ADDENDUM

Updated Aug. 25, 2014

This Addendum contains material that will be included in the next edition of **Fundamentals of Piano Practice** if, and when, it is written. Any ideas/comments would be appreciated, as this site is still under construction. Please email me your comments.

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Errata

P. 54: 3rd paragraph, first two sentences. ". . . .soft pedal correctly. If the pedal . . ." should be " . . . damper pedal correctly (effect is negligibly small for the soft pedal). If the damper pedal . . . .."

P. 58: holding the octave 35; the 35 should be 31

P. 88: shear size should be sheer size, 1st paragraph.

P. 89: statements to the effect that "the thumb should be played like any other finger" is not strictly correct because the thumb is played mostly by forearm rotation, see section 5 below.

P. 96: A(-1) should be A(0), 3rd paragraph.

P. 125 "automation" should be "automatic", 3rd paragraph.

P. 172: "the sound velocity in amniotic fluid is different from that in air with a resultant change in apparent frequency" is wrong. The frequency does not change. Thus exposing babies to music before birth may help them to develop musically, acquire absolute pitch or develop the concept of rhythm. There is now scientific evidence that many babies of egg laying species communicate with their parents while still in the egg, before hatching.

Introduction

This addendum is an example of what I mean by "this book is not a finished product, it is just the beginning" (in back cover of book). The future of piano pedagogy has unlimited potential and how far it advances depends only on our efforts, and the methods we use, to study how to study. See section 7 on what is meant by "unlimited potential". This book is not the only pioneer advancing piano teaching methods; there are now many web sites and teachers who are applying modern education methods to piano teaching with similar results (see Book Reviews, bottom) although this book is the most comprehensive at this time. This phenomenon is a consequence of the advancement of education in general, which tells us that higher education outside of music will become increasingly helpful and necessary to future pianists and especially piano teachers.

The most important musical/biological lesson of this book is that music is a particularly useful device for developing the human brain (section 1 below), and that teachers can control this development. In the past, music pedagogy had too often ignored (or was unaware of) this possibility and ascribed the students' progress to talent. Some details of how to practice for speed and to teach are given below, sections 3, 4, 5, & 8.

The most important practical lesson of this book is project management (see item 9): how to manage a project from beginning to end. It is important because the same principles apply not only to learning other musical instruments, but also to everyday life, school, and work. Historical accounts indicate that Alexander the Great used similar methods to defeat armies much larger than his.

This book also contains several new discoveries and teaching methods that cannot be found anywhere else in the literature; the major ones are listed in section 10.

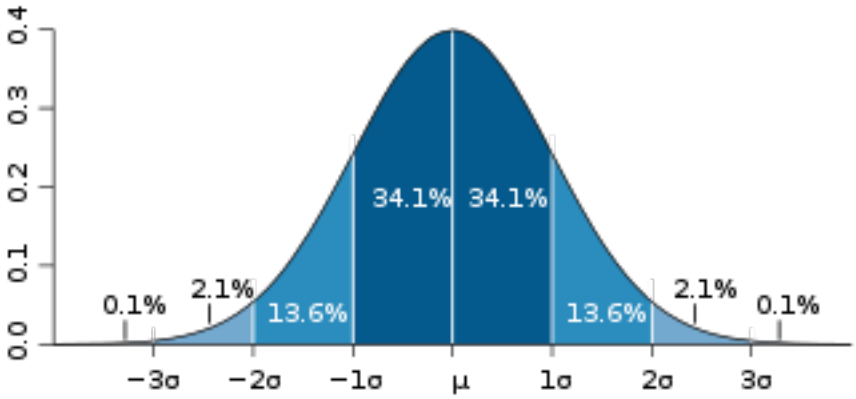
Section 11 is my attempt at creating a "top → down" theory of music. My opinion is that theories are meaningless unless they serve some useful functions; thus the usefulness of this theory is illustrated

using the Beethoven sonatas, suggesting that perhaps, Beethoven used some similar lines of thought.

1. Creating Geniuses

This book deals with the human brain and how to use it to produce music. ***The greatest discovery of this book is that we have identified the procedures for creating geniuses.*** To this end, we must define what a genius is. Prodigy, talent, and genius are basically synonymous here. We can distinguish at least two classes of geniuses: Class I consists of those who have acquired so much musical knowledge and skill that they can perform incredible musical feats; Class II consists of those with inborn musical minds, such that with little musical training, they can perform those same incredible musical feats. Discussions on whether geniuses are born or created are presented on pages 16 and 202 of the book. Until the 1900s, the assumption was that they were born (Class II). However, there has been a growing realization that they can be created (P. 16, Olsen). This is somewhat analogous to the now discredited belief that some are born with absolute pitch – nobody is born with it; everyone must learn it. In fact there is ample evidence that Class I geniuses exist, and that most of those we consider to be geniuses are of the Class I type. The number of Class II geniuses is extremely small and most of them have handicaps that prevent their geniuses from fully developing. ***We therefore conclude that the majority of famous geniuses are Class I -- they were created.***

There is little doubt that, given a group of equally diligent students with similar backgrounds, there will be those who will excel and those who will fail. Similarly, if you teach absolute pitch to a group of youngsters, some will learn more quickly than others. Obviously the human population has a *distribution* of brain powers from very poor to very good, and such a distribution also exists for musicality. Those with musical brains above a certain point in this distribution are labeled as geniuses. Let's use a Gaussian distribution for this discussion, as this distribution matches a surprisingly large number of actual distributions in the real world and should be a good representation of musicians:



Gaussian Distribution

The horizontal axis represents intelligence, or learning rate, and the vertical axis is the proportion of students with that intelligence. The center is indicated by the letter “mu” and important points are indicated by 1 sigma, 2 sigma, etc. The area under the curve represents the number of students within that intelligence range. Most music students fall within the dark area around the middle (68.2%); the fast learners fall in the lighter areas to the right, and the slow learners are to the left. Let’s suppose that those we label as musical geniuses comprise 0.1% of the student population, as labeled on the far right. Now if a

terrific new teaching method were discovered so that every student improves, the entire curve will shift to the right, so that, for example, 2.1% of students perform as well as the previous 0.1% of geniuses, as labeled on the distribution. The number of geniuses has increased by a factor of 20! The astounding implication is that ***there is no evidence today that the distribution can't be pushed up so that 50% or more of the population can be raised to today's genius level with proper education and other means yet to be discovered, s***ee section 6 above (Scientific Method).

Thus knowledge can replace raw brain power. To see this, suppose we take an average 5th grader today and time-port him back to Egypt 8,000 years ago and suppose that he had written down everything he knows about math. He would have been recorded in history as the greatest mathematical genius of all time!

If this book, and emerging modern methods of teaching, are as revolutionary as the testimonials they have received indicate, there will be many more geniuses in the near future than there are now. This should apply not only to piano technique and performances, but also to music composition, originality, and inventiveness. ***Better teaching methods may result in many more Mozarts, Beethovens, and Chopins of the future. Good teaching methods can create geniuses!***

What are some of the elements of this genius-creating-procedure? For details, you will have to read the book because of the amount of knowledge needed to execute it. We can summarize here some of the prominent points:

(1) It is important to start young, when the brain is developing and adapting to its environment. Historically, the famous geniuses were created by their parents who were already musicians, sports figures, performers, etc., and knew how to teach their very young children.

(2) The teaching/learning methods must follow proper project management procedures. Without a structured plan, most projects will fail. For musicians, learning the piano is one of the best structured plans for learning project management. The most important elements in this plan are the practice methods, which include: Mental Play, Absolute Pitch, Memorization, Piano Technique, Music Listening and Training, Knowledge (college level education), etc., as outlined in this book.

(3) Experimentation and self reliance. You can not rely on some master teacher to make you into a genius; you must control your own development. Part of that control, nevertheless, is seeking out good teachers that can advance your musicality as well as interacting with a select group of musicians who understand "genius".

One way of measuring genius is the IQ (Intelligence Quotient). There are three levels at which learning piano can raise your IQ:

(1) You have an ***intrinsic IQ*** -- how good your brain is. This is the most difficult IQ to raise, but performing musical feats will exercise the brain in such a way that it works better, just as exercising will enlarge the muscles and increase your strength. One of the objectives of practicing mental play is to increase the mental stamina and to train the brain to work all the time without requiring periods of rest and inactivity. This will increase blood flow to the brain and increasing the blood supply, by enlarging the blood vessels and making them more elastic, or even increasing the amount of blood in the body.

(2) Your ***effective IQ*** -- how well you use the brain power that you have. A person who uses the brain more effectively will appear smarter than one with the same brain that does not know how to use it. This difference can be made unmistakably obvious for piano because pianists can do things on the piano that non-pianists can absolutely not do. Thus it is easy for pianists to raise their effective IQ to much higher levels than their intrinsic IQ. In fact, most of this book is about methods for raising the effective IQ: efficient practice methods such as using parallel sets to quickly speed up play are extremely effective.

(3) ***Perceived IQ*** -- how others judge your IQ. Mozart, Beethoven, etc., have some of the highest perceived IQs. A unique feature of the perceived IQ is that it can be raised far above even the effective IQ. In a sense, the intrinsic and effective IQs are real -- you should be able to devise methods for measuring them. Perceived IQ is purely "in the eyes of the beholder"; it can be raised to any level by using methods or tricks just as magicians do, to perform "miracles". What is surprising is that all accomplished musicians do this routinely, whether they do it consciously or not. In a way, musicians are magicians with their own

set of tricks. Using music as an algorithm to memorize 5 hours of repertoire is such a trick. Mozart used mental play to read sentences backwards. Combining mental play and Absolute Pitch is another.

