The Musical Keyboard as the Cognitive Tool of the Musician

The Importance of Visualizing the Keyboard

by Marianne Ploger © 2010 Nashville, TN

Introduction

The piano / organ keyboard provides among the most important and useful tools to all musicians. With a vivid visual imagination of the keyboard anyone can clearly ascertain that there are but twelve basic pitches and eleven di-chords. What is more, the eighty-eight notes on the keyboard provide the totality of the pitch materials employed by even the largest band or orchestral ensemble. During the most richly textured moments, the pitch materials of a work can be visualized on the keyboard. This allows anyone to understand at a glance how these pitches/notes relate to one another. It's no wonder that keyboardists so often possess the greatest craft at encoding and decoding music.

Our capacity to name what we hear does not relate so much to our ears as to our ability to assign a name to sounds through a systematic identification of the heard elements. The fact that an individual from a foreign country misnames an object does not mean that he doesn't see that object correctly; rather, it indicates that he has assigned the incorrect 'code' word for that object.

In music, we generally determine the strength of the musical ear by the mental ability to identify the pitch and di-chords elements heard. Though this will change in the future, we usually consider the person with Absolute Pitch (AP), who can quickly name each of the 12 pitches by sound, to have the strongest musical ear. To a person with AP, the realm of pitches consists of 12 discreet elements; that's not a lot of elements, which explains why persons with AP have an indifference to their intuitively obtained 'gift'. Those of us without AP perceive a world of pitches filled with a seemingly infinite number of elements. (I continually must remind my students with relative pitch to remember that there are only 12 pitches in our musical system.)

Viewing a keyboard helps the average musician to grasp that, though there may be eighty-eight notes, there are only 12 different pitch classes.

An F is always found to be the white note immediately to the left of the lowest of the three black note grouping. There it is found in each and every octave. This obvious fact is not so

obvious to a string player who applies a different fingering pattern to a pitch in a different octave; a violinist finds a G as the open bottom string; the G an octave higher may be played with the 3rd finger, first position, on the D string, another being played by the lowered 2nd finger on the highest string. As a result of this discrepancy between the pitches on each of the four or more different strings, the musician may miss completely the logical pattern of octaves so apparent on the keyboard. Imagining the keyboard allows the musician to make more sense of the strings and positions.

Similarly, wind instrumentalists often have a peculiar sense of the relationship of pitches/notes as a result of the idiosyncratic fingering patterns. Trombonists, among the brass instrumentalists, have the strongest sense of pitch relationships due to the necessity of mastering the slide. In mastering the slide, trombonists learn to gauge subtle differences in spatial distances between pitches, thus giving them a skill similar to that of string players who must master shifts of fingering position by ear/feel. The greatest disadvantage of all non-keyboard instruments is that the player can visualize mostly only one line of music at a time.

Our capacity to encode and decode the musical language is greatly enhanced by visualizing a piano, organ or harpsichord keyboard.

The Keyboard as the Musician's Tool

Having a good ear in music depends greatly upon our ability to accurately and fluently calculate the distance between heard pitches – in other words, to correctly identify and track musical intervals. Over the past 35 years, I have specialized in teaching practical musicianship and have developed a method for teaching my students how to identify musical intervals by ear at the speed of music. The method grew out of the normal beginning students' total initial inability to correctly mentally calculate musical intervals on the musical staff and keyboard. The best ear in the world will be of little effect indeed without this skill. I like to say that learning to identify intervals by ear would be like creating a chalice to contain a really fine wine. That is, knowing how to correctly calculate distances between notes on the keyboard and the Musical staff is like creating a golden chalice to contain the wine. If your chalice is riddled with holes, the wine cannot be contained and drips uselessly through the holes, falling to the ground.

Among the most crucial skills needed for musicians is the ability to accurately and fluently comprehend distances between pitches (what I like to call TRACKING), because it is this skill that the mind employs unconsciously to recognize any familiar melody when it has been transposed. To demonstrate this, all you need to do is to sing a song you have learned by ear, never having read it on a musical staff. You may have no idea of the pitch on which to begin the tune, but this does not matter because you can sing the tune starting on any pitch as long as you correctly retrace the pitch distance from the first pitch to the second to the third and eventually to the final pitch of the melody. How accurately you are able to correctly retrace the pitch distance between adjacent pitches in the tune determines both how in tune you seem to be from the

standpoint of a listening bystander and the more likely it is that you will end in exactly the same spot at the end of the melody. What is astonishing is that you have created the "pitch space" map of the tune neither knowing that you were doing this nor how. The challenge to all of us as musicians is for our conscious mind to be able to keep up with our ear, not the other way around!

