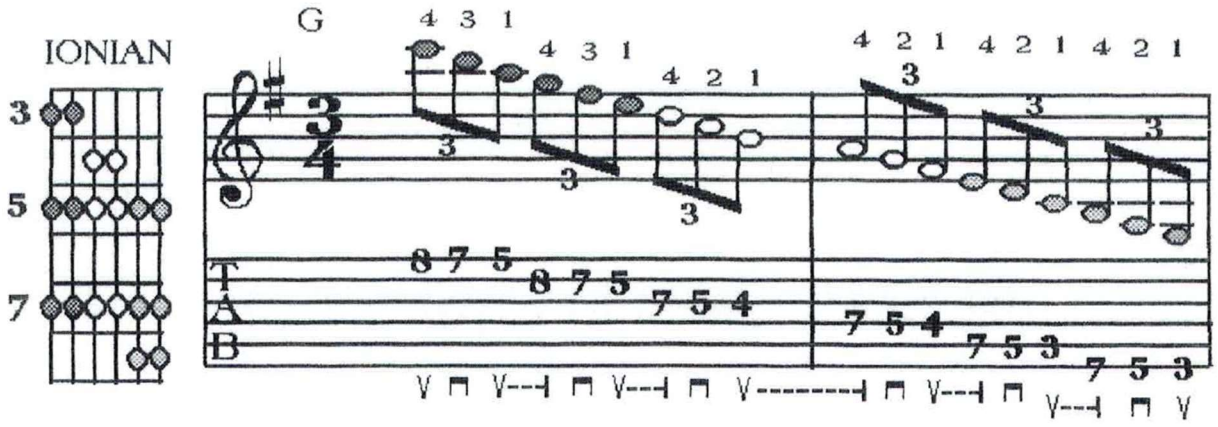


Fig. 3-15 Sweeping The Descending Ionian Scale

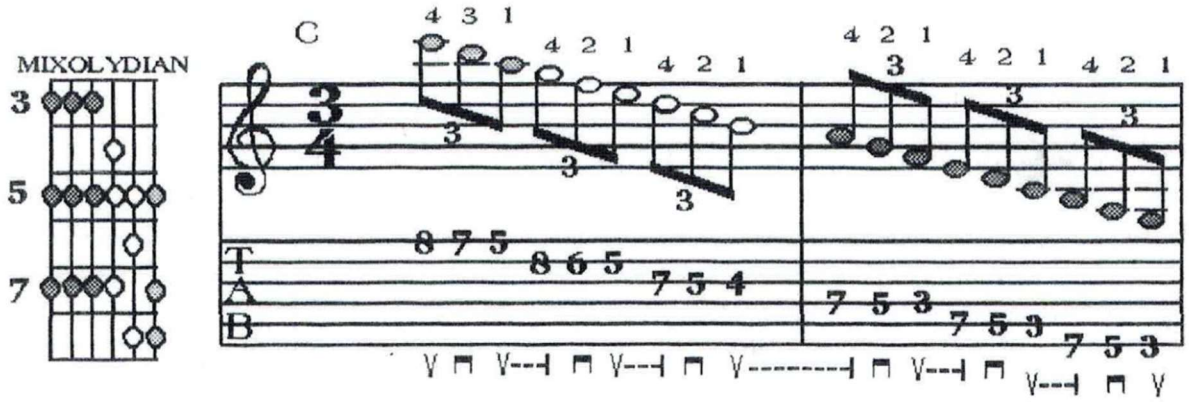


Fig. 3-16 Sweeping The Descending Mixolydian Scale

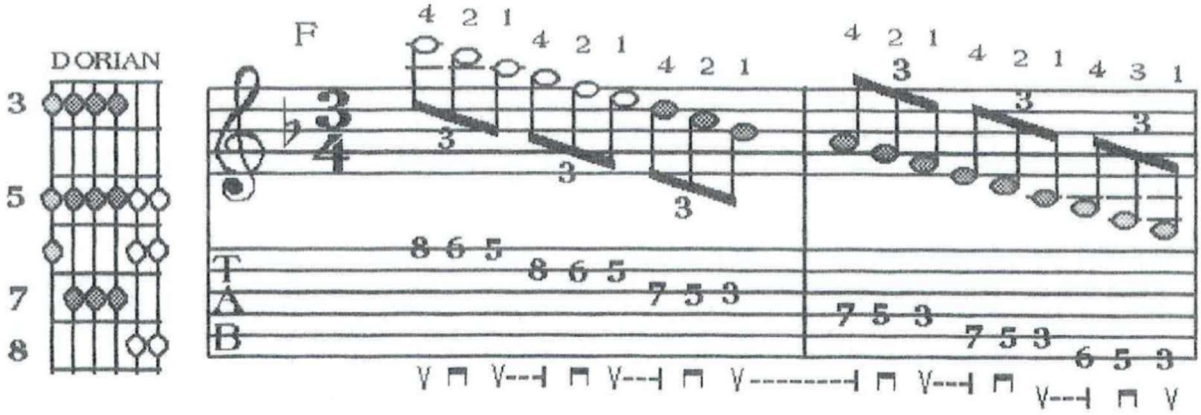


Fig. 3-17 Sweeping The Descending Dorian Scale

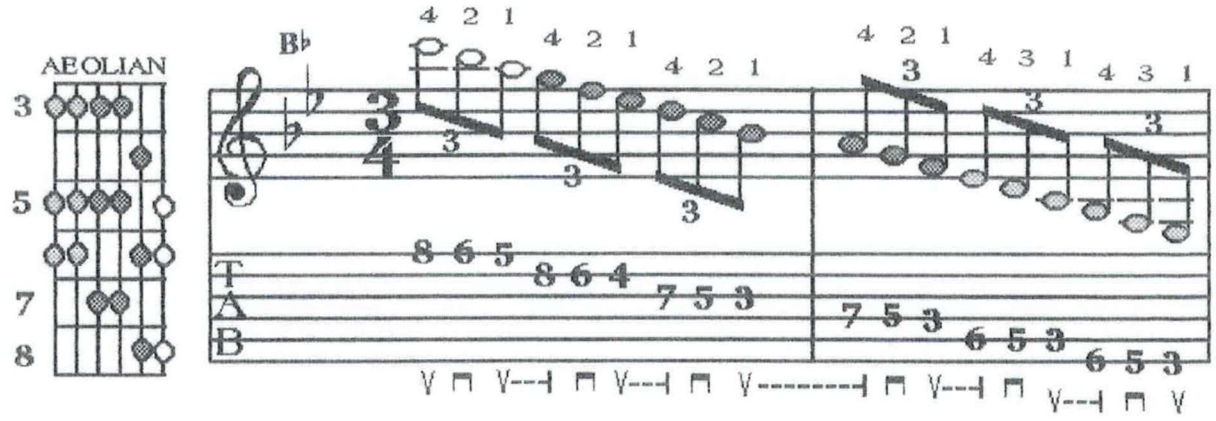


Fig. 3-18 Sweeping The Descending Aeolian Scale

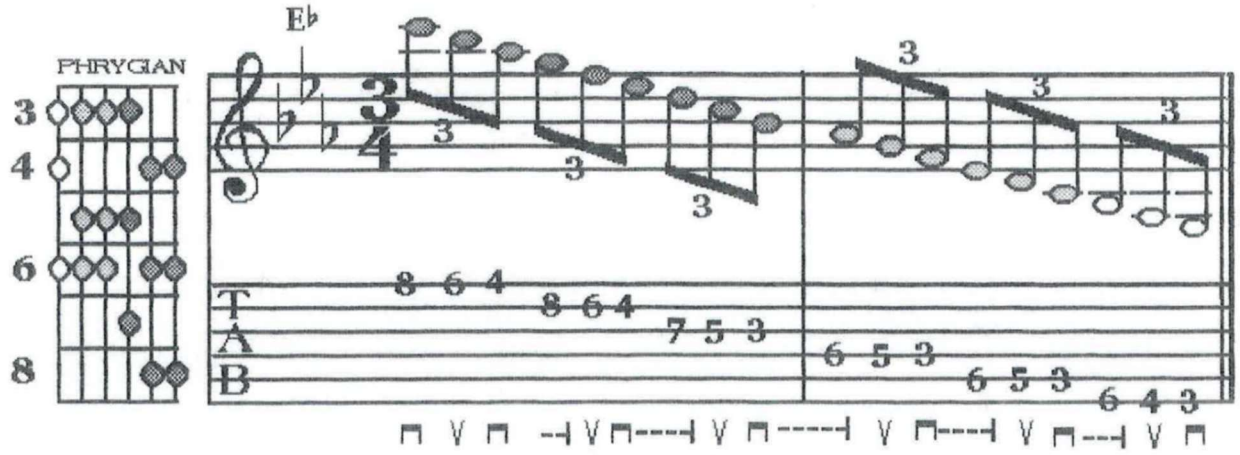


Fig. 3-19 Sweeping The Descending Phrygian Scale

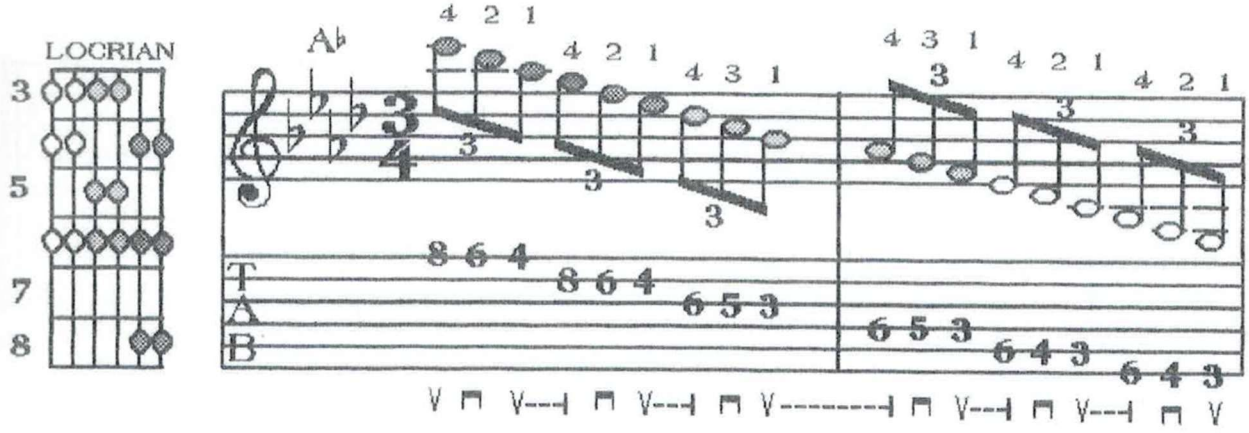


Fig. 3-20 Sweeping The Descending Locrian Scale

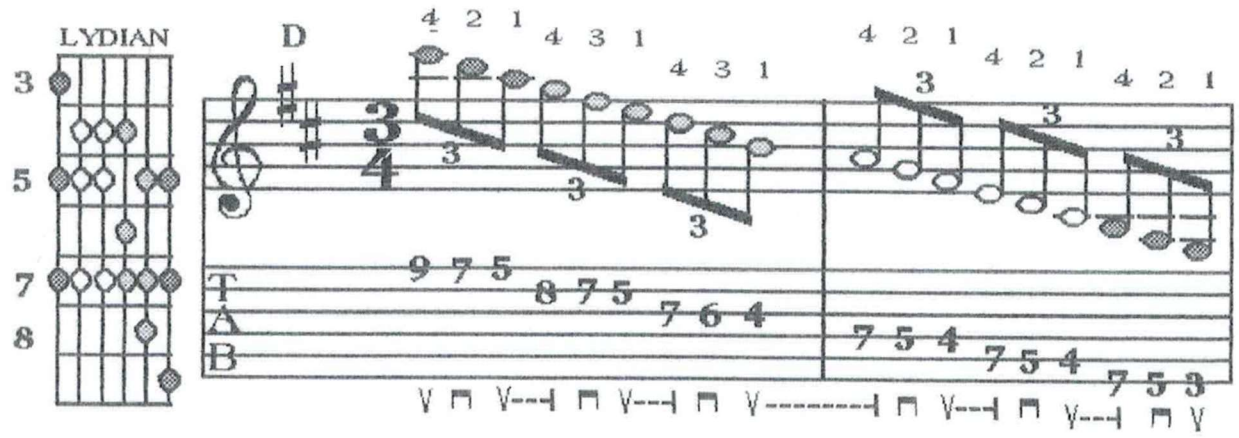


Fig. 3-21 Sweeping The Descending Lydian Scale

Turnaround Cycles

We've covered ascending and descending diatonic scales. The next logical step is to make the transition from one to the other. Here are some exercises that concentrate the ascending-to-descending transition and the descending-to-ascending transition into an infinite loop. I've chosen three symmetrical subsets of the mode patterns because these are right-hand picking studies. Space prohibits printing all 21 different three-adjacent-string turn-around loops (There are 7 different modes, and 4 turn-around patterns per mode, which makes 28 turn-around loops, however, 7 of these are redundant, so there are only 21 unique loops). The picking pattern is identical for all of them.

There is really no need to memorize them, as they are subsets of the modal patterns that you already know. Hopefully, if you want to be thorough and want to practice all 21 patterns, I've given you enough of a clue as to how to derive them graphically (study the scale charts), but it really shouldn't be necessary. Once you've committed the modes to memory (1-1-1-2-2-3-3), and you've got the right-hand loop pattern down, you should be able to pick any three adjacent strings of any modal pattern and work it out on the spot. Or just work your way through the modes. And perhaps even take each loop pattern, for fun, up and down the neck and on other strings as a geometric exercise. Who knows? Perhaps you'll even find the lost chord (or scale)!

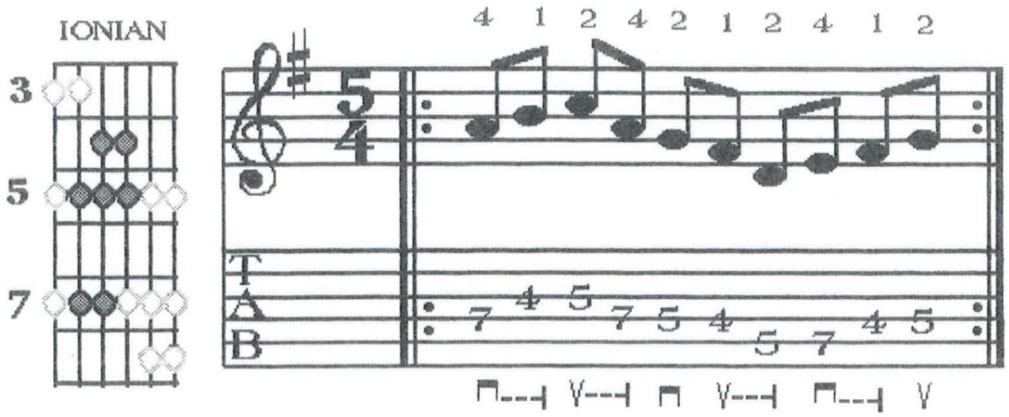


Fig. 3-22 Ionian Subset Turnaround Cycle

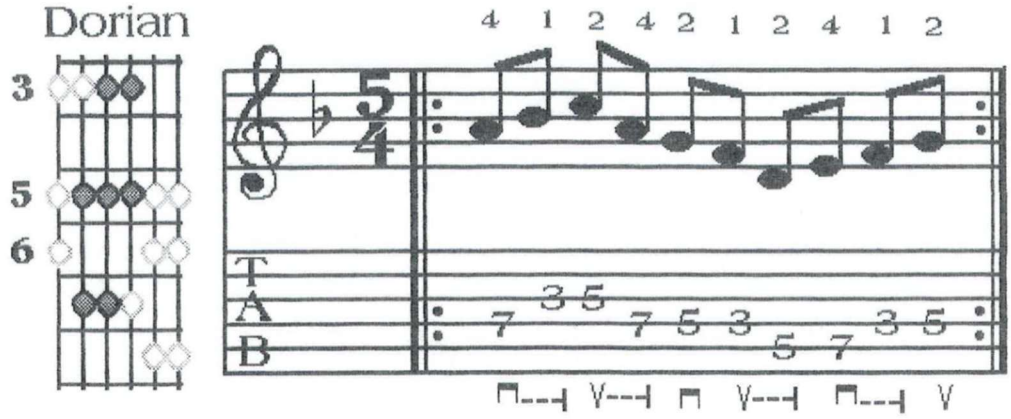


Fig. 3-23 Dorian Subset Turnaround Cycle