Every pianist should be aware of these different IQs and cultivate them -- this is the fastest way to raise them as high as possible. The result is what everybody calls a genius. Here is a partial list of why musicians tend to be smarter than others: (1) learning music is all about improving the brain more than the fingers. (2) musicians must learn how to memorize. (3) musicians learn project management and become skilled at accomplishing tasks. (4) musician brains must know how to handle high speed (P. 36). (5) in playing music, musicians are constantly conversing with some of the greatest geniuses that ever lived, and these conversations rub off on the musician, such as genius tricks and learning tricks. (6) musicians have more success the younger they start, because their brains start their training earlier, when the brains are more pliable, long before non-musicians are exposed to such complex concepts and long before the parents can supply such material. (7) music involves mathematical, etc., complex brain responses to (mainly audio) inputs (harmony, chord progressions, melodic lines, etc.), which help to develop brain power. (8) producing music requires constant, continuous concentration, which increases blood flow to the brain and enhances brain stamina. (9) musicians must sense exquisitely minute differences in pitch, volume, timing, etc., of sounds and control the fingers and body to execute them; these increased sensitivities require more developed brains. (10) music is a language, and learning any new language gives you added advantages in learning new logic/concepts and ways to communicate. Every new language gives you new capabilities that the other languages did not have; music is no exception, and is most effective because it is a universal language. Etc.

2. MOZART'S FORMULA (see P. 206)

I have located the music professor who lectured on Mozart's formula in December of 1977 at a Bell Laboratories Research Colloquium, at Murray Hill, NJ, that is mentioned on P. 206. He is Professor Robert Levin of Harvard who talked about "Mozart's Fingerprints: A Statistical Analysis of his Concertos" concerning a "specific and sophisticated hierarchy of musical motives that underlies the Mozart concerto form" (Levin). I have to thank Brian Kernighan (co-author of "The C Programming Language") for locating the records to this lecture which was still stored in his computer after more than 30 years. After several email exchanges with Prof. Levin, I have arrived at the following account of the events that led to my analysis of Mozart's compositional microstructure discussed on P. 206; for more detailed analysis of Mozart's Sonata Op. 11 (K300), see Scoggin, P. 224.

Prof. Levin did not discuss the microstructure of Mozart's compositions that I discuss in my book but instead lectured on a hierarchy of musical motives that were so specific as to be potentially useful for authenticating Mozart's compositions. On the one hand, I was disappointed with the lecture because of my ignorance of musical motives; I was hoping to hear that there was a more easily understandable musical structure. On the other hand, Prof. Levin awakened my awareness of *structure* in music. I am a crystallographer, who deals with the atomic structure of matter, so this awareness led me to examine Mozart's music to search for any structure simple enough for me to recognize.

As a crystallographer, I am accustomed to discerning the repetitive microstructure of matter that determine the properties of each material. If you take just one atom, carbon, you can change the atomic microstructure and get anything from hard, brilliant diamonds to lubricating graphite to light weight golf club shafts and even buckyballs with amazing properties and uses. It was no surprise, therefore, that the repetitive structure of Mozart's music jumped out at me as soon as I examined it from a structural point of view. For those not accustomed to dealing with microstructure, this repetitive structure in music is not easily recognizable because it appears to have no obvious relevance to the melodic progression. I have tested this recognition with my musical colleagues and it took most of them a while to recognize this

structure as a part of the music. This lack of recognition has historically impeded the pursuit of this microstructure because, for musicians, it seems so trivially simple that it does not deserve attention. One of the best examples of this is the slow movement of Mozart's Piano Concerto No. 21, which is generally considered to be non-repetitive because the incredible emotional content hides the repetitions.

Repetition, of course, is key to most music. The time signature governs the entire piece, so the rhythm is 100% repetitive. In rap music, both the rhythm and melody are repetitive, with mainly the lyrics changing. Mozart's music uses mostly a single repetition (2 units in a row). Bach uses repetitions extensively, but is not mainly confined to a single type like Mozart's. In the Inventions, Bach uses 2 repetitions most frequently (3 units in a row – see Invention #8). Repetitions on larger scales are also important, as Ruth Slenczynska wrote: "play all repeats marked by the composer" (Slenczynska – P. 49) - instructions from a seasoned pianist, because the repetitions are there to elicit a specific reaction from the audience. Clearly, musicians must develop a deep understanding of repetitions and how to use them.

These types of repetitive structures are well known among composers, and articles on music analysis and composition are starting to discuss them in greater detail (Brandt). Even the pitch sets and symmetries similar to those discussed on P. 209 (in Beethoven and Group Theory) have appeared in the literature (Bernard, Solomon).

References

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* **Scoggin, Nancy**, Barron's Education Series, NY, 2010.

* **Slenczynska, Ruth**, "Music at your fingertips", Cornerstone Library, NY, 1976.

Solomon, Larry: "Bach's Chaconne in D minor for solo violin" see Variation Techniques

* for links to Amazon Books, click on *

3. Memorizing **(how to, importance of sleep)**

We discussed methods for memorizing in section III.6, and we saw that there are at least five types of memory: hand memory, photographic memory, music memory, keyboard memory, and theoretical memory. The natural question that arises is, "which is the best one to learn?"

The answer is "***ALL of them!***" Wouldn't that be a waste of time that can be better spent practicing your repertoire? Let's see why we ***need*** to learn them all.

(1) Memory is associative; therefore, in order to truly memorize a composition, the use of all of the memory methods is needed to maximize the associations. That is, as musicians, we must ask ourselves, do I want perfect memory, or will I be satisfied with just partial memory? Do I want to be a true professional concert pianist, or will I be satisfied with being an amateur pianist?

(2) To a professional pianist, each memory method has its particular use. **Hand memory** makes it easier to play. Without it, the brain would have to send every instruction to every muscle over the entire

body to play even simple notes – without hand memory, the brain would be totally exhausted by the time you play one page of music. **Photographic memory** is needed for composing, and testing your memory away from the piano. It is the link between the music you play and the original notes from which you learned the music. It contains the original instructions from the composer to the performer. It is an essential component of Mental Play. **Music memory** is part of the basic algorithm that allows us to memorize an almost infinite repertoire. It is the reason why we learn piano! No one performs without music memory. **Keyboard memory** is most useful when you are learning a new piece. Therefore, it is the first memory method that we consciously practice. **Theoretical memory** is useful for analyzing the composition and understanding why certain notes are there, and for automatically memorizing large chunks of the composition without the use of photographic or keyboard memory. All of the memory methods can be, and should be used for mental play. These are just the major uses; there are many more. We have come to the realization that each memory method deals with different properties of the composition, so that if we are to totally memorize it, we need all of the memory methods.

(3) In fact, it is a waste of time not to learn them all because if you learn one of them well, you have already learned large parts of most of the others and can learn them more completely in a short time. Moreover, you gain all the associated benefits with this small investment of time. If you don't learn all of them, you are effectively throwing away those very resources that distinguish a genius from an amateur. These points (1) - (3) lead naturally to the question, what is the best procedure for learning all of them?

During practice, we learn hand memory automatically, so we do not need to practice it consciously. But we must know what it is, and encourage its growth. We also saw that keyboard memory is the first memory to practice because it is most useful when first learning a new piece. Because you use the music notes to learn the composition, photographic memory can be practiced at this time and then later, during mental play. Music memory is also automatic, especially if you practice musically. Theoretical memory is the only one that is different from person to person because it depends on how much theory you know. The degree to which you can apply theoretical memory depends on your theory education. However, even without advanced theory education, anyone can make structural analyses of the music, which can serve as a theoretical memory.

Surprise! We have come to the realization that learning all of the memory methods follows *naturally* from the process of memorizing a composition. This is one of the reasons why practicing a passage over and over doesn't have to be boring, because there is so much work to do.

Proper **sleep** at night on the day of the memorizing event is apparently important for permanent memory; there are many reports on this now -- just search "memory and sleep" on the internet. As described earlier (P. 108), it takes about 5 minutes for the brain to transfer short term memory to long term memory. However, there is another "memory consolidation" process that proceeds during sleep, which makes sense because most growth processes occur during sleep (P. 42), and building permanent memory probably involves some types of growth processes in the brain. Thus memory has a PPI component (Post Practice Improvement), just like technique development, so that we can take advantage of our knowledge of PPI (P. 41) to improve memory. The quality of sleep is especially important for memory PPI.

4. Practice Methods

4.1 Importance of Parallel Set Exercise #1

Most pianists do not fully realize the importance of Ex. #1 in the Parallel Set (PS) exercises (P. 128). This happens because Ex. #1 does not look like a PS exercise, it is just an exercise in repetitions. However, Ex. #1 is the foundation of all PS exercises and you will not progress as rapidly without first making sure that it is satisfactorily completed. This is because it teaches the larger members of the playing mechanism

the correct motions. It separates out the motions of the larger members (arms, hands, body, etc.) from the smaller motions of the individual fingers. In fact, most students should initially spend more time with Ex. #1 than the actual PS finger exercises that necessitated its use, for the most difficult techniques. The good news is that, because repetition is mostly a single skill, once you acquire it, it will apply to all PS exercises. This is more reason why starting students should invest a lot of effort in practicing Exercise #1.

An excellent example is the LH octave tremolo in the Allegro (following the Grave) in Beethoven's Pathetique Sonata, first movement. In order to speed up this tremolo, you must practice the 51 PS. ***However, you must start by practicing repeated 51 octaves (Ex. #1).*** This point cannot be over-emphasized. Once this repeated octaves becomes satisfactory (four quads at the desired speed or faster, relaxed, without fatigue), a quick way to increase speed is to play a fast double octave, 51,51, then immediate follow with two 51,51 PSs; ie, replace the octaves with PSs. When these become satisfactory, increase to three, then four 51 PSs, etc. Then follow the instructions on P. 77. Of course, PS is not the way you play – it is just an intermediate step that quickly gets you up to speed so that you learn the necessary hand positions, motions, etc. In the final motion, the tremolo is played almost entirely with forearm rotation, not finger motion; thus, in addition to PSs, you need to know the necessary motions.