Developing conscious and deliberate music tracking skills using various methodologies that I have developed will help speed up your ability to keep up with, or 'track,' what your ear hears. You do this by using your other sensory modalities - your visual and kinesthetic ones - to match pitch space on the musical keyboard and staff - the musical maps.

In the course of doing these exercises, you may find that you are sometimes mentally disoriented. If this occurs, it is important for you to realize that your feeling of disorientation is caused by 'visiting' new and different places in your brain, those that coordinate aural, verbal, visual, spatial and kinesthetic modalities. Be assured, as you quickly become familiar with these new ways of being, in these new places in the brain, you need to relax and trust your senses. Remember, your brain has been tracking pitch space without your conscious awareness since the time you first heard music. Your brain knows what it is doing, so trust it.

Creating the Pitch Space Map

Years ago, it occurred to me that musical training entails the ability to exactly and precisely follow match the pitches we hear while moving our index finger on a single stringed, fretted instrument, on which the note names for each pitch are written on the fingerboard. Having taught already for at least 15 years, and having read numerous musical treatises before this, it occurred to me that this was precisely the instrument that Pythagoras must have devised, called the monochord, around 500 B.C.E. to calculate pitch spaces in music.

This brings me to the modern musical keyboard. The keyboard is a useful tool in calculating pitch space because:

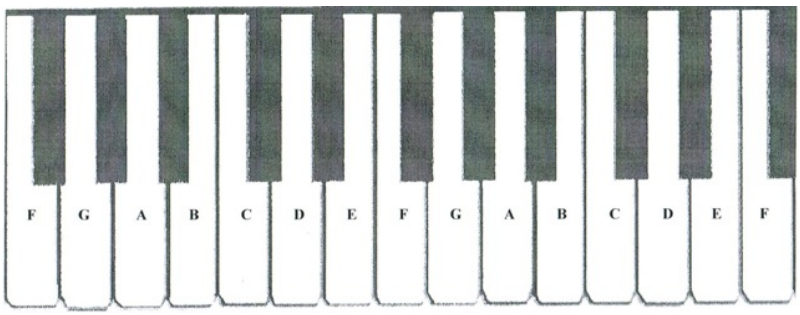
- There are 12 equally-spaced inches in a foot ruler, there are 12 equally-spaced pitches to the octave
- The same 12-note pattern of black and white keys is repeated 7 and a half times to create the 88 keys found on most modern music keyboards
- The 7 white notes together form to the 'diatonic' scale
- The 5 black keys together form to the 'pentatonic' scale
- It is possible to measure even pitches falling somewhere between those indicated on the keyboard in the same way that we can measure objects that are between the inch markers on a ruler
- The entire scope of pitches used in music can be found within the span of the keyboard

- The keyboard provides a visual pitch space field that allows us to keep track of one or many different pitch tracks simultaneously, which is not possible using other instruments
- Exceptional musicians visualize the keyboard almost all the time
- Unlike other instruments, it allows us to employ the visual, kinesthetic, and audio modalities simultaneously, ensuring cognitive strength and integrity.
- Anyone can become fluent at using the keyboard as a cognitive tool

I have provided two versions of a portion of the musical keyboard below, one with accompanying diatonic letters and one with diatonic solemnization (also called solfege) syllables. Both versions are used to define the notes in music conservatories throughout the world. You can learn either version or better still, learn both. To secure your memory, draw the keyboard version you have selected, including the note names, using a pencil or pen in your favorite color.

Drawing the keyboard will help you fix it in your imagination/memory more than passively looking at its image because you will use two rather than only one cognitive modality; to draw, you use your eye (visual modality) to guide your hand (kinesthetic modality) as you draw, creating a stronger cognitive bond or cognitive web in your mind.

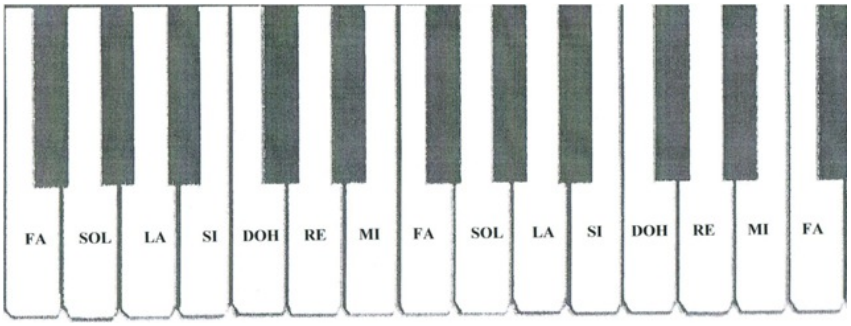
It is important that your drawing closely resemble the actual keyboard in both size and proportion to the one provided so that, when you play on an actual keyboard, you mind can easily adapt to this reality; if your keyboard is distorted, it will create a poor ruler for you to use in calculating pitch space, will be difficult to read and may even make you feel internally agitated or uncomfortable.