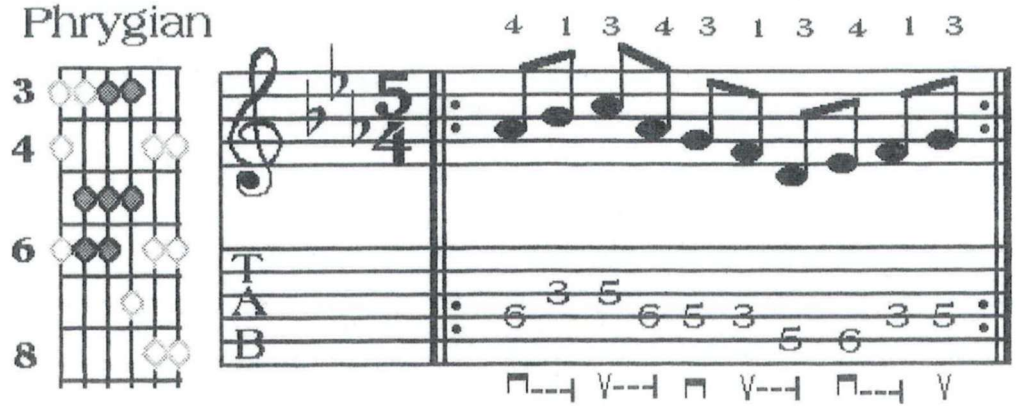


Fig. 3-24 Phrygian Subset Turnaround Cycle

Pentatonic Modes

Pentatonic Mode Derivations

Scale comes from the Latin word scala, meaning staircase. A musical scale is a sequence of notes that go progressively higher or lower. The type of scale depends on the number of steps in the staircase, and the size of the steps.

The seven-note diatonic scales we in the West are familiar with originated in ancient Greece. There are many other scales. A few are listed here for the record.

	Whole Tone	1-1-1-1-1-1
	Diatonic Minor	1-½-1-1-1-1-½
	Chromatic	½-½-½-½-½-½-½-½-½-½-½-½
I	Diatonic Ionian	1-1-½-1-1-1-½
ii	Diatonic Dorian	1-½-1-1-1-½-1
iii	Diatonic Phrygian	½-1-1-1-½-1-1
IV	Diatonic Lydian	1-1-1-½-1-1-½
V	Diatonic Mixolydian	1-1-½-1-1-½-1
vi	Diatonic Aeolian	1-½-1-1-½-1-1
°vii	Diatonic Locrian	½-1-1-½-1-1-1
I	Pentatonic Corinthian	1-1-1½-1-1½
(ii)	Pentatonic Ephesian	1-1½-1-1½-1
iii	Pentatonic Philippian	1½-1-1½-1-1
V	Pentatonic Colossian	1-1½-1-1-1½
vi	Pentatonic Thessalonian	1½-1-1-1½-1

The pentatonic scale is simply a five-tone scale, specifically one that is obtained by omitting the 4th and 7th from the Ionian major scale. The scale is common to ancient Chinese, Japanese. Native American, and more recently, modern Blues and Rock music.

My first exposure to the pentatonic scale was a slick lead break the Blues Magoos did back in the 60's. After that, I started noticing it everywhere! Mastering this scale is an essential skill, but don't worry. . . It's easy, and I'll make it even easier. Let's start out the same way we did with the major scale: First make a note map and then divide it into mode patterns.

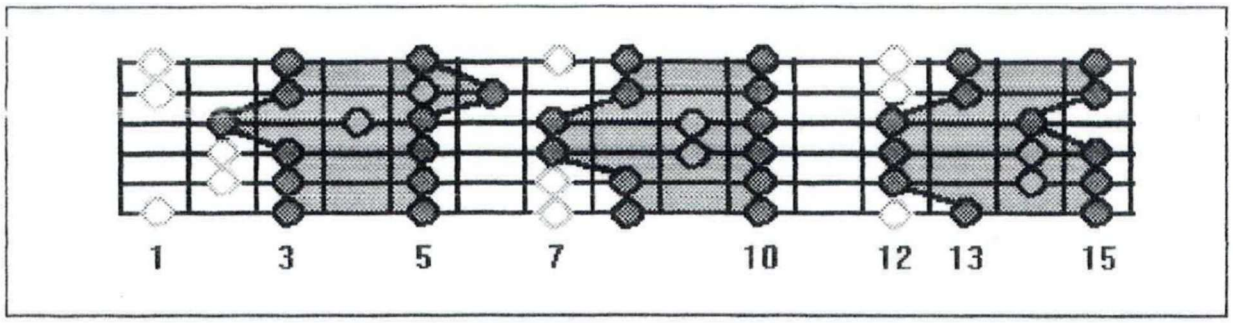


Fig. 4-1 The Pentatonic Note Map

Now, when we refer to 'THE MODES', we are usually talking about the different permutations of the 7-note diatonic scale, and someone, somewhere, at some time endowed them with the labels Ionian, Dorian, and so on. I've never seen any names attached to the pentatonic modes, so to make it easier to discuss them, I hereby christen them in the tradition of ancient Mediterranean cities such as the Corinthian, Ephesian, Philippian, Colossian, and Thessalonian modes, respectively.