Ex. #1 illustrates the theory of why PSs work: you end up playing faster by *slowing down*! In the above example, you play the 51 PS in one down motion, while playing two notes so that the required motions with PSs are at half the speed. You effectively slow down even more as you use larger PSs of three, four, etc., notes. This simplification then allows you to teach the brain these faster speeds (using slower motions!) as well as to move fingers in parallel; i.e., to play groups of notes in one hand motion. These concepts must be understood in order to achieve maximum benefits from PSs. Once the brain is acclimated to the higher speeds, and the simpler motions are established, you are ready to add the final necessary elements such as forearm rotation, glissando motion, etc.

Acquiring new techniques and increasing speed are major objectives of PSs; below, we summarize some basic principles for attaining these goals.

4.2 Acquiring Technique, Speed, Quickly

Technique and speed are the main objectives of Parallel Sets (PSs), and their acquisition methods follow some surprisingly simple principles. Students/teachers unfamiliar with these principles follow the "Practice, practice, practice!" principle and use exercises (Hanon, Czerny, etc.) extensively. Such approaches can "work" because the hand-brain combination is an incredible system that can sometimes figure out, accidentally, how to achieve "impossible" feats, after enough repetitions. This had led to a widely held misconception that repetition is the only way to acquire technique. In reality, it is a most inefficient solution to the problem. This lack of knowledge also led to the belief that only a few "talented" students could become pianists. We now know that there are methods to teach what was previously thought of as talent.

4.2.1 Practice Routine, Sleep, Touch, Color, Slow Practice, Quiet Fingers, Chopin's Fantaisie Impromptu, Bench Height

The fact that concert pianists can play "impossible" passages is an existence proof that such techniques can be acquired – we *know* that it *can* be done. The next step in solving this technique problem is to figure out the fastest way to get there. The best known methods are:

(1) Simplify! Practice HS and memorize. Learn to experiment and find new motions, hand positions, etc., that is the basis of what we call "technique". Without discovering these motions (or being taught by teachers who know them), technique will never improve.

(2) Shorten difficult practice segments so that they become trivially simple to play.

(3) Most subsequence practice methods fall under the umbrella of PS exercises; these are not exercises in the conventional (Hanon) sense, but are diagnostic tools for discovering technical weaknesses and then using them for correcting those specific weaknesses.

(4) Adjust practice speeds so as to learn relaxation, avoid speed walls, and increase accuracy (e. g., critical uses of slow play P. 43).

(5) Make use of factors such as Post Practice Improvement, Mental Play, Musicality, practicing softly and without pedal (initially).

(6) Most importantly, speed is gained mainly by playing your old pieces faster, not by trying to speed up new pieces you still can't play satisfactorily.

(1) - (5) This optimized practice method is **knowledge based**. It is based on specific skills and motions, such as forearm rotation (below), cartwheel motion (P. 98), Thumb Over (P. 89), flat finger positions, outlining, relaxation, quiet hands, Mental Play, etc. In addition, you need **learning tricks**, such as HS practice, parallel sets, outlining, Post Practice Improvement, and associative memorizing (P. 122). Knowledge tells us how to **simplify**, which is the opposite of the old school of piano teaching, which was based on repeating the most difficult material in order to become accomplished pianists. Of course, you must be able to play difficult material; but in order to acquire such technique, you don't just repeat them, you must learn how to simplify them. All difficult technique should be acquired HS. As you increase HS speed, you may notice that your hand suddenly shifts into a new mode of play; such modes are more easily discovered using parallel sets, **experimenting** with new hand motions, etc. These new modes that enable better, faster play are what we call "technique". They are analogous to a horse changing from canter to gallop as it increases speed.

Most practice should be conducted by **playing softly** because:

(a) that requires more direct control from the brain, and is less dependent on hand memory – we need to train the brain, not develop automated reflex habits.

(b) it allows the experimentations into improving the **touch** and bringing out the **color** of the music. Touch is very dependent on each individual and difficult to change; you must listen to numerous recordings from different pianists and compare them to recordings of your own play. The idea is not that you need to imitate someone else's touch, but to eliminate undesirable aspects of yours. **What is color?** It is a unique musical quality of a particular piece of music, a composer, or a Well tempered scale, created by the sum total effect of all the elements in a composition. It is frequently discussed, but specific colors have never been described in words (except for simple descriptions such as happy, sad, energetic, etc.) because the human languages are inadequate for defining the entire range of possible colors. This does not mean, however, that languages do not have color. A few aspects of color have been identified, such as key color (Bach), Chopin's special staccato, or elements of Debussy associated with nature and water. Color depends mostly on the composer, so you need to be able to recognize color in performances by concert pianists and to try to bring them out in your playing. Practicing too loud produces a harsh touch and erases most color; of course, color does not automatically disappear in passages played FF. Practicing for color is most easily conducted after you can play the piece at the correct speed.

(c) practicing softly increases your dynamic range. The ability to play PP is what makes your FF more effective.

(d) it allows practicing relaxation and extended, intense practice without strain or fatigue, and reduces the chances of erecting speed walls.

(e) it is all about technique – both pianists and the audience know that clear, soft play is the ultimate in technique. Thus it must be practiced as much as possible not only because it is so useful, but also because it is the fastest way to develop better technique and musical sensitivity.

(f) this is the best way to practice intensely, yet avoid injury. Once you suffer injury by practicing too loud and over-stressing the playing mechanism, you will probably never completely recover from it – it

is not worth taking such a risk, especially because there is nothing to gain from it.

When practicing for speed, it is critically important to end every practice with **slow play.** But how slow is slow? It is generally best to maintain the motions necessary at high speed when practicing slowly, which means that you cannot arbitrarily slow down to very slow speed, resulting in a completely different mode of play. Practicing too slowly has the obvious disadvantage that it wastes time. For most cases, just slowing to a comfortable speed at which you can play accurately and with more than enough control is adequate. But each pianist must experiment and find out which slow speed works best. Why is this last slow run-through so overwhelmingly important after you have practiced this same thing dozens of times? The reasons are not well understood, but those who use this rule experience such obvious benefits that, once they use it, they will never give it up. One obvious reason is the benefits of slowness itself. Another is the effect on post practice improvement; every run-through reinforces what was practiced and partly erases previously played material, including mistakes. Another is that slow play allows more relaxation.

There is a general tendency for more advanced pianists to use more slow practice. Why? Because they know all the benefits you can gain from slow practice, such as memory maintenance, the basic keystroke (P. 64), making sure that all the components of the jump are secure (P. 138), optimizing post practice improvement, expression and interpretation, etc. Thus a student arbitrarily practicing slowly for no particular reason other than having been taught that slow practice is good, is not accomplishing anything and possibly wasting time. This discussion on slow play teaches us that students must study the reasons why slow practice is beneficial and to pro-actively work for those benefits during slow practice.

We describe here a typical practice routine for speed. However, there really is no such thing as a typical routine; the best one is what you create at every practice that best solves your problems. However, the example below will give students a good idea of how to design one, but keeping in mind that, depending on what you want to accomplish, the best routine can be totally different.

Practice routine for speed: a typical practice routine for speed is now clear. Pick a short section to practice HS, for RH and LH. Start each one at slow speed, playing accurately. Incorporate all the necessary motions (flat finger, glissando motion, cartwheel, finger splits, etc. as needed) and practice methods (parallel sets, continuity rule, conjunctions, basic keystroke, jumps, etc.). **Gradually increase speed**; do not force your hands to play faster, but wait for the hands to *want* to go faster, and accelerate only to that maximum speed with which the hand is comfortable.

We now come to the most important rule in acquiring technique: *never practice anything wrong*. The most common cause of a lack of progress is practicing wrong movements which too often creates speed walls. This happens because of lack of knowledge about the correct motions or trying to play faster than you are capable of. It is now clear why using the **metronome** to gradually increase speed doesn't work; in fact, it is precisely the wrong thing to do. In fact, you may at times feel that you have to *slow down* in order to feel comfortable, depending on the condition of your hand (fatigued, picked up a bad habit, etc.). The metronome is almost never at exactly the fastest speed at which your hand is comfortable, and trying to keep up with the metronome distracts you from experimenting with different hand motions. Even if the metronome accidentally hits the correct speed, you don't need it anyway, because the hand will tell you what that speed is. Experienced users of the metronome know that you can't accelerate too fast, so they tend to accelerate too slowly, which might work, but wastes time. Not only that, but the "comfortable speed" depends on which hand motion you use and how well you can use each one, so that the actual speed needed cannot be set to a metronome. It is now also obvious that practicing too fast for too long is a bad idea; it is necessary to speed up to experiment with new motions, but keep that to the barest minimum for accomplishing your objectives, then reduce speed and practice with accuracy.

After some practice with this "maximum comfortable speed", you will generally find that you need to adopt some new motions, such as quiet hands or glissando motion, for such speeds. Now slow down and start another acceleration routine all over again, this time incorporating the new motions at slower speed and increasing relaxation and accuracy. This return to slower speed is used to set a firm foundation for the faster speeds later on. Therefore, there is lots of work to do at these slow speeds; the more experienced you

are, the more work you will know to do, such as improving your **"touch"**. Listen carefully to others playing (including students and teachers, not only concert pianists), and you will hear a whole range of touch; compare them to yours and see if yours can be improved; you might notice that many teachers do not necessarily have good touch. Most of the work on improving the touch is initially done **without the pedal**. Touch should be practiced at all speeds, unlike color which is usually difficult to bring out a slower speeds.

Then comes a surprise! The above routine (ramping up speed) is just for the beginning. When you get close to final speed, one option is to reverse the procedure: **ramping down the speed**! Using HS practice, when you switch hands, the rested hand is ready to go; therefore, this is the time when you can play at maximum speed with minimum fatigue and stress. The trick in this procedure is to ramp down the speed so that you practice accuracy, build the correct motions/muscles/nerves, and prevent building speed walls or FDP (fast play degradation, P. 61) by using the slower play but keeping the new hand positions, motions, etc., used at maximum speed. After several tries at maximum speed, choose a maximum slower speed at which you can play as accurately as you want – this is the key step in this procedure. As this ramping down procedure is repeated, the maximum comfortable speed should gradually increase. Thus the best practice routine is often counter-intuitive: we are all familiar with the ramping up procedure, but the correct one at advanced levels turns out to be a ramping down procedure.