Use only one basic color to draw the keyboard and note names in order to keep the image simple and straightforward; using many colors causes the mind to become fixated on the colors rather than on the more important note pattern of the keyboard and note names. If you wish to use more than one color, color the 'white' notes a very pale version of the color for the 'black' notes, perhaps coloring the white notes a watery, pale lavender and the black notes a dark, deep violet.

In writing the note names, I suggest that you start with the note C/doh, then draw its lower neighbor B/si, then draw its upper neighbor D/re, then draw B/si's lower neighbor A/la and D/re's

upper neighbor E/mi, then A/la's lower neighbor G/sol then E/mi's upper neighbor F/fa, in a fanning pattern. With the addition of each note name, imagine that same note name applied in higher and lower octaves, with this name-tag theoretically applied to that note in each octave; to infinity! With the addition of each subsequent note, do the same while continuing to visualize the name-tag already assigned. The goal will be to see each white note with its name-tag AT ALL TIMES, for the rest of your life.



Having the name-tag written on each note on the keyboard, even the black notes, eventually allows the brain to access that name instantly, perceiving it in the context of all the other notes and their names. Caution: if you do not see the note names at all times, you may point to the note but unable to evoke its name without performing a 'double-click' in the mind. Imagine how slowly you would write using your computer if you had to double-click before you could type each letter in a document. It would totally impede fluency and quickly discourage you from writing with the computer entirely. Or, on a more positive side, imagine how nice it is to be at meetings where everyone is wearing a name-tag; you do not need to scratch your head to remember who is who, because their name is right in front of your eyes, allowing you to better pay attention to your conversation. So, keep the name-tags on the keys at all times. It can be beneficial to draw the keyboard several times until you have it embedded in your memory.

Additionally beneficial is to take a few moments to recall the image of the keyboard -- in every detail -- several times during the day for three or four days in a row, until the memory is firmly established. This can be done in your car when stopped at a red light, during a commercial break or whenever you have a moment to reflect.

Developing an imagination of the musical keyboard can be an adventure and can even be fun at times. In Richard Bandler's "Using Your Brain for a Change," he discusses how the images we hold in our mind greatly impact how we behave and how we feel, see and hear in different situations. For instance, he discusses how individuals with phobias perceive the object of their fears as being close up, shaky, distorted, contorted, unfocused, blurry or generally unpleasant, though the actual object may actually appear small, regular and still. Thus, our mind has a powerful capacity to shape our experiences, making it crucial for us - as musicians - to create an attractive, reliable, clear, smooth, warm and delightful version of the keyboard as imaginable.

Some people have suggested having the letters or the names of the notes embossed somehow on to the keyboard, like braille, so that they can be felt as much as seen. For those who are strongly kinesthetic, and who enjoy tactile sensations, this could be an excellent strategy and would increase memory retention for anyone.

Troubleshooting

If you have trouble establishing the image of the keyboard, imagine your hand (mouse cursor) pointing to some note, any note. Strangely, by initiating the motion of your hand in your imagination, you will not only be able to see the note but you will also be able to see the image of the keyboard. I have found that, without exception, the visual image of the keyboard is stimulated by kinesthetic motion and, more specifically, the act of pointing. Have you ever tried to use your computer when your mouse cursor was malfunctioning or not functioning at all? The cursor - the pointer, whether a mouse or a finger, acts as a focal point of attention for the mind, creating a direction and intention. Without the pointer, the mind is without focus and intention, but with the pointer the mind is alive with a sense of purpose and direction so that, when the pointer is operating, the mind's hands are no longer tied behind its back. (Notice that infants point at objects of focus much of the time. As they mature, they learn that this physical action is unnecessary and may even be considered rude in some cultures. Nonetheless, I maintain that the pointing still goes on in the imagination.)

About your imagination of your hand as a musical mouse cursor, always imagine the hand as completely relaxed, with no fingers extended, stretched or tense. The hand, even in the imagination, must be slightly cupped, so that the fingers and thumbs arch gently towards the palm, with all five fingertip-pads - even the side of the thumb - resting softly on the surface of the imagined keyboard 'pad'. You will not need to depress a key in order to activate it because there is no action to 'throw' as on a piano, harpsichord, organ, or electronic keyboard. Imagine that the index finger is the activation point of the pointing device.