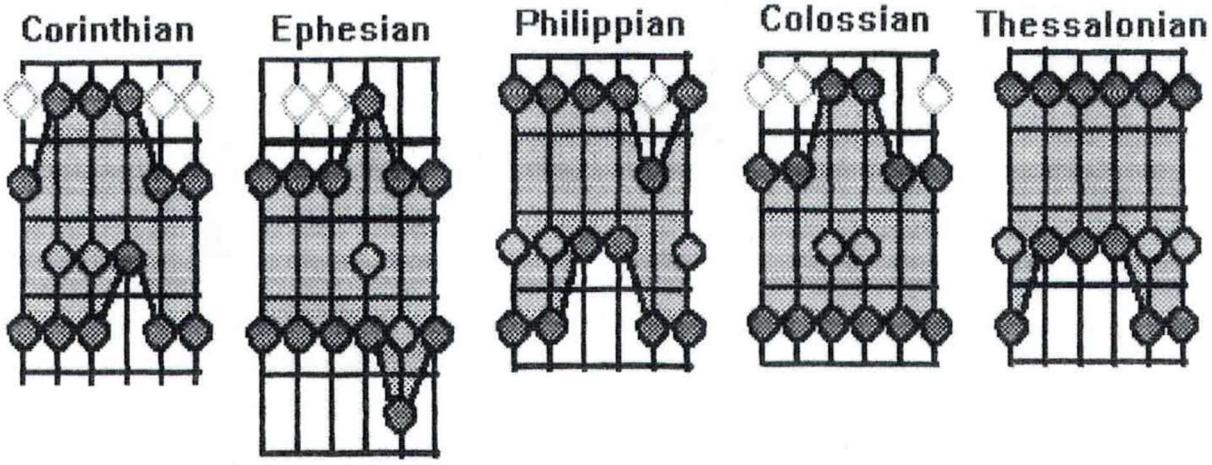


Fig. 4-2 The Pentatonic Modes

Hybrid Picking

It's quite a stretch to apply the same sweep picking pattern we used on the diatonic modes to the pentatonic modes, because there are only two notes per string in these scales. It's not impossible, just a little uncomfortable if your hands are as small as mine. The good news is that there is more than one way to skin a cat. I now introduce the concept of hybrid-picking.

Hybrid is a snooty way of saying that dissimilar things are combined. In this case, we mix different speed-picking techniques. What I've discovered is that combining sweep-picking with common pulling-off or hammering-on, works well with 2-note per string scales like these.

To be thorough, we should make a table of every combination of speed techniques so that we will make sure that we catalog them all, but as soon as we did, we'd discover that we left one out and we'd have to DOUBLE the size of our table. Because there are so *many* creative things we can do on stringed instruments, it is enough to say that you can create a powerful riff by combining the bits and pieces you already know into one long run. Explore the combinations. But for now, study these exercises as simple examples:

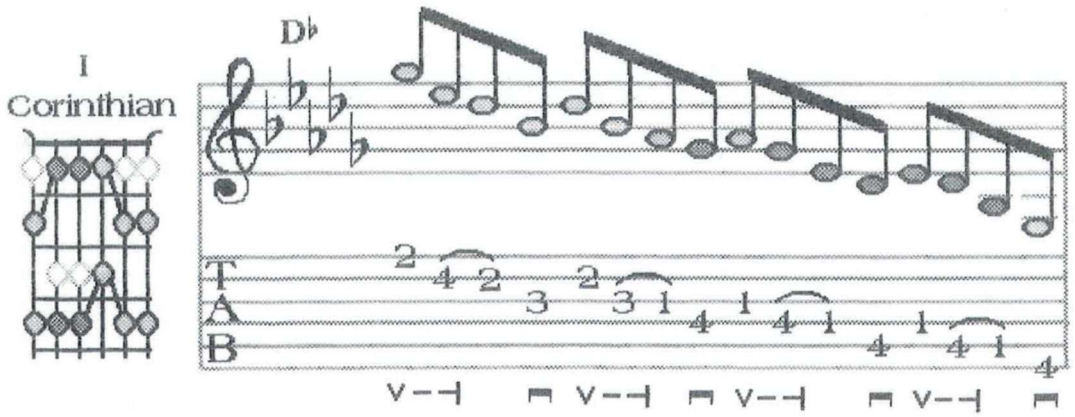


Fig. 4-3 Descending Corinthian Hybrid Pattern

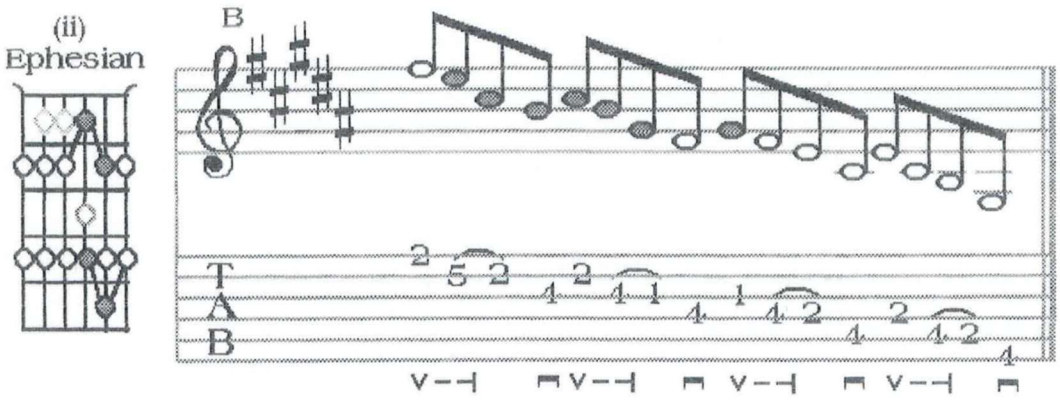


Fig. 4-4 Descending Ephesian Hybrid Pattern

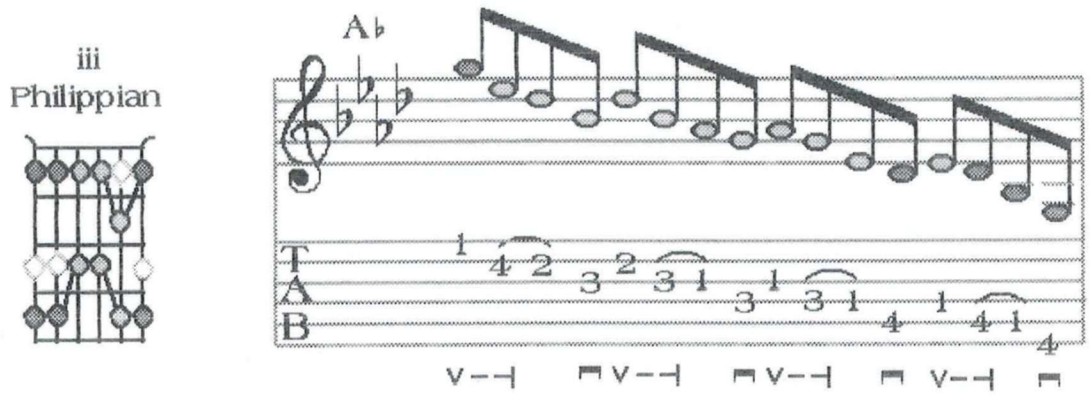


Fig. 4-5 Descending Philippian Hybrid Pattern

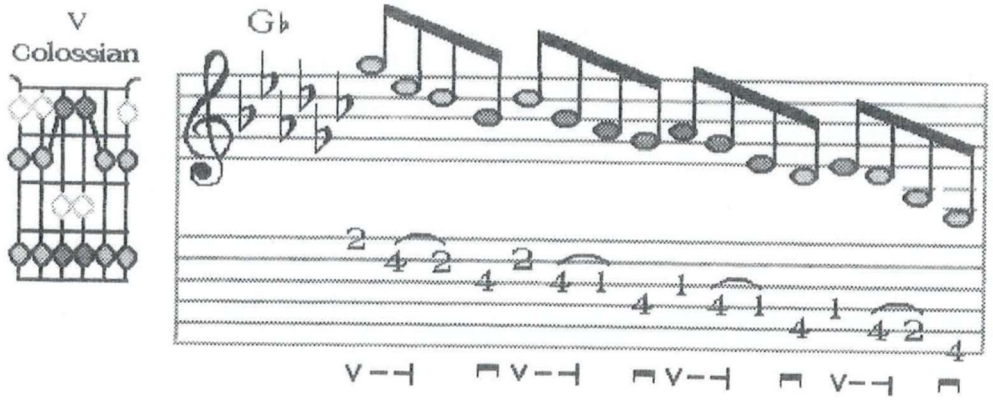


Fig. 4-6 Descending Colossian Hybrid Pattern

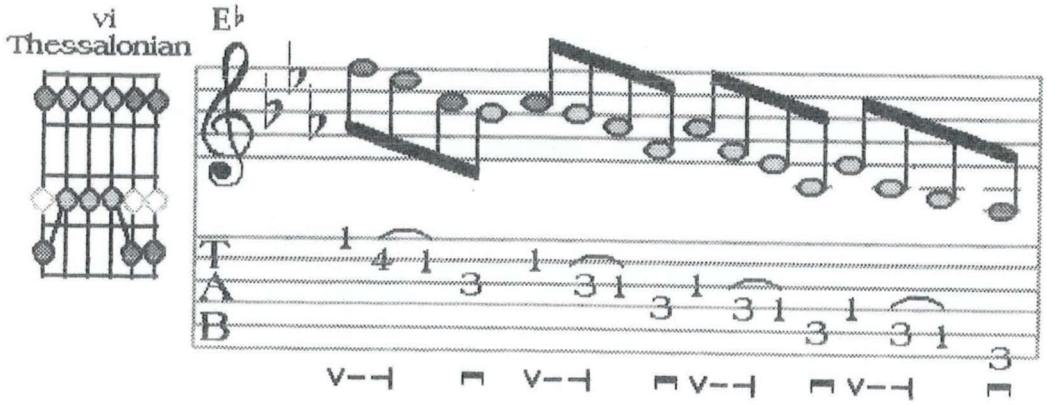


Fig. 4-7 Descending Thessalonian Hybrid Pattern

Tapping

This technique has enjoyed a recent surge of popularity due to the work of pioneers like Eddie Van Halen, Jennifer Batten, Stanley Jordan and others. The effects that can be achieved range from melodic yodeling, to speed-scales on a par with sweeping, to bazillion-note-per-second arpeggios, to complex piano-like contrapuntal arrangements. It's fun to do, once you get the hang of it, nay, quite habit-forming! Some even advocate retiring your pick forever. I wouldn't go quite that far.