If you have a **digital (electronic) piano**, acquire new technique using the **lightest key weight** setting. Once your technique is satisfactory, practice at the heaviest setting so as to be able to perform on mechanical pianos because, in general, they have a heavier feel than digitals. Thus there is a rationale for the generally lighter weight of digitals – the lighter weight makes it easier to play. The heavier action of mechanicals is an unavoidable disadvantage, a consequence of the limitations of mechanical systems. You may have heard that piano tuners can adjust the key weight of mechanicals to any value. This is true only for the **static weight**. They **dynamic weight**, which becomes important at higher speeds, cannot be arbitrarily reduced, and reducing the static weight can actually increase the dynamic weight.

An important method for increasing speed is **quiet hands** (P. 120) which helps to increase speed by eliminating unnecessary motions. One aspect of quiet hands that is too often overlooked by beginner piano teachers is "**quiet fingers**" which means that the non-playing fingers do not flail around in the air in useless extra motions. If quiet fingers is not taught at the beginner stage, the extra finger motions become ingrained habits and will create problems with playing musically at the intermediate and advanced levels. By then, these bad habits can be so ingrained that they are difficult to correct. Quiet fingers is usually overlooked because it is not necessary at the beginner stage so that the need to quiet the fingers and the methods for practicing quiet fingers do not become an issue until the student is at a more advanced stage. The most important fact about quiet fingers is the knowledge of its existence; students who know nothing about quiet fingers can suffer frustration from not being able to figure out why progress is not made in spite of diligent, hard work. Although there have been famous pianists who played without totally quiet fingers, at today's expected level of technical excellence, quiet fingers can make the difference between passing or failing an audition because judges now look for such details, and lack of quiet fingers is generally audible to experienced judges.

Quiet fingers is specifically practiced just like any other element of technique. Choose a short segment (HS or HT depending on your level, one bar or even less) and practice it, keeping all fingers close to the keys at all times, and eliminating all unnecessary movements. This generally works best at higher speeds because the motions at higher speeds require more quiet fingers. It is in fact be more difficult to practice quiet fingers at slow speeds. This does not mean that all extra finger motions are bad. The artist has the license to consciously make any motions that are expressions of art. What quiet fingers eliminates are those *unintended* motions that can interfere with control and musicality. Practice starts with the realization that the keydrop motion is very small – just a few millimeters; thus, practice with the minimum motion needed. This applies not only to the keydrop, but all other motions of the hand, wrists arms, etc. Practice with these minimum motions until the technique is satisfactory, *then* add the extra "artistic" motions that you want.

In practicing for speed, you can also experiment with **HT** although the best general approach for HT practice is *after* you have completed all HS work and can practice immediately at final speed, HT, comfortably. However, you should know that, although HT is more complex than HS, there are some advantages to playing HT, such as developing rhythm, balancing the body, using one hand to teach the other, etc., so that HT should be explored as soon as possible in order to discover and make use of these advantages; that is. If one hand is better than the other, the better one can teach the other by playing HT; in this procedure, the objective is not to force the slower hand to play with the faster hand (which will only cause stress) but to transfer the motions and other tricks that the better hand is using to the slower one. *There are many instances in which it is easier to play HT than HS.* These opportunities should not be missed.

Proper fingerings and other aspects are also important – getting the details right is the key to success. For example, in **Chopin's Fantaisie-Impromptu** (P. 61, 72)**,** at bar 7, LH, the A is played twice, first with finger 3 and then with **finger 4**. One difficulty in this bar is that the 4 must then be immediately lifted very quickly so as to be able to play the ensuing 5 and 3 without the 4 inadvertently hitting a note. In this type of situation, do not try to lift the 4 because that is a slow motion that will cause stress; instead, flick the 4 out straight into the flat finger position, a motion that can be very fast. If you cannot help flicking other fingers out with the 4, that is OK – you will just end up in the flat finger position. Many pianists (including famous ones like Horowitz) developed a bad habit of completely curling fingers 4 and/or 5 to prevent them from hitting keys inadvertently. It is better to cultivate the habit of stretching them out into the flat finger position. Once you develop the severe curling habit, it will be impossible to get rid of it. This method of straightening the 4th finger instead of lifting it applies generally, not only in the situation cited here.

This piece is surprisingly easy to learn if you know how to practice it (and frustratingly difficult if you don't). From a technical point of view, if you can play one bar, such as bar 5, you are capable of playing the whole piece. Thus this piece provides one of the best examples of the efficacy of the methods of this book. On the other hand, if you are not taught the proper practice methods, it can seem impossible. One cautionary note: even after you can play the piece satisfactorily, it is important to practice HS so that you do not develop bad habits in the LH. Bad habits in the RH are immediately audible so that they are not problematic. However, inaccuracies in the LH are not audible unless you know what to look for, especially if you are one of those who "simplify" this piece by playing too fast and making most of the LH inaudible. These LH inaccuracies destroy the "speed multiplication effect" and "Moire pattern" (P. 73-5) and will completely change the character of the piece. Of course, you can wow the audience more easily with sheer speed than accuracy and since piano performance is entertainment, the pianist has a choice. In fact, most recordings by famous artists play just for speed; these can be easily identified because they do not play the Allegro (first) section slower than the last (Presto) which, strictly speaking, is a mistake. You can have your cake and eat it by playing the Allegro at correct speed and the Presto very fast, which is what Chopin wanted us to do.

It is very educational to learn this piece. It tests your accuracy, because without accuracy, the multiplication effect disappears. Accuracy is of paramount importance in Chopin, which is why this test is so educational. Note that HS practice is the best way to develop this accuracy; that is why the methods of this book, based on HS practice, are so helpful. If you practice HT too much, especially when starting to learn this piece, the LH can become inaccurate, making it impossible to learn this piece correctly. This is why this piece has a reputation of being difficult to learn.

We saw that **practicing "cold"** is a great way to strengthen your performance ability (P. 109). Another good use of cold practice is to practice slow play. It's a great way to warm up without wasting time on exercises and at the same time practice slow play since you can't go full speed anyway.

You will hit two types of **speed walls** as you increase speed. The first is the speed walls you erected from bad habits. Hopefully, you have avoided these, or used the standard methods for eliminating them, such as PSs and HS practice. Then the next speed wall you hit will be your natural speed wall as a result of

inadequate technique – everybody will eventually hit this speed wall, even concert pianists. Your natural speed wall is raised first by experimentation (using new hand motions) and then by using PPI (Post Practice Improvement, P. 41). With experimentation, you can immediately see some improvements during practice. PPI occurs mainly during **sleep**, so that you should see some improvements the next day. Thus, even if you practice hard in the morning, you will not see any PPI improvements in the afternoon. In fact, after an intense morning practice, an afternoon practice of the same material will generally become more difficult. This occurs because a hard workout results in excess cell damage. Your body loses millions of cells every hour, and intense workouts accelerate the cell damage/death rates. This increased ate triggers a compensatory reaction in the body that creates more new/larger cells than were lost – this is how weight lifters grow such huge muscles. This cell creation occurs mostly during sleep which is the repair/growth time for humans; that is one reason why sleep is so necessary. The body cannot grow during the waking hours somewhat analogous to the fact that you cannot repair a car while driving it on the highway. Thus, if you plan on practicing several times a day, it is best to practice different things each time and let them all improve by PPI during sleep.

(3) There is no need to waste time on **exercises** or the 10,000 repetition rule; such practice methods are obsolete, and are used in the absence of knowledge. They provide no assurance of success, and can lead to bad habits, speed walls, tension, injury, and frustration. PSs are used *only* when needed; they are *not* exercises to be practiced every day, as Hanon exercises have been recommended to be used.

Exercises are useful under certain circumstances, so that they should not be completely eliminated from your practice routine. You just have to know when, why and which ones to use. In the complete absence of knowledge, exercises may in fact be an acceptable way to learn piano. One danger from eliminating all exercises is over-practicing difficult passages. Absent all other causes of bad habits such as stress, practicing too loud, practicing too fast, etc., over-practicing is a major cause of bad habits. Thus replacing that difficult passage with closely related exercises is one good use of exercises. Of course, one alternative to exercises is to practice several difficult passages and to alternate among them to avoid over-practice. However, if one passage needs extra work, use of exercises is a viable option.

Also, just before a strenuous performance, when you need to conserve as much energy (especially mental) as possible, using “mindless” exercises just to limber up the hands, may be a good idea.

Historically, exercises were initially invented for a good reason: to solve specific technical problems. Misuse of exercises started when they replaced knowledge based practice methods, enabling teachers with little knowledge to “teach” piano. Exercises “work” when, after enough repetitions, your hands accidentally hit on the right motions for that technique. Many teachers who do not know enough practice methods believe that to be the best way to acquire technique; in reality, that is the best way *they* know how to teach. Because music is art that explores the mysterious powers of the brain, this mysterious accidental acquisition of technique was often accepted as *the* “artist's solution” to technique. It has instead let to untold hours and even lifetimes of frustration in spite of hard work and dedication.

However, we shouldn't dismiss this method of technique acquisition as useless, because *every pianist* must eventually depend on it for that last final adjustment to get the technique just right. Every person is different, every music has different requirements, and everyone is at a different stage of technical development. Good practice methods can only get you close to what is needed, and the final tuning must be performed by the body and the brain using the “artist's solution”.

Some aspects of exercises remain controversial. During the periods leading up to the “exercise craze” of the 1900s (Cortot), and even today, there is belief that the best techniques require practicing extremely difficult exercises, many of which never occur in actual music. Thus the most difficult exercises were conjured up with the belief that you aren't an advanced pianist if you can't play them. This belief also influenced the piano culture in which certain difficult pieces of music had to be mastered in order to be considered an advanced pianist, whether those pieces were to be performed or not. This culture was accepted by Chopin, Liszt, etc., who wrote Etudes for the purpose of developing technique. Such “technical pieces” are now a part of advanced piano culture and certainly contribute to better technique.