If you encounter anxiety in recalling the image of the keyboard, carefully observe how you are imagining it when this occurs. Does your mind perceive darkness, vagueness, blurriness, roughness, harshness or over-brightness? Is the keyboard shifting or undulating?

Is it rising up or getting smaller on the edges? Does it appear way too close or too far away? If so, imagine that you possess a dial that you can use to adjust the image, forming the image to the point that it appears pleasant to you. For example, if the image is dark, imaginatively adjust the dial until it becomes even too bright then turn the dial back to the position that it looks and feels comfortable in your mind's eye. If the image is too far away or too close, turn the dial to where it feels comfortable, to where you can see several octaves and still see the note names clearly. If the letters for the note names appear jiggly while the keys themselves are stable, turn the dial so that the note names appear and feel stable. If the keys feel rough and sharp or cold or hot, adjust the dial until they feel pleasant and even delightful to your mental touch. As you find the right settings in your mind's eye, imagine that you can mentally set or lock these settings so that they will be in place every time you visualize/feel the keyboard. If, in the future, you wish to change these settings, you can.

The importance of easily visualizing the keyboard cannot be overemphasized if you wish to become fluent in tracking the distances between pitches.

You will become more and more at ease with this tool as you employ it in every imaginable context. For example, while listening to music, imagine using your index finger to trace the melody.

What the Keyboard Shows Us

For a musician to conceptualize di-chords/intervals, it is critical to visualize the musical keyboard. The keyboard aids the musician in conceptualizing pitch space, acting in much the same way as a ruler aids the architect.

The musical code is the way in which musical sounds are written for purposes of communication. In the same way that the alphabet is a language code, the system of notes as measured on the musical staff is a musical code. If you don't know the alphabet, you will be unable to read in any language employing these symbols. Similarly, if you don't know the organizational system of the staff, you will be unable to read the thoughts of the composers who employ that system.

The keyboard allows us to understand a great deal about music:

- We can see patterns of notes such as the pattern of two and three black note groupings and the logical pattern of white notes between, repeated in every octave.
- We can see that there are only twelve basic pitches to the octave –the same number as months in a year.
- The 88 note keyboard defines the entire range of pitches employed in a large string and/or wind ensemble.
- Though the same pitch class may appear in different locations on a staff, the pitch on the keyboard is fixed when it is in tune.
- By visualizing the note name of each note, we can effortlessly identify any note we may encounter in any octave, recognizing that it is essentially the same in any octave.
- We can see that there are only 11 basic di-chords, determined by the number of half-steps between the bottom pitch and top pitch.
- We are capable of keeping track of several different voices or parts/voices going on simultaneously; something not possible on most other single-line instruments.

In Review

1. Draw a keyboard of your own, placing the note names, either in letters or solfege syllables, on each white key. To improve your visual memory, choose a colored pencil or crayon to write each of the note names. Cognitive research has repeatedly demonstrated that we recall objects in color better than in black-and-white. Note that the D key and the G# key are central points when making your drawing.

2. Using your index finger as your 'mouse cursor', move your finger just under each note name of the keyboard you have drawn, sliding the finger across the surface of the page, naming each note as your finger passes under its name. Always keep your finger tips in contact with page, relaxing and elongating your other fingers as you horizontally glide from one to the next. Just go wherever you feel like going, as long as you always glide on the surface to get to the next note. When you go to a note several steps away, you still pass through the pitch space of the notes in between. Become increasingly aware of how many notes you pass over to get to another note further away; are there two, three, four or more notes between? If so, see what they are.

3. Now, without actually looking at your keyboard drawing, see it in your imagination. You will see it better if you imagine using your index finger as the mouse since the finger seems to activate visual memory for many of us. If the color or details are weak, relax and imagine a color/contrast dial button, like the one on your television, which you can adjust to the level that you want. I have often found that my male students do not imagine in color. Don't worry at all about the color. What you need to be able to do is to see the names on the keys as your imaginary finger passes under the name. Start by seeing only the four notes above and including C/Doh (C/Doh, D/Re, E/Mi, F/Fa) then work on seeing the four notes below Doh (C/Doh, B/Si, A/La, G/Sol). Remember, there are only seven.

4. Become increasingly aware, as you practice moving beyond simple neighbors, of the notes and the number of notes between the notes further apart as you glide your imagined finger across your imagined keyboard.

5. Build this skill to fluency.