Let's start with something simple: The basic tap consists of a hammer-on followed by a pull-off, all with a single right-hand finger. Just imagine yourself to be sitting at an ancient mechanical typewriter, and you want to type an entire row of hhhhhhhhhh's. If you don't hit it hard enough, the hammer might never make it to the platen. So, whack it one! Use the middle of the tip of your 1st or 2nd finger (try the 3rd or 4th later) and hit the string as close to the fret wire (nearest to the guitar body) as you can without touching it. Once you've hammered it, and you can clearly hear the note ring, pluck the string by pulling it towards you. While the iron is still hot, hammer it again! Pull it off again. And again.

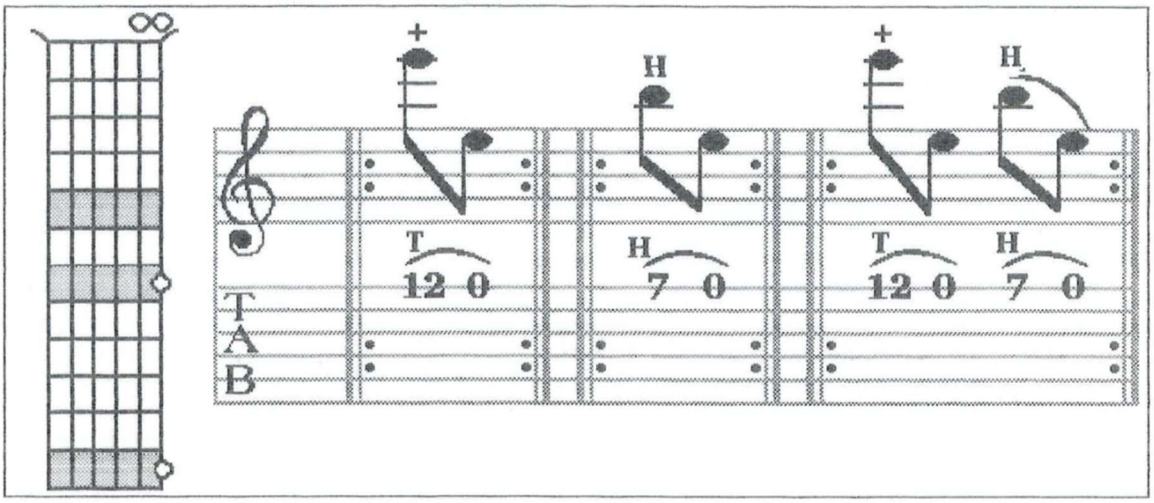


Fig. 5-1 Some Basic Tapping Cycles

Now use the 4th finger of your left hand. Hammer on a B on the 7th fret of the high E-string. Don't be shy. NAIL it and then pull it off (down) to the open string. When you're comfortable tapping with your right hand and hammering on with your left hand, it's time to put them together and alternate between one and the other. Note all the repeat signs: Practice each 'subatomic part' until your fingers get the hang of it, then move on---at your own pace.

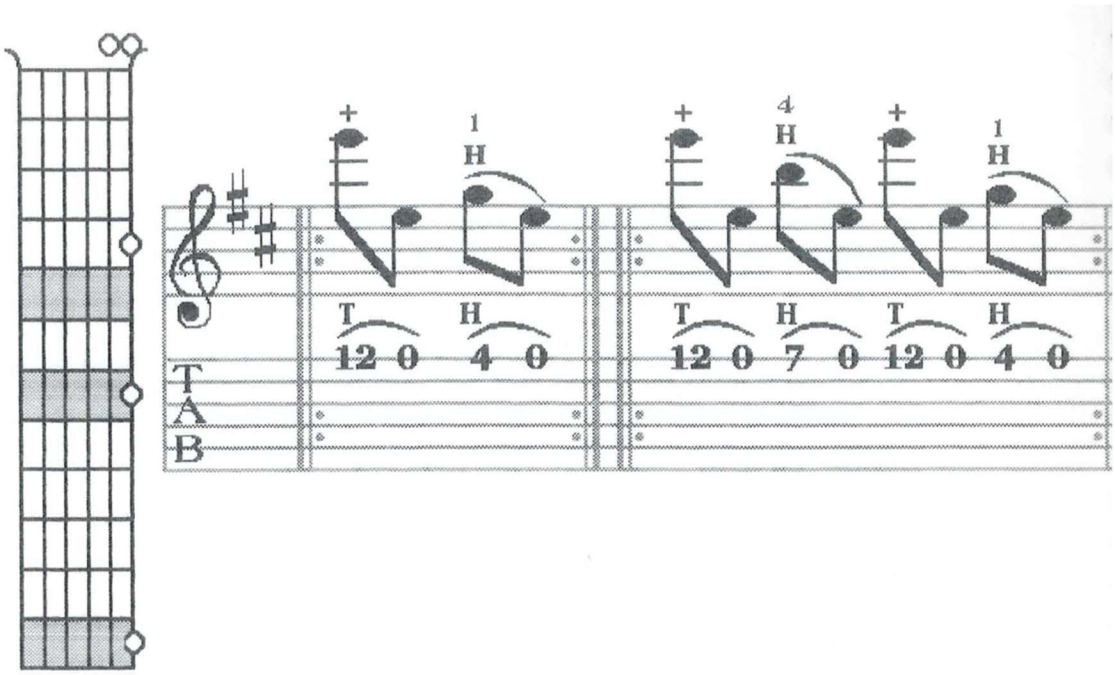


Fig. 5-2 Basic Tapping Arpeggio

PEP-TALK: Notice how we're building the complexity of the tapping cycle. We didn't start out with 4th species counterpoint using exhaustive hybrid picking combinations. We began with the simplest cycle I could think of and then added a little more of a challenge. And then some more. And more. Before we sent men to the moon, we had to first discover Newtonian mechanics, the gravitational equation, projectile motion, the chemistry of burning, human-respiration, thermal insulation, and a BUNCH of other technologies. We didn't do it in one sitting. So be patient. This stuff is all simple, but it sometimes takes time to put it all together. Persevere, and you will be rewarded. There is almost nothing as fun as playing music skillfully anywhere this side of eternity.

Let's try a practical application of tapped chord arpeggios. An arpeggio is simply a sequence of notes, typically the notes of a chord, played in any order. Most often it is a repetitive pattern. Different voicings, or inversions affect the character of the chord (the nuances of what it sounds like) but not its identification. When tapping a triad, we can create more interesting arpeggio textures by using open strings in our note cycles. By using different inversions, we can find 3 major triads, 3 minor triads, and 4 diminished arpeggios per string when the open string is either the root, the 3rd, the 5th or the 7th degree of the scale.

Because the strings are tuned to E-A-D-G-B-E, there are only 7 keys (C, D, E, F, G, A, B-flat) for which we can find open-string triads for every major, minor, and diminished chord of the key. You can modulate to D-flat, E flat or A-flat if your progression includes only the 5 (of 7) chords in the key for which open-string triads exist (or Just substitute a closed-string triad). It gets a bit tougher for the keys of G-flat and D-flat respectively. A complete table of open-string triad arpeggios appears in the appendix.

A simple example of tapping a I-IV-I-V chord progression in the key of E is shown in Fig. 6-Ic.

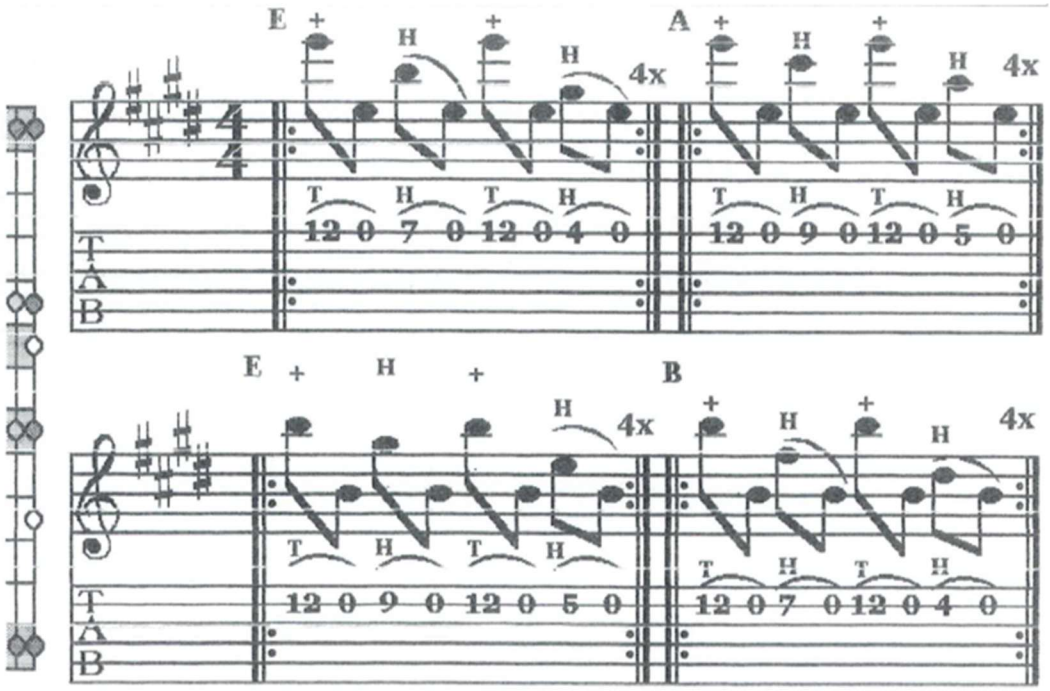


Fig. 5-3 Tapping Chord Progression

Tapping also comes in handy as an alternative way to blast through a scale in no time at all. Consider this descending Dorian scale:

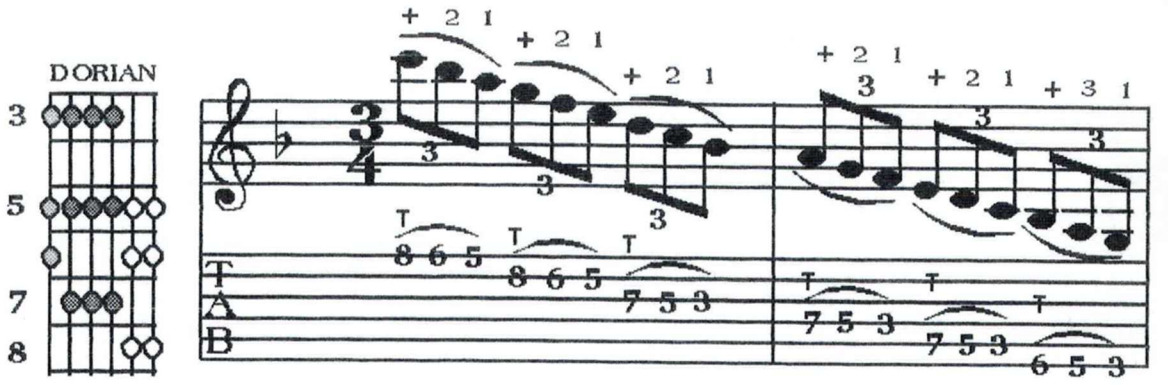


Fig. 5-4 Tapping A Descending Dorian Scale

By symmetry, we can play an ascending modal scale as well, but in my experience, it's a lot harder to get any volume out of a string by tapping than it is by pulling off, so descending scales are a little more powerful.