These advanced topics are not treated here. There is some controversy concerning whether such advanced exercises are needed for performances; ie, is time better spent practicing performances, or practicing difficult exercises?

(4) The importance of **relaxation** cannot be over-emphasized because it is not a natural condition of human movement and must be practiced. When the brain commands your hand to move a finger, it initially doesn't know *exactly* what to do, so it sends out a lot of signals to move that finger as well as many other muscles. Especially when attempting complex, fast, tasks, these extra signals will conflict and cause stress. This can be illustrated by an analogy to duck hunting. If you are not a super sharp shooter, you use a shotgun, not a rifle. This approach wastes a lot of pellets, but you have a better chance of bagging a bird, and the brain automatically chooses this shotgun approach if not trained otherwise. But music requires the greatest of precision and speed, so you must learn to shoot a rifle accurately; which means knowing how to relax all muscles except the ones you need.

Seymour Bernstein, in his book "With Your Own Two Hands" ridicules relaxation using the gravity drop (on P. 129 of his book – in section entitled "The Relaxation Myth") as something you don't use to actually play the piano. He is certainly correct, but the gravity drop must be taught in order to better understand the concept of relaxation, to learn to use gravity as a reference force, and to devise a method for measuring relaxation. Gravity drop should not be ridiculed; it is an important component of learning relaxation. Learning the gravity drop is a means to an end, not the end itself. It is important to understand this "means to an end" concept because it applies to practically every major learning trick, such as parallel sets and HS practice. Otherwise, you can end up ridiculing something that is important because the subject is not understood.

(6) Perhaps the most important practice method for speed overlooked by a majority of aspiring pianists is the use of **"finished" pieces** for acquiring speed. Too many students spend over 90% of their practice time trying to "get their new, difficult pieces up to speed". You can't find a better formula for creating speed walls, destroying your touch, and eliminating all color from your music! The methods of this book are designed for acquiring speed and the reader must know the details of this design in order to benefit from it. This design is difficult because of the need to navigate through seemingly contradictory, counter-intuitive requirements.

The design elements for speed start with rapid technique acquisition and memory methods for quickly building a repertoire of "finished" pieces and freeing up time to make music with those finished pieces. Unnecessary daily "exercises" are eliminated to free up even more time; even the initial "warm up time", previously used for exercises, is used to practice "playing cold" using finished pieces; this greatly strengthens the ability to play at speed without having to warm up. Czerny and other "technical" pieces are replaced with music you like because difficulty becomes a non-issue if you use these learning tricks. There is nothing as enjoyable as playing at speed, Bach's Inventions, Chopin Etudes, the greatest classics, etc., knowing that you are using the most efficient method for gaining speed.

When using the old practice methods, most students move on to a new piece when an old piece is "finished" and can be played at speed because there is not enough time to be playing finished pieces. Thus the majority of students have only a few pieces, that were finished recently, that they can perform and most of the older pieces are forgotten because of the need to spend time on new pieces. After all, you need to learn new pieces for acquiring new technique, right? Wrong, for speed! The only pieces you can practice speed with (and really make music to develop your technique), are the old pieces because the new ones aren't even up to speed! So the good news is: Play your old pieces to your heart's desire, make music, and enjoy! Because that is the fastest way to become an accomplished pianist. This is when you can truly concentrate on improving your touch and bringing out the color – abilities that are the hallmarks of true musicians.

In the end, technique acquisition comes down to **music** which is both the best judge of technique and the best route to acquiring technique. Why is music so important? Because there are too many ways to play incorrectly and every time you play incorrectly, you are practicing that incorrect motion. This is why

mindless repetitions are so counter-productive – because it is difficult to produce music with mindless exercises. Many students believe that simple repetition will grow piano playing muscles that will enable them to play better eventually, especially when they are assigned repetitive exercises such as Hanon. Unfortunately, this almost always leads to dead ends – the formation of bad habits. Music is needed to make sure that everything is correct. Learning piano is one of the few disciplines in which you learn the meaning of, and how to achieve, **perfection**, a degree of perfection far beyond what is needed in daily living activities. A frequent conflict arises when practicing for speed – the temptation to practice at faster speeds than appropriate for that skill level. By paying attention to music you can avoid those excessive speeds that are counter-productive.

How do you achieve perfection? Half of the requirement is mental – you need to develop the **music sensitivity** to recognize what is musical and what is not. This training is one of the major jobs of the teacher – to instill musical sensitivity into the student. The other half is hand motions. Always strive for economical hand motions and hand positions that reduce errors and improve control, such as quiet hands and quiet fingers. Watch how your teacher plays; better still attend concerts and critically assess how the pianist is positioning the hands to ensure that there isn't even one audible mistake in the entire performance. Only by striving to achieve musicality at all times during every practice session can you achieve this perfection and gain the ability to produce flawless performances. The attitude of "OH, I'll acquire technique first, then add music later" is a mistake, that will deprive the student of all opportunities for practicing musicality.

This is also a good time to experiment with **bench height** – when practicing old pieces and experimenting with fast speeds, expression, etc. – try different bench heights to find out the best height for you. Try something too high, then something obviously too low, then gradually adjust to some intermediate height. At any height, you should practice for some time (over 20 minutes) because it takes time to get accustomed to a new height which will always start out feeling strange. At first, just find out if your old height was too high or too low (or just right). If it is not just right, it will take some time for you to find the best height, by adjusting in small increments. The best time to test for the best height is when playing the most difficult material. Beginners and their teachers never know what the best bench height is for you. So the teacher or book will suggest a height at which the elbows are at the height of the keys (P. 30), but this is only a suggestion, a good starting point.; only when you have advanced past intermediate level does the bench height become critical for technique, and this height is different for every pianist. Since it is easy to get accustomed to a significant range of heights, students often stay at the height initially suggested by the teacher and forget about adjusting it after the technique has advanced to the point at which bench height becomes important. Thus adjusting the bench height is an essential part of technique development. At about the intermediate level, it is a good idea to invest in a bench with adjustable height. As you change the height, you may also need to change the distance that you sit from the piano.

Proper bench height has not been adequately investigated because the benchmarks needed to determine the best height have not been established. Therefore we start here with discussions of some of these benchmarks. What are the consequences, benefits, or disadvantages of different bench heights? High bench height is defined here as elbow above keyboard level, and low is below. The majority of pianists are taught to sit either neutral or slightly high. Low bench height has the advantage that it makes it easier to lift the fingers, especially the 4th. However, because it allows more finger curl, it suffers more from curl paralysis (P. 81), although advocates of curled fingers may consider that an advantage. It also makes it easier to sit with a straight spine. A high position can cause the players to hunch their backs, so that a conscious effort must be made to sit straight up. Massage therapists will tell you that a crooked spine can cause numerous problems, especially with stress. The high position makes it easier to lean forward and exert downward pressure with the shoulders for loud passages. It may also make it easier to prevent "hand collapse" (HC), which is a controversial subject because HC has not been clearly defined, although it is prominently discussed in several books. The basic idea behind avoiding HC is to hold an arch in your hand, so that it doesn't flatten out completely, similar to the difference between curled and flat finger positions.

However, flattening the hand does not necessarily cause HC. Raising the wrist also helps to prevent HC. Whatever advantages/disadvantages there are to high or low bench positions, they can be easily compensated by an adjustment in wrist position, which introduces another layer of complexity to defining high or low positions. In addition, each person has different ratios of the lengths of the spine, upper arm , etc., further complicating the issue. What seems clear is that most pianists can adapt to a fairly wide range of heights, although there is a perception among performers at the highest levels that bench height is critical. These are some of the reasons why bench height is controversial. Clearly, we need more research on this topic. The greatest pianists have performed at all heights, indicating that height does not necessarily affect technique.

The **best bench height** seems to be the neutral or slightly low position which makes it easier to: lift the fingers (especially the 4th), raise the wrist slightly to avoid HC, and play with the strong thumb position. The lower position also facilitates forearm rotation. It also brings the shoulders closer to the keyboard, which allows sitting farther away from the piano, thus freeing up more space in front of the body for moving the arms and elbows freely. Thus most teachers may be sitting their students too high, and most non-adjustable benches may be too high.

Any **experienced teacher** can learn and start to teach the methods of this book in a week, and most students can learn most of these methods in a year, although gaining more knowledge and perfecting each application is a lifetime endeavor. Within reason, there is no such thing as "too difficult to play" if the methods of this book are properly applied, allowing the students and teachers to concentrate on musicality instead of struggling with technique for entire lifetimes without any assurance of ever performing musically.

The belief that a "talented musician" can naturally and automatically produce music won't teach you anything – the audience should be led to believe that, not the pianist; instead you should look for those simple **"genius tricks"** that you can use to fool the audience, just as **magicians** do in Las Vegas, such as moving the fingers in parallel to play rapid notes (parallel sets), using music as an algorithm for memorizing hours of repertoire, adapting mental play to music, or learning absolute pitch (which most in the audience can do but don't know that), etc. Using magician type tricks to impress the audience is not shameful practice for musicians – Mozart did it all the time.

In conclusion: the old, obsolete methods tried to strengthen the hands to enable them to play difficult material, which only led to speed walls; the correct method is based on finding ways to simplify difficult material so that normal human hands can play them easily – this is the true definition of technique.

4.2.2 Staccato Practice

In the literature, there are numerous methods for improving technique such as the rhythm method (change the rhythm or accented note), tapping, etc. A particularly effective method **taught by Combe** (as reported by our daughter, Eileen) is **staccato practice** in which you play every note staccato (without pedal, mostly HS). If you feel awkward playing staccato, it is a diagnosis that there is a weakness in your technique at that point. Thus, like parallel sets, staccato practice is both a **diagnostic tool** for discovering your weakness and for strengthening that particular weakness. If you have difficulties with **smooth runs** or **hitting notes accurately**, staccato practice can remedy them. Parallel sets only get you up to speed; to really convert that speed to technique, staccato practice is one of the best ways. We already saw that you should practice without the pedal when practicing for technique. Staccato play advances this concept one step further, with a corresponding additional improvement in technique.