Another interesting thing we can do with two-hand tapping is to play two mode harmonies, one voice with each hand. Here is a snippet from an Ionian/Phrygian couple:

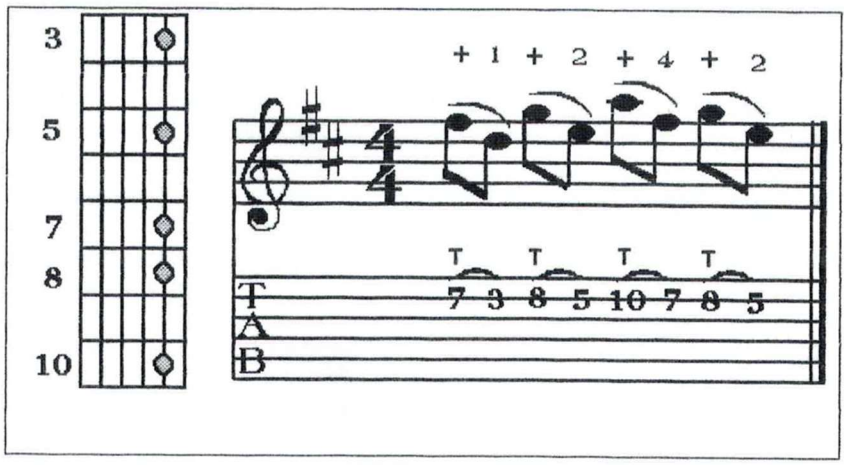


Fig. 5-5 A Bi-modal Tapping Example

Tapped Chord Charts

We learned how to tap an arpeggiated I-IV-V chord progression in the key of E. Here are a complete set of single string arpeggiated chords for the key of D:

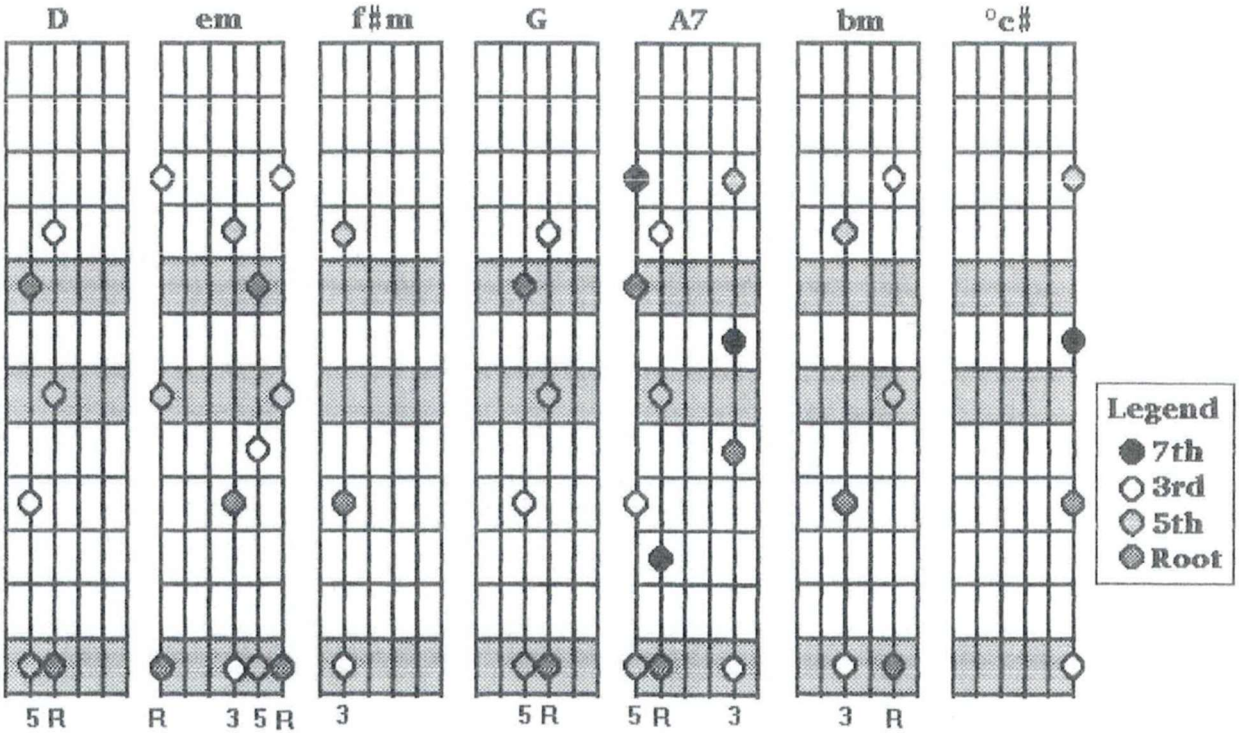


Fig. 5-6 Essential Tapped Chord Triads

As I mentioned earlier, there are enough chord inversions possible to play all basic chords in seven keys and most of the other five keys. Here are the essential major and minor triad inversions, each containing one open string:

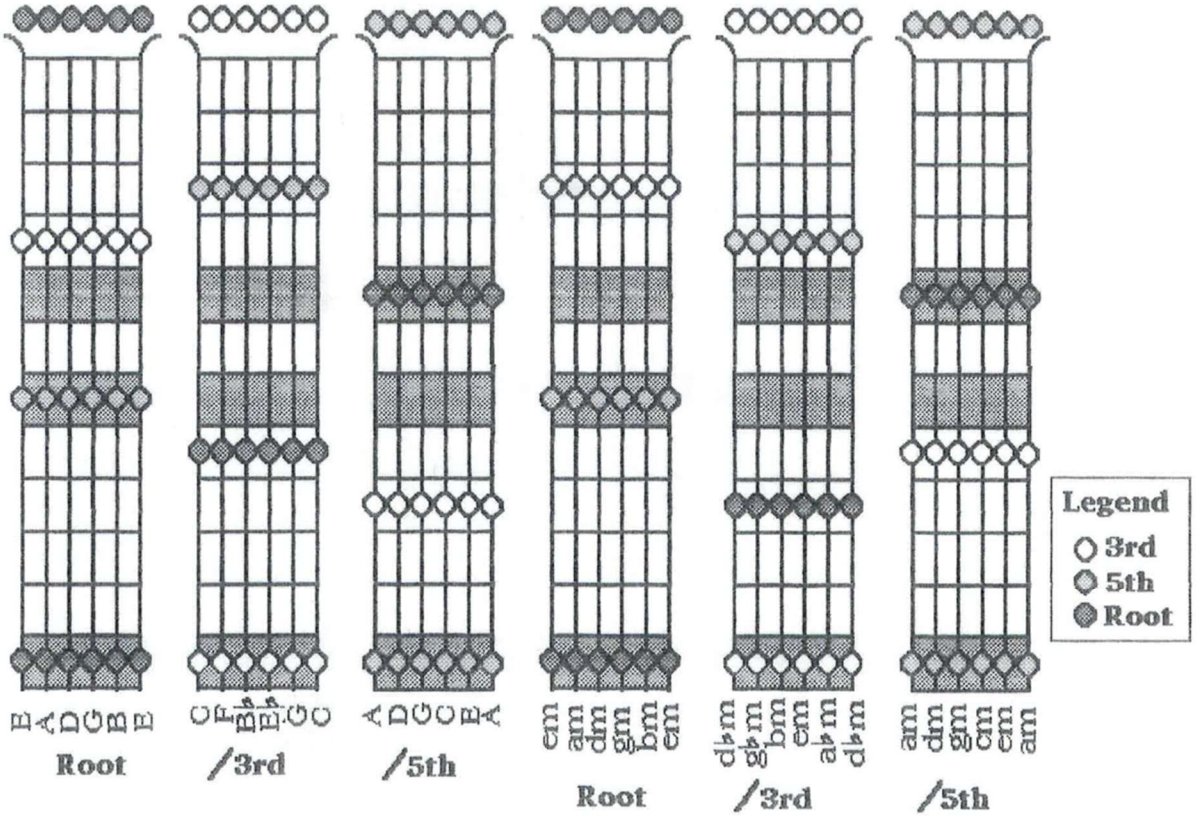


Fig. 5-7 Essential Tapped Chord Triads

Let's find the most mileage we can get out of these chords. Here's a matrix of the essential chords in each key. The chords that *do not* have open-string triads are shaded.

Key	I	ii	iii	IV	V7	vi	°vii
A	A	bm	c♯m	D	E	f♯m	°g♯
B♭	B♭	cm	dm	E♭	F	gm	°a
B	B	c♯m	d♯m	E	F♯	g♯m	°a♯
C	C	dm	em	F	G	am	°b
D♭	D♭	e♭m	fm	G♭	A♭	b♭m	°c
D	D	em	f♯m	G	A	bm	°c♯
E♭	E♭	fm	gm	A♭	B♭	cm	°d
E	E	f♯m	g♯m	A	B	c♯m	°d♯
F	F	gm	am	B♭	C	dm	°e
G♭	G♭	a♭m	b♭m	B	D♭	e♭m	°f
G	G	am	bm	C	D	em	°f♯m
A♭	A♭	b♭m	cm	D♭	E♭	fm	°g

Fig. 5-8 Open String Triad Table

There are many other open string chords possible besides the simple root-third-fifth triads. Here are a series of charts. The root is the lowest note in the first one. The second chart's lowest note is the third. The third chart has a fifth in the bottom.

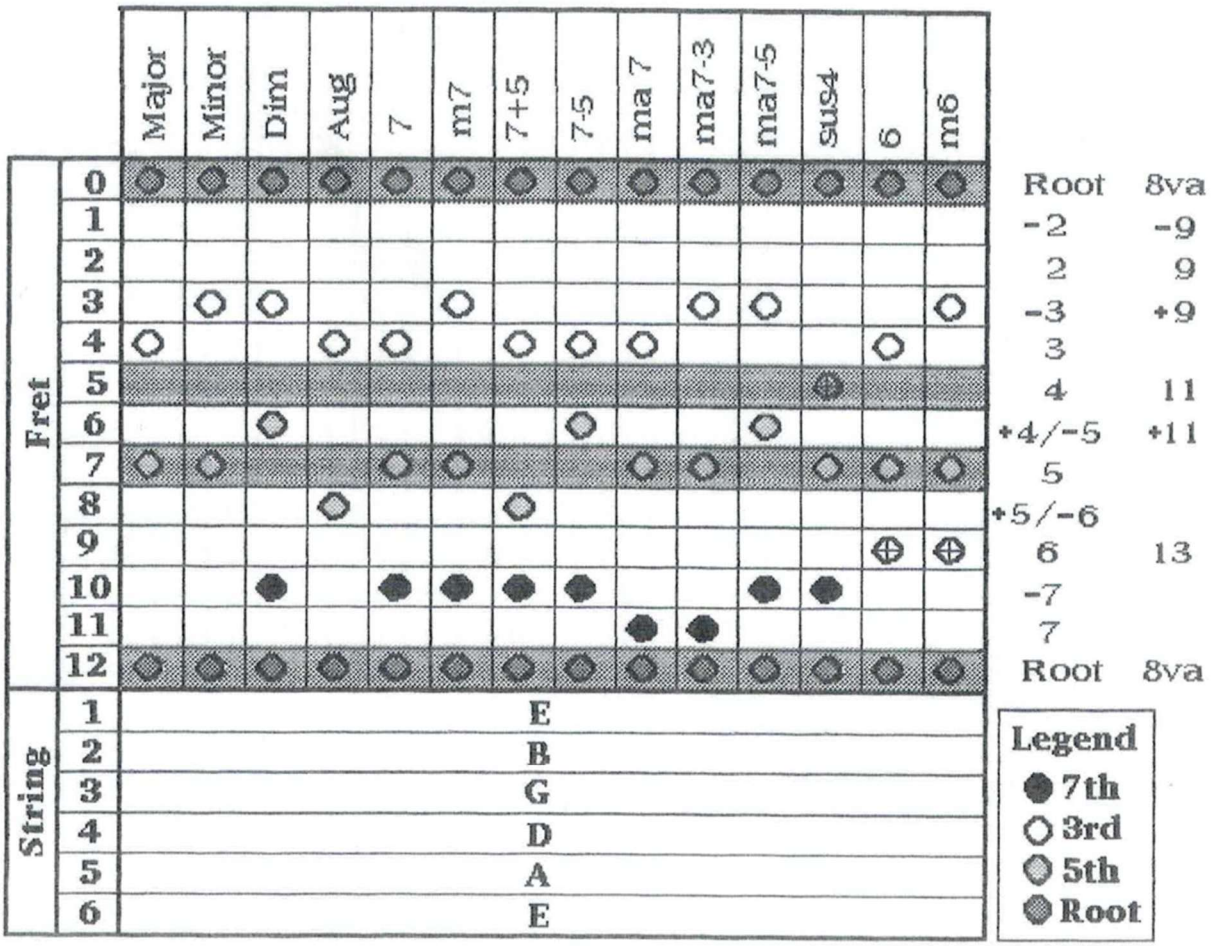


Fig. 5-9 Single String Chords (Root in Bottom)

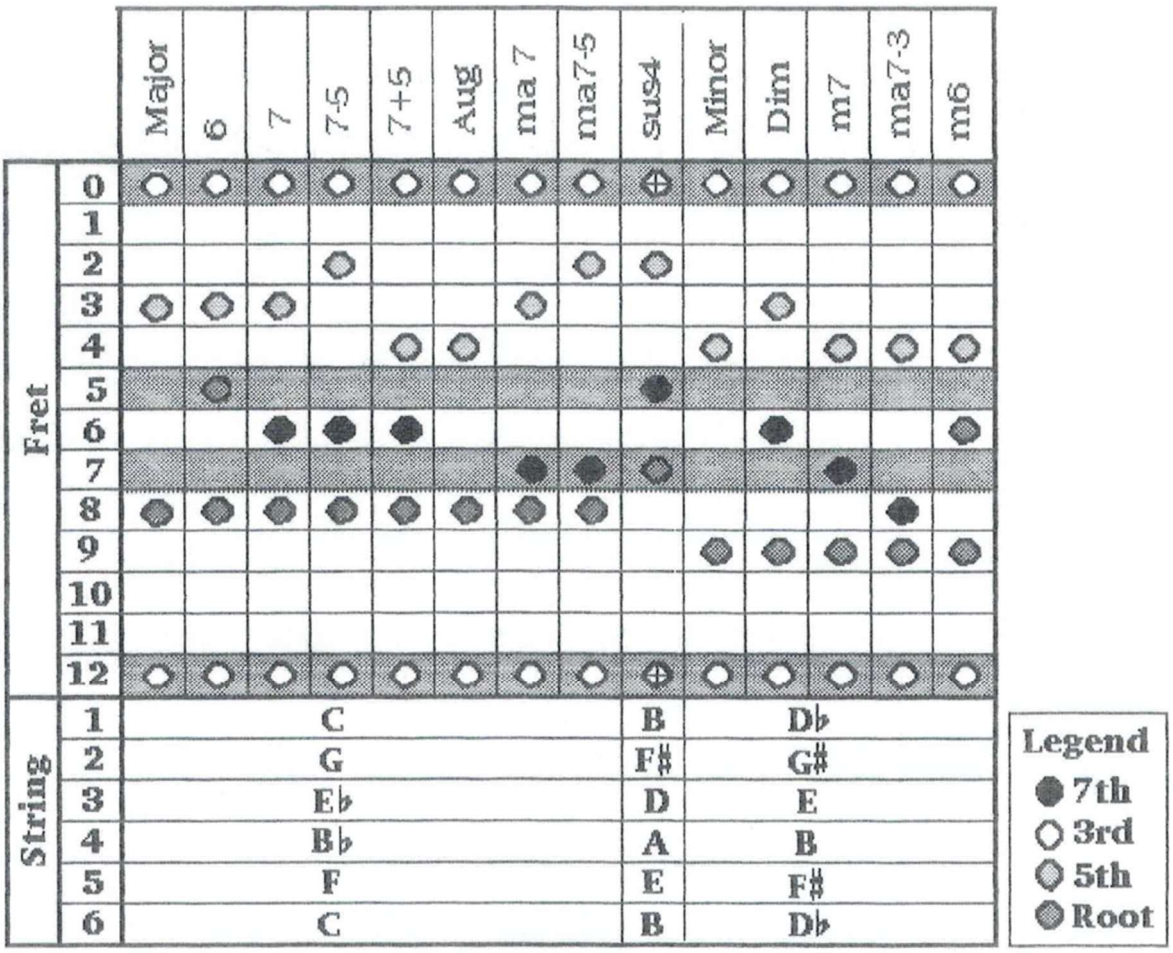


Fig. 5-10 Single String Chords (3rd in Bottom)

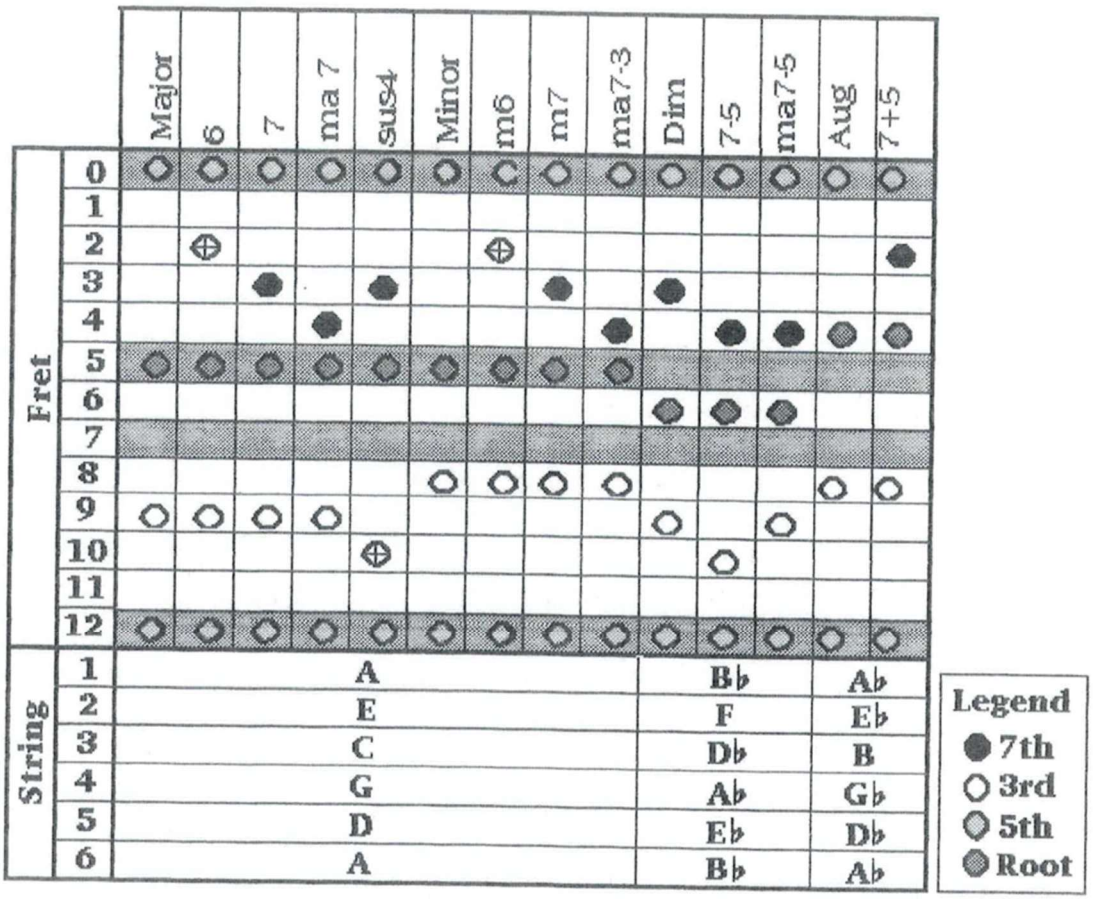


Fig. 5-11 Single String Chords (5th in Bottom)