How does staccato practice improve technique? The main thing it does is to remove certain **crutches** that allow you to cheat, such as pressing down with the hand to increase speed. Such crutches ruin the technique because they allow you to "play", but without adequate control. Staccato practice forces

each finger to be totally responsible for its note, so that a weak finger or missed note will immediately show up. Any small error gets magnified in staccato. Most students have **weak finger 4**, and this weakness should show up in staccato practice every time. Those with **weaker LH** should experience more problems in that hand, although there should be no such difficulties if you practice HS routinely. Staccato helps with **relaxation** because the fingers are not always pushing against the piano and especially with **rapid relaxation** (P. 40) because of the rapid return of the fingers to their rest positions. Therefore, if you detect stress or fatigue, try staccato practice. Staccato helps with **memory** because it is different from normal play, thus adding an extra association (P. 38) and aids in improving your **mental play** which is an essential ingredient of memory. Bach understood the value of staccato practice and incorporated it into eight of his fifteen Inventions (although he did not indicate staccatos in his manuscripts, it is clear where staccato is needed). Combe pushed this concept several notches higher by asking you to practice the entire piece using staccato.

What is so surprising (and initially counter-intuitive) is that staccato play works at any speed, and with all technical motions such as quiet hands, relaxation, jumps, soft, loud, etc. It is especially effective for practicing fast, soft passages – the holy grail of pianists. **Pianissimo** technique is best practiced using staccato. Staccato practice creates a robust technique so that you can play on any piano, whether the action is light or heavy and strengthens your performance ability. Thus when practicing with staccato, do not change any playing motions – just add staccato.

Those who had never routinely practiced staccato may initially find it difficult to play entire passages staccato. This is normal; with continued practice, you will be able to play every note with clear staccato. If you slow down sufficiently, you should be able to play every note staccato; then speed up gradually. Maintaining staccato as speed increases will become progressively harder. Thus it is necessary to constantly pay attention to staccato at the higher speeds.

Staccato practice is helpful for **accuracy** because you have less help from other fingers to locate the next note, as you do in legato play. It also helps with gaining **speed** because the staccato motion is inherently faster than legato motion. By practicing staccato at any speed, you are practicing the motions needed at a higher speed because of the faster finger speeds needed for staccato. Thus staccato practice is one method for overcoming **speed walls.** At the highest speeds, the staccato and normal motions tend to merge: this tells you something about how to play fast. Staccato practice also gives you a clearer idea of the differences between **legato** and staccato, thus improving your legato play. The advantages of staccato practice are so numerous and pervasive that they can not all be written down in a few paragraphs, just as for HS practice, segmental practice, etc. Any accomplished pianist will find an endless number of ways to benefit from it. **Note the close relationships between speed, pianissimo, relaxation and staccato: all four are easiest to achieve using the *smallest motions*.** Keep this in mind as you practice, and you should get the quickest results.

But there are several types of staccato (finger, wrist, forearm, forearm rotation, hard & soft - P. 72) – which to use? Most people use combinations of staccato methods and the precise combination depends on the requirements of each specific situation. So this choice must be left to the pianist. It is good to be conscious of which one(s) you are using, so that you can optimize the staccato and experiment with different combinations.

When acquiring new technique and especially with staccato practice, the need to **practice softly** (P. 47, 77) and even pianissimo, cannot be over-emphasized. Soft practice reduces fatigue and stress to a minimum. Loud practice seems easier initially because it gives you **crutches** that hide various technical weaknesses; this results in non-musical play, unevenness, speed walls, fatigue, and bad habits. For example, when playing loud, you tend to lose control over the 4th finger and this loss of control can become a bad habit. The crutches are bad because they prevent you from practicing for technique. Thus if you practice parallel sets using staccato and soft play, you will find initially that even parallel sets become difficult to execute. This is normal because both parallel sets and staccato are diagnostic devices and we are assuming that you still lack the needed technique. The fastest way to progress is to first use the crutch and simply get

up to speed, then add staccato, then add soft play. **By playing softly, you are dealing only with technique.** In the long run, you will gain speed much faster by practicing softly. For loud passages, FF can be added at any time, after you have acquired the necessary technique. FF is an new skill; learning FF and new techniques at the same time is much harder than learning them one at a time for very fast speeds. Thus there are two reasons why soft practice is necessary: (1) The ability to play loud at a certain speed does not guarantee that you can play softly at that speed whereas if you can play it softly, you can always play it louder at that speed, and (2) practicing softly gets you to the fastest speeds more quickly than practicing loudly.

Staccato can be practiced HT to improve the **left-right hand coordination**. This is more important for those who use a lot of HS practice and parallel sets, both of which can suffer from left-right coordination inaccuracies. For those researching technique (who isn't?), staccato, being a diagnostic tool, reveals new complexities of technical issues such as relaxation, pianissimo, weak fingers, missing notes, etc., that were previously not so obvious. Once you learn to practice staccato routinely, you should find that normal play becomes a lot easier because you will have much more control.

4.3 Fast Octaves

Ex. #1 has another importance use: for acquiring the technique to play fast repeat chords and octaves (such as those in Liszt's Hungarian Rhapsody #6). The objective is to play fast intervals or chords an indefinite number of times without fatigue. This is a skill that every pianist needs. The good news is that once you acquire this skill, you will have it for life -- no need to practice it every day, and it is not difficult to acquire. Let's work on fast octaves (chords, etc., are similar). In order to play fast octaves, you must (1) get your brain accustomed to such speeds and (2) practice speed with relaxation.

Start with quick double octaves, HS, as fast as you can without stress, one octave only, eg, CC, CC, where CC is the octave; repeat the octave -- do not move around, like CC, DD until the single octave skill is completely finished. At first, work only on speeding up the double octave; after a hard workout, always play slowly several times, completely relaxed, before quitting. Work on one octave for the LH and one for the RH so you can switch hands and use the better hand to teach the slower one. Because fast double octaves is the easiest skill to learn, you can use this practice to train the brain to become accustomed to such speeds.

There are two ways to increase speed. One is to reduce the keydrop amplitude (up and down motion). If you raise the hand high for each octave and play the double octave, it will be slow. As you reduce the height, you will be able to play faster. For grands, this travel can be reduced to slightly less than the maximum keydrop because of their special repetition mechanism. You can demonstrate this speed principle with a basketball or tennis ball. First, bounce it up and down 2-3 feet; then gradually reduce this height. As you push the basketball lower, its bounce frequency will speed up. The second trick is to play the double octaves in one down motion. The basketball analogy works here also. At 2-3 feet you have to tap the ball with your hand up and down to dribble; but as you push the basketball closer to the ground, it will dribble on its own, you just have to push it down. This happens because the basketball has a bounce when it contacts the floor. Similarly, in piano, beyond a certain speed, your hand has to supply a bounce when it hits the bottom of the keydrop.

Then follow the routine Parallel Set procedures: advance to 3 repeats, then to quads, then a series of quads, playing each quad with one down motion of the hand. The reason for practicing in groups of 2, 3, or 4 is that it gives you a chance to raise your hand between groups so that you can play the next group in one down motion. This down motion is very small; it is more of a feel than an actual motion.

You will see only a small increase in maximum speed at each practice session. The next day, however, you will discover that you can go a little faster. ***When increasing the speed, do not force the hand to play faster (that's when stress develops), but wait for the hand to WANT to go faster after switching hands when that hand has had time to rest***. Get up only to a comfortable maximum speed, and

as soon as fatigue sets in so that you begin to slow down, switch hands. If you force a faster speed, you will only build speed walls and end up practicing the wrong motions.

Practice softly, do not practice loud; most students make the mistake of practicing loud because louder play requires more force and greater force usually equals faster speed. But this louder extra speed is false speed; what you need is the SKILL to play fast, which is independent of loudness. Loud play increases fatigue faster, wastes energy where it is not needed, prevents you for experimenting with all possible hand motions, and fools you into thinking that you are playing faster whereas in reality, you are building speed walls, and missing out on the need to practice relaxation.

Pain and injury: improper octave practice methods, especially those that follow the "no pain, no gain" philosophy, frequently lead to injury. To prevent injury, practicing softly is the obvious first rule. However, where power is eventually required, the power thumb position, described in Section 5 below, is needed. There are two thumb positions: the weaker one in which the thumb nail points horizontally, along the plane of the keyboard, and the power position, in which the thumb nail points towards your face when the hands are placed straight in front, about two feet apart. In the weaker position, the thumb can not compete with the other fingers in power, resulting in missed notes. When forced to play in this position, pain and injury can result, not only to thumb muscles but elsewhere, as the hand tries to overcome this deficiency. Thus, where power is required, use the power position even when practicing softly.

Finally, after the quads are satisfactory (you can play as many quads in succession as you want), what do you do if you need to play many more that 4 octaves fast? To play this, push down on the piano continuously as you play the series of octaves, and let the bounce of the hand bring it back. Once you learn to provide the bounce, you can push down on the piano but the hand will not go down. You need to push down on the piano because you need to depress so many keys, so that all of the down force you supply simply goes into depressing the keys, and the faster the play, the greater down force that is required, because you need to depress more keys.

At first, acquire speed using the smallest keydrop amplitude possible because that will give you the fastest speed. Once you have acquired the skill, you can then increase the amplitude to anything you want. One way to increase the amplitude is to increase the bounce back from the keydrop. Of course, only certain amplitudes will be appropriate for certain speeds (the system consisting of your body and the piano has certain "resonances" at certain frequencies), but you will quickly find out which is which. Thus, if you suddenly find certain combinations of amplitudes and frequencies difficult, it may not be your fault; you will then have to find changes in the way you play (move your elbow, or your body, or simply avoid those amplitudes, etc).