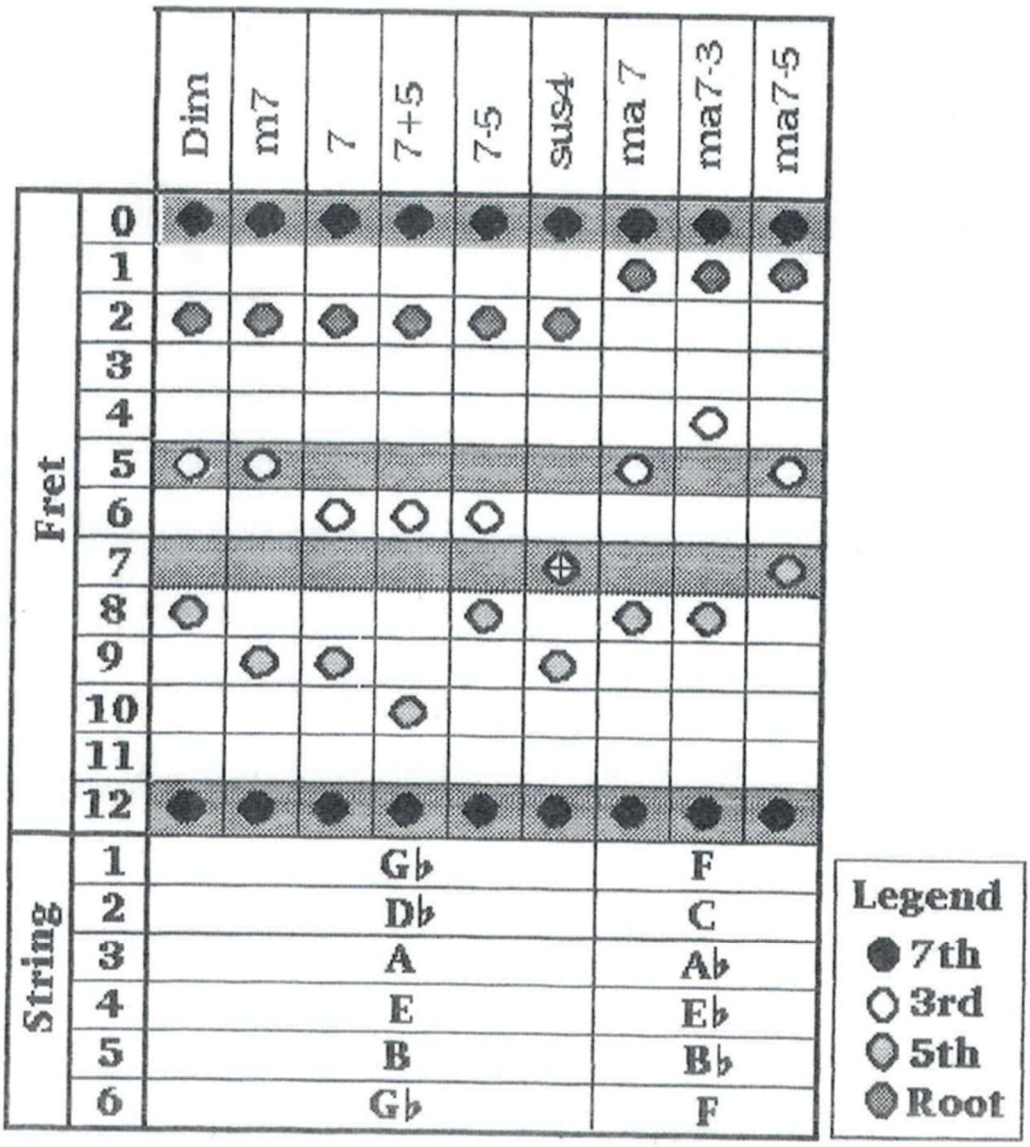
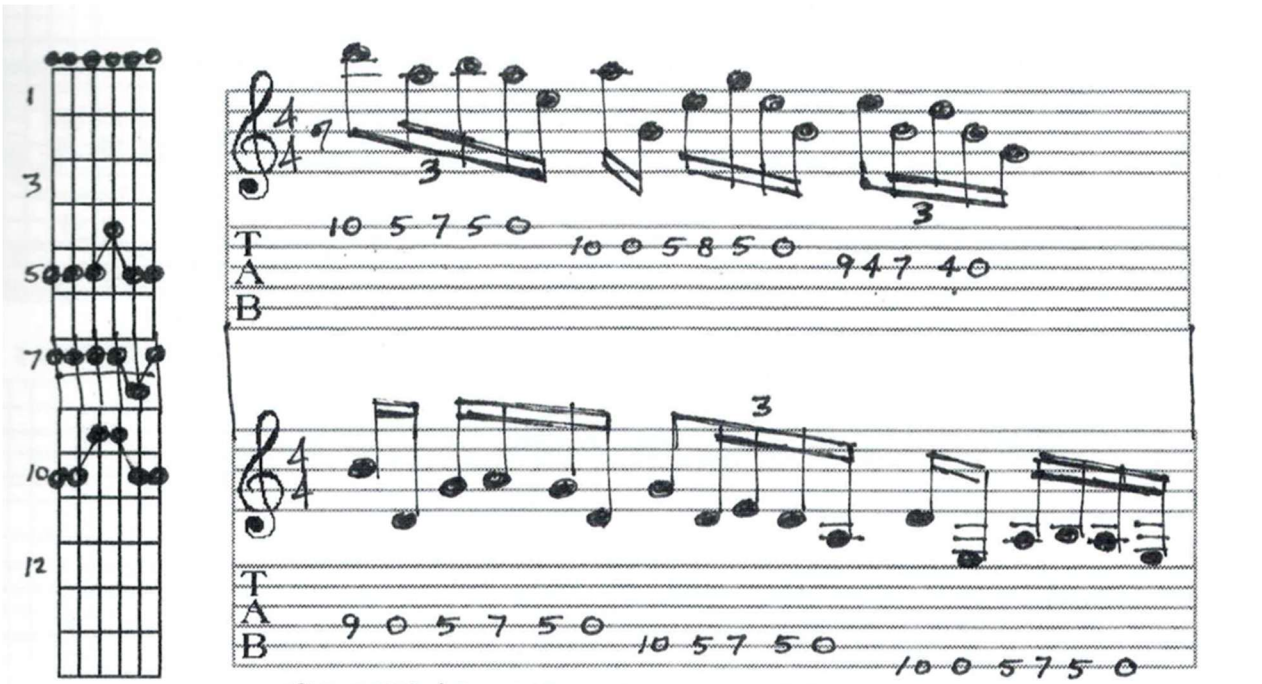
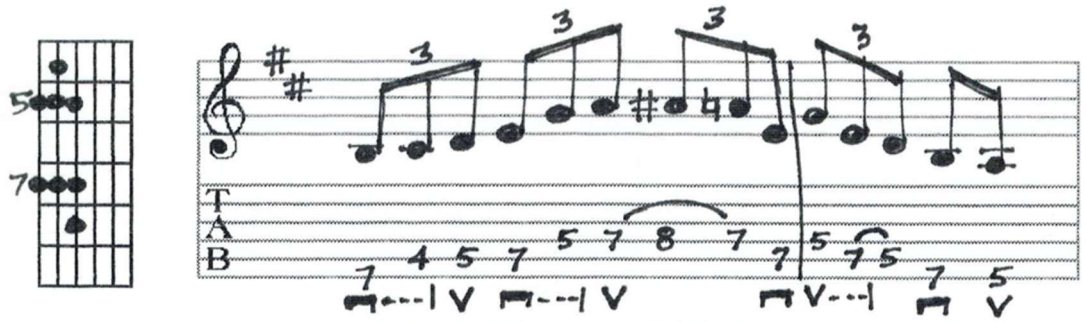


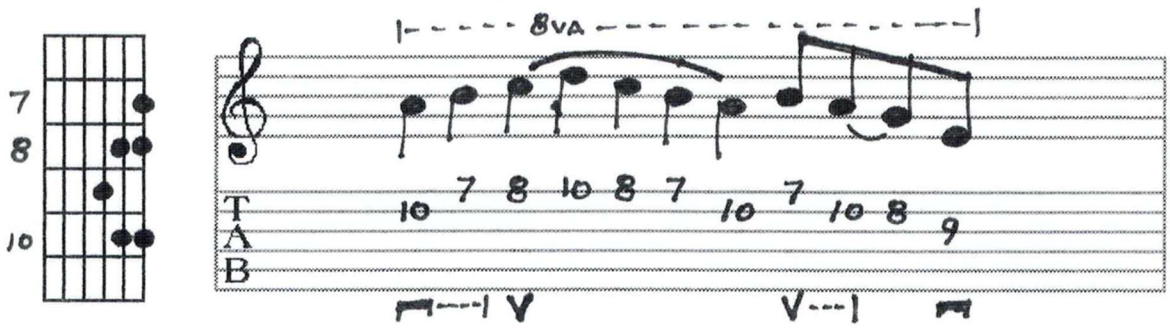
Fig. 5-12 Single String Chords (7th in Bottom)



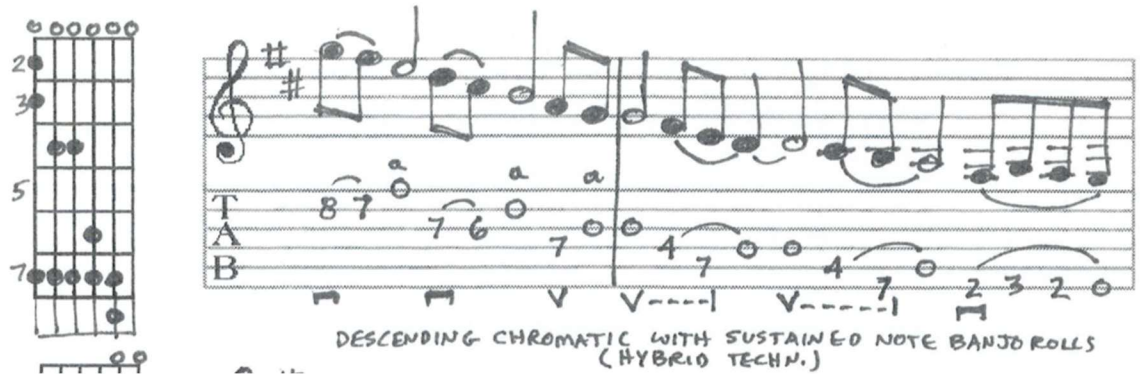
EXAMPLE 1: TAPPING A DESCENDING PENTATONIC ARPEGGIO



SWEEP ASCENDING DIATONIC SCALE, SLIDES, SWEEP-PULLOFF DESCENDING PENTATONIC SCALE (HYBRID)

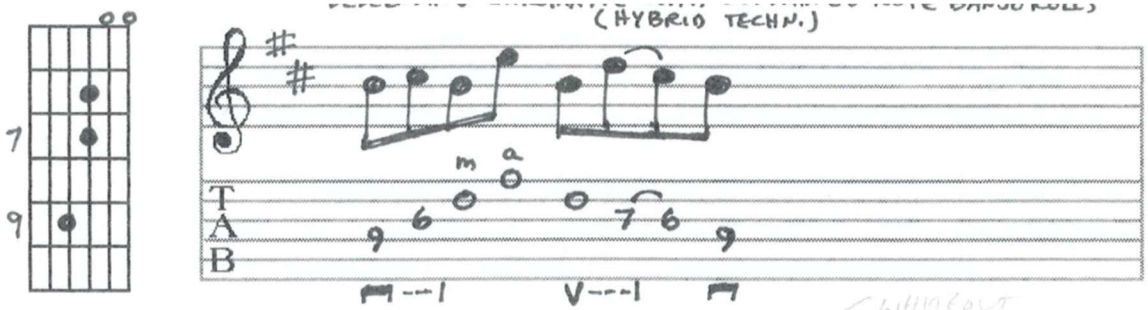


BASIC SWEEP, LOTS OF HAMMER-ON/PULL-OFFS, SWEEP-PULLOFFS A DESCENDING PENTATONIC

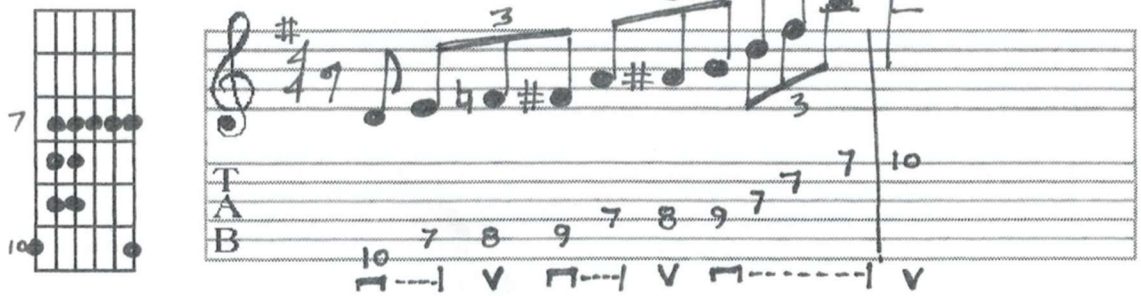


DESCENDING CHROMATIC WITH SUSTAINED NOTE BANJO ROLLS (HYBRID TECHN.)