After the repeated octaves is satisfactory, advance to moving octaves. Before advancing, make sure that you did a good job with the single octave repetition. Again, start first with only 2 notes: CC,DD. Only when this is satisfactory, move on to 3, CC,DD,EE, etc., as above. Then CD, CD, and CE, CE, etc., gradually increasing the distances of the jumps. Always make sure that you can play relaxed before moving on to the next skill.

The key to the success of this method lies in finding ways to accelerate the double octaves such as CC to extremely fast speeds (black keys may be easier – the easier, the better). Once these fast doubles are attained, the brain "gets the idea" of what "fast octaves" means, and how to do it. Then the rest of the work becomes easier, since all you have to do is to build up stamina and learn how to relax in order to play as many fast octaves as you want. Most people will not be able to achieve all this in one or a few sittings, but will need to make extensive use of post practice improvement (P. 41). Too many repetitions in one sitting can become counter-productive, resulting in loss of musicality and bad habits. After about 10 minutes, the effect on post practice improvements become smaller, so that hours of repetitions will mostly be wasted or worse. Remember to practice slowly, fully relaxed, a few times after every fast workout (P. 43).

Small hands: For most pianists, the black keys may be easier because they stick out of the keyboard and you are less likely to inadvertently hit neighboring keys. Unfortunately, those with small hands may not see much difference between black and white keys because the shortest distance between

black octave keys is larger by 1.3 cm than the shortest distance between white octave keys, although the distance between the centers of all keys is the same. Therefore, try both black and white keys to see which is easier for you. For those with larger hands, the black octaves may be significantly easier, and should be used.

It is important to know that you have two sets of muscles for spreading the fingers: one set to spread the palm only, and another to spread the fingers. Everybody naturally uses both sets, but those who are not aware that there are two sets of muscles tend to use mostly the finger spreading muscles, which is exactly the wrong thing to do. This locks the fingers into position, making it difficult to move the fingers and produces stress. Thus you should use mostly the palm spreading muscles in order to free the fingers to move without stress.

Relaxation is especially important for repeated octaves or large chords, but relaxation for octaves is most difficult for small hands. This is because the hands are necessarily stressed just trying to reach the keys and most people just keep the hands stretched all the time during the octaves. Pianists with small hands must do two things those with larger hands do not need: (1) palm stretching exercises (P. 136) and (2) learn "rapid relaxation". (1) may not seem to accomplish much short term, but over a lifetime, it can make all the difference, especially as the ability to stretch starts to decrease with age. It is something you do regularly all your life, and is most effective when started at a young age. (2) is an important skill to develop whether you have small hands or not, because rapid relaxation is not a natural body process and must be cultivated. Thus when practicing octaves, always play the octaves by rapidly spreading the hands and then quickly relaxing after each octave is played. Do not contract the hands, just release the spreading tension. These extra steps may seem to slow down the repetitions but, once they become a habit, the extra relaxation will not slow you down and will free enough energy for you to keep playing those octaves indefinitely. Moreover, you will be using this rapid relaxation everywhere else, improving your over-all relaxation skills.

4.4 Performance Preparation Routine (P. 164)

Why practicing on performance day is bad: Most students cannot resist the temptation to work very hard on performance day, and the parents certainly won't object to that. The basic rule for students (they change as you advance towards concert pianist level) is to allow only one practice at performance speed, then several at moderate speed, and ending with several at slow speed. That's all! No more practice, except for warmups to keep the hands in playing condition. Play easy pieces, just enough to prevent the hands from cooling off. Hard practice is one of the worst things to do on performance day because it will result in inferior performance.

There are several major reasons for this and one of the most important is the role of sleep in technique acquisition. Little actual technique is acquired during practice, just as a body-builder's muscles don't grow during a workout. Practice sets in motion a series of processes that eventually results in better technique and this process can last for days and weeks. Most of the significant changes occur during sleep because these changes are extremely complex and the body does not have the resources during waking hours to conduct such complex procedures. Two major processes occur during sleep.

One is the building of muscles and nerves that were exercised. Thus if you practice on performance day, the benefits will accrue on following days, but will not help on performance day. But there is more.

The second major process that occurs during sleep is the removal of bad habits. How does the body know what is a bad habit? It doesn't, of course. Whenever you practice, you gain technique as well as bad habits. Most bad habits are random motions and small compared to the desired technical motions, in terms of type of motion and number of repetitions. One of the things that happens during sleep is the "flushing out" from the brain of "junk"- small, random excitations that are probably not useful. In this way, the brain

avoids expending resources on useless items, and can concentrate on the important ones; i.e., it throws out most of the bad habits and builds technique. Thus if you practice hard on performance day, you have most certainly gained some bad habits, which will not be eliminated until that night – very bad for performance on the same day. Concert pianists know how to practice on performance day without creating bad habits using practice routines perfected through experience – routines that students have not yet developed, because the details depend on the person and the specific pieces to be performed.

What does "flushing bad habits out of the brain" mean in neurological terms? During waking hours, numerous chemicals accumulate or are depleted in specific locations in the brain, such as in the spaces between synapses. During sleep, the accumulated chemicals are flushed out and the depleted ones are restored. Since stimuli are stored as chemical changes at specific locations in the brain, this flushing process removes most of the weak stimuli, leaving only the strong ones for which the chemical changes are too large to flush out. Thus the weak bad habits are literally flushed out of the brain.

There is one type of bad habit that is not small and random; that is the type that becomes speed walls. If you play faster than what your skill level allows, you will tend to repeat the same stressed motions so frequently that the body will acquire that bad habit more than technique. This is a major reason for not practicing too fast; it is certainly not what you want to risk before a performance. This is why it is a good idea not to practice too fast for at least one week before a performance. When ending practice on a piece of music or passage, practice at moderate speed, and finish at slow speed.

The above theory of getting rid of bad habits during sleep also teaches us one way to get rid of speed walls. Even the stimuli that initially created the speed walls will always diminish with time. If you wait long enough, those stimuli will reduce to levels comparable to those of the random bad habits that are flushed out during sleep. Thus one way to get rid of stubborn speed walls is to stop practicing that piece and move on to something else. Practicing other music tends to erase speed walls and further helps to eliminate them. Of course, the use of parallel sets is usually the more efficient approach.

Blackouts are some of the most disastrous events that can happen during a performance, and they can be basically eliminated by using several procedures that enhance each other. The first is mental play (MP). When practicing MP, learn to picture the entire structure of the composition in your mind and develop the ability to know where in that structure you are playing. Then practice starting from anywhere in that structure.

One cause of blackouts is dependence on hand memory (P. 107), which is dangerous because hand memory is a notoriously unreliable memory. This is because it is a reflex memory that depends on stimuli from previously played notes and largely bypasses the brain. Thus if any circumstance changes, such as a different piano, or a new environment such as a concert hall, nervousness, or the presence of an audience, the stimuli will change, resulting in a blackout. Once a blackout happens, all "preceding notes" disappear, the stimuli and reflex disappear, and the pianist is unable to re-start. The only alternative is to re-start at the beginning. This why it is so important to practice mental play and starting play at random places in the music.

It is therefore important to reduce your dependence on hand memory. Slow play is the best way to do this because reflexes are speed dependent so that at slow speed, most reflexes disappear, thus forcing the brain to intervene and command the playing of each note. This, of course, requires the brain to memorize everything. Thus slow play is one of the best ways to ensure good memory.

Every practice should end with slow play because (1) it is free of bad habits (but you must make sure to use the same motions as required at speed), (2) this is a good time to test memory at the same time with other tasks, and (3) you erase the hand memory developed during practice. There are several more reasons. The last run-through during practice has an inordinately strong effect on technique compared to preceding run throughs probably because each run-through partially erases preceding run-throughs. This is why the slow play should be your last run-through.

In other disciplines, where performance is paramount, the science of performance optimization is much better developed (scientifically, Kotier) than in piano performance. At this writing one major

principle of performance enhancement is based on the concept of "flow" (Csikszentmihalyi). Thus piano pedagogy is way behind other disciplines in understanding and teaching key concepts in performance. Even if we may not aspire to be concert pianists or become superhuman, the basic knowledge can be helpful to everyone.

In summary, it is extremely beneficial to end every practice with moderate play followed by slow play. This applies to when quitting one segment and moving on to a different segment during the same practice session. Piano pedagogy needs a formal course on performance optimization.

Csikszentmihalyi, Mihaly, "Flow: The Psychology of Optimal Experience", 2008, Harper Perennial Classics.

Kotier, Steven, "The Rise of Superman: Decoding the Science of Ultimate Human Performance", 2014, New Harvest.

4.5 The Myth of Frantz Liszt's Teaching Methods

The materials of this section are clear examples of what practice methods are and what to do to acquire technique. By contrast, there have been thousands of teachers who claimed to teach the "Franz List Methods" or trace their teaching lineages to Liszt (and therefore to Beethoven: Beethoven - Czerny - Liszt), yet there *isn't a single book or reference that defines or describes what that method* is (P. 17)! Thus the implication that a terrific "Franz List Method" of teaching exists has no factual documented evidence – it is a myth.

It is well documented that Liszt did not know what he did to become such a proficient performer (P. 248). Because he was a pianist, not a trained analytical "documentalist", this is understandable; he was a trained musician so that he could play or demonstrate, but did not know how to teach or write a manual. It is also well documented that he only taught students who were already technically proficient. Thus, going to a teacher who teaches the Liszt Method for learning how to play the piano makes no sense unless you are already a concert pianist. But over 99% of piano students learn piano to become concert pianists, not after they can already play. These facts are generally overlooked by piano students and teachers.