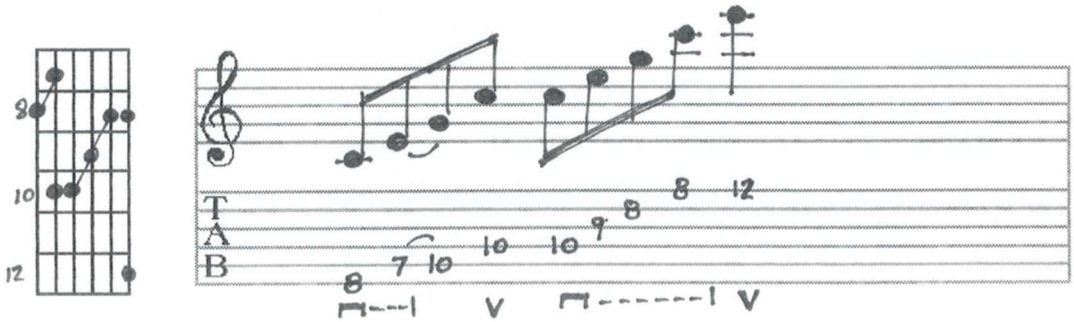
(HYBRID TECHN.)

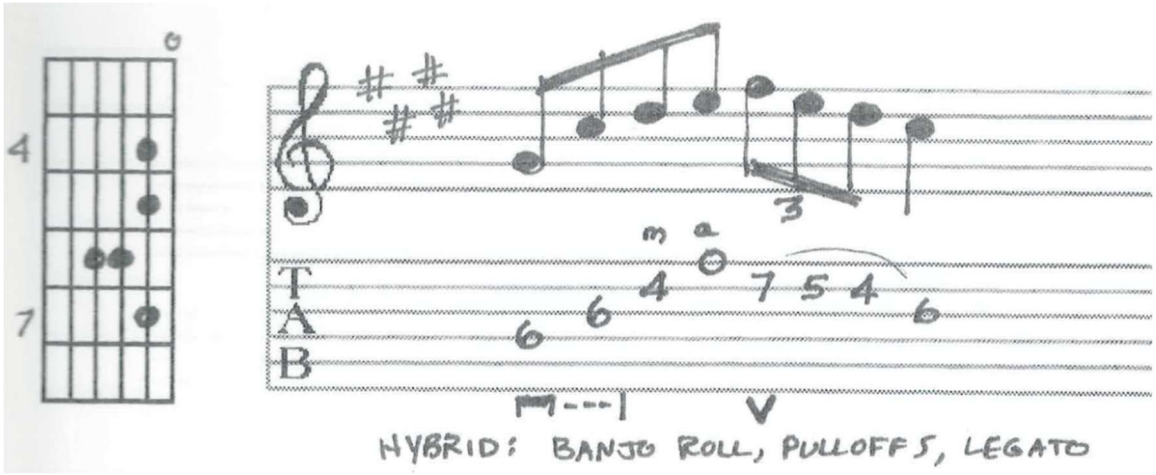


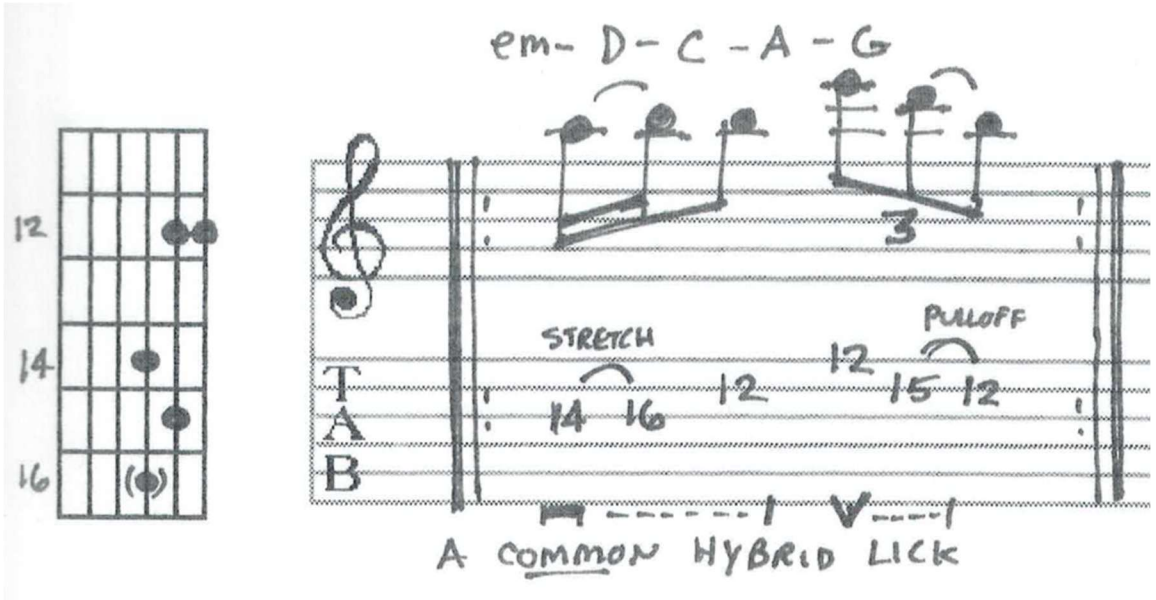
FINGER PICKING/ SWEEPING/ PULLOFFS



SWEEPING AN ACCELLERATING CHROMATIC/PENTATONIC SCALE


8
10
12
T
A
B
8 7 10 10 10 9 8 8 12
V V
MAJOR CHORD SWEEP ARPEGGIO


G
4
7
m a
T
A
B
6 6 4 7 5 4 6
V
HYBRID: BANJO ROLL, PULLOFFS, LEGATO


em- D- C -A - G
12
14
16
STRETCH
PULLOFF
T
A
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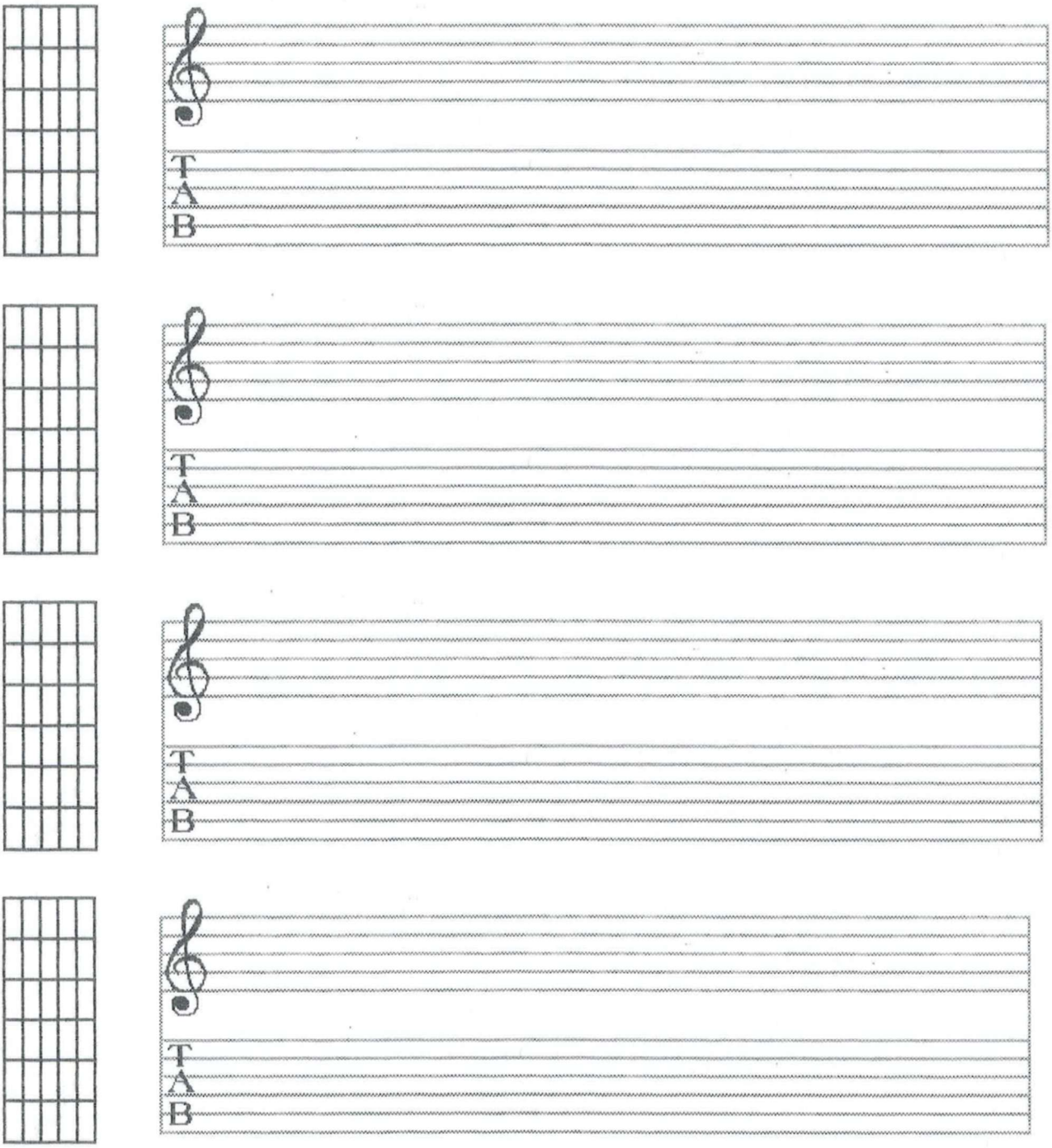
14 16 12 12 15 12
A COMMON HYBRID LICK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