Even the teaching lineage to Beethoven has little meaning because Liszt basically ignored Czerny's methods (P. 248) and the popularity of Czerny as teaching material has been declining for decades, now to the extent that Czerny is often cited as representing what was wrong with the "old obsolete" teaching methods (P. 250 - according to Whiteside). Therefore, the "teaching lineage" concept carries less weight now among piano teachers, although it is still "useful" among the general public because the public is still unaware of these "details".

Thus going back to Liszt or even Beethoven does not help us to learn effective methods for learning piano. Chopin is an exception because his students documented some of his teachings (P. 250). Bach is another exception. As with Liszt, Bach never wrote a treatise on teaching piano because he was a musician, not a writer. Therefore, he embedded piano lessons in his "teaching compositions" such as his Inventions and the WTC. Thus, if we learn to "read" his lessons in his music, they can be quite beneficial (P. 192).

These remarks are not meant to disparage claims of "Liszt's teaching methods" or the Russian School, etc., that have long histories of teaching traditions and have produced a large number of great pianists. In fact, my survey of teachers who claim to teach the "Liszt Methods" such as Combe and Van Cliburn's mother, reveals that most of them are familiar with similar principles, such as HS practice, chord attack, thumb-over, segmental practice, etc. Thus, although "Liszt's Method" is a myth, the claim to teach that method does increase the probability of finding a better teacher. However, it does not provide any assurance that wrong concepts will not be taught – that can only be optimized by a well-researched text book.

4.6 **Theory of Technique Acquisition**: Knowledge, Experimentation, and Talent

A theory of technique acquisition (we will use "technique" here for simplicity) does not exist today, as far as I know; however, such a theory is necessary if we are to devise the most efficient practice routines. In the past, a student's ability to learn was ascribed to "talent" which tells us nothing about how to learn/teach piano. Below is my attempt to create a theory of technique based on what we already know about how to practice. Every pianist wants to know how to practice: "what is the best practice routine?" is the question I encounter most frequently. A good teacher will assign a new piece, then go over it, demonstrating how to play each difficult section and how to practice it. However, even such a good teacher cannot always solve your problem. Why? In order to answer this, and almost an infinite number of other questions that arise as you start practice, we need a theory of technique. Such a theory must start with the most fundamental principles that all the known material can be boiled down to, and from which we can derive every useful practice method.

The material of this book makes it clear that we need **knowledge** about practice methods, etc., so knowledge is a necessary component of the theory. This component is simple because all we need to do is to document and organize all the known material as we do in this book, and will be summarized below. But nobody knows everything, every person is different, etc.; how do we find those missing elements that are not listed in knowledge? The answer is **experimentation**. By adding experimentation to the theory, we cover everything else not found in knowledge. Knowledge and experimentation combine to **nurture your talent**, the direct link to music. Thus like a grand piano, the theory of technique stands on three legs: knowledge, experimentation, and talent. Most people are more musically talented than they think, but their talents can't be expressed without technique. Thus technique is like tools to a carpenter – the best carpenter in the world can't build anything without his tools. Talent is a necessary component of technique theory because it is what connects technique to music. Moreover, the process of learning to become a musician involves major changes in the brain (see below), a process that greatly helps the expression of talent. Furthermore, talent can be nurtured at any age, but especially for the very young. Thus the past practice of attributing success in piano only to inborn talent is not only incorrect, but also detrimental to the learning process because it tells us nothing about how to acquire technique. In addition to inborn talent, we must add knowledge, experimentation, and the nurtured component of talent. There is no known way to measure inborn talent, so it is a concept that is not even well defined. On the other hand, the nurtured component, such as memory, mental play, absolute pitch, etc., are not only definable, but can be taught. This is why a proper theory of technique can be valuable.

Knowledge, experiment, and talent form a positive feed-back loop that accelerates learning. The more knowledge, the more you know how to experiment, the more you can express talent, and each one enhances the other two in complex feedback loops. This explains why there is such a huge difference in learning rates between those who know how to learn and those who don't. It is not just a difference in talent, it is much more complex and we are untangling that complexity here.

Before developing the theory further, we must first recognize that the human brain/nerve/muscle system is so complex, that the number of ways in which you can depress a piano key is basically infinite. This is initially not easy to understand, but I will only allude to this complexity at the end because it is not completely understood; for example, we don't even know all the facts needed to count this "infinity", but it is easy to prove that this number is much, much larger than most students realize. Now only one out of that "infinity" is the best. Our chances of finding "the best" out of an "infinity" is basically zero, especially because it is probably different for every person at any given point in time. Fortunately, there is a large number of "good ones" that will suffice – these are the ones that we seek. One consequence of this "one out of many good ones" situation is that no two pianists will use the exactly same method to achieve a given goal. Thus a teacher who knows how to play a particular passage may not be able to teach a specific student if the student's "best" is different from the teacher's (and it usually is, because the student's skill level is different from the teacher's).

The next logical question to ask is, if the old teaching methods are so obsolete, how did those thousands of accomplished pianists acquire their technique? The answer is : mostly by accident, especially if their skill levels are higher than their teachers' (a frequent occurrence). With enough practice, you start learning how to experiment and explore, and eventually, the brain and hands will accidentally find motions and methods that are progressively better. Clearly, those who learned to experiment early in their learning process made the fastest progress. This accidental learning process is why learning piano can take so long and even with diligent, hard work for a lifetime, there was no guarantee of success, especially for those obedient students who followed instructions but did not start experimenting on their own. Thus, in the absence of knowledge, experimentation may be the most important factor for developing technique quickly. Even if the greatest pianist in the world were to demonstrate to you by playing your passage right in front of you, too many elements of piano playing are invisible (such as momentum, relaxation, the use of infinitesimally small motions of the body, shoulders, arms, hands and fingers to effectuate a small motion at the finger-tip, etc., not to mention the fact that most pianists use different methods for achieving the same goal). Experimentation may in fact be the major distinguishing factor between a talented concert pianist and an amateur student.

Our theory, of course, helps teachers, and good teachers provide the fastest ways to learn. Watching Liszt play would have been extremely educational. First, you get the existence proof that certain things are humanly possible; without this proof, you might give up because it might be impossible, so why even waste time trying? But a more important factor is that watching the specific motions will give you some ideas about what to try. By imitating the positions and motions of someone who can play the passage, you are closer to doing the right thing. Of course, without knowing what to look for (forearm rotation, curled vs flat finger positions, cartwheel motion, thumb-over, quiet hands, etc.), most students will not even see the critical elements of motions that need to be imitated. This is why it is so important to formally define every element of a technique theory (this is true of anything scientific) so that we know exactly what we are talking about. These are the items we find in knowledge.

Knowledge: We have already defined various elements of technique theory, such as segmental and HS practice, parallel sets, etc. In order to see how they contribute to technique theory, we must analyze why they work. **The first principle is simplification.** Simplify so that you can play it better, faster; once you get up to speed, you can start adding the complexity. The parallel sets (PSs) give us the **second principle: move the fingers in parallel**, which allows the notes to come much faster than the motion of each individual finger and thus provide ample time for control. **Third principle - technique is attained in two stages: 1) finding the proper motions, and 2) training the nerves/muscles to execute them.** During a single practice session, technique will improve every time you find a better motion, but the nerves and muscles needed for execution may not be fully developed. Repeated practice then develops them via PPI (post practice improvement P. 41), over periods of days to even years. This explains why you can experience immediate improvements during practice, and further improvements in the following days and weeks. These principles provide a way to classify the items in knowledge as well as the reasons why they work.

Experimentation: repetitions during practice are not meant to be mindless repetitions; they must include experimentation to see what happens when changes are made to the motions, timing, etc. The types of experimentation that can be tried are limited only by the pianist's imagination. Thus constant experimentation, imagination, and originality are just as important in experimentation as they are in music itself. Pronation, supination, quiet hands, quiet fingers, forearm rotation, flat finger positions, etc., are examples of ideas that can be experimented with. Experimentation is easiest to conduct HS, except for experiments requiring both hands, such as one hand teaching the other, or coordination betweedn the two hands.

Talent: This is the topic that is probably most misunderstood, yet may be the most important long term benefit of learning piano. Most components of talent, such as memory (P. 104), mental play (P. 36, 110), absolute pitch, improvisation, speed, and technique itself, can be taught. Of course, inborn talent does

exist; just as some humans are smarter than others, some are more musically talented than others. But in a theory of technique, we are most interested in components of talent that can be taught. Thus the first important lesson is the realization that significant components of talent can be taught. Then we can proceed to identify the inborn talents and nurture them, as well as add components that can be taught, to create a more complete musician. Just as we can improve our performance in sports, etc., by practicing, we can also improve our brain performance by proper practice methods. The brain of a person who has never played fast music doesn't even know what it feels like to play fast, much less how to control the body muscles to actually play fast on the piano. By using parallel sets, we can teach the brain the idea of speed approaching infinity very quickly (P. 35), thus launching the student on his way to increasing speed. Such achievements of the brain can be very exhilarating!

This is an outline of what we know today, but much greater understanding and improvements in practice methods are possible. Such improvements will require studies of how our brains and muscles work together to enable us to play the piano. They are the material of thesis topics for degree students at conservatories and neuro-scientific research by biologists. The number of ways in which the human body can use to play the piano is huge, but a relatively small number of these are optimum; finding these optimum motions may be the best way to approach the problem of technique acquisition. I need not speculate on such possible studies here because those involved will have much clearer ideas of how to proceed than I. But if past histories – of how research has transformed every field that made huge strides in understanding and enabling achievements beyond any initial expectations - are any indication, the transformations in piano learning can be spectacular. This will benefit not only pianists, but can transform the music industry. Becoming a pianist today is generally viewed as a poor way to earn a living. This view will be reversed if the process of learning piano can become cost effective.

4.7 The Mystery of "Warming Up"

If you hadn't played the piano for a day and sit down to play, your hands are "cold" and need to "warm up" for 20 to 30 minutes before the fingers are really ready to play. "Cold" hands are totally incapable of executing technically difficult material but, once warmed up, they can perform miracles. Why is there such a large difference? What changes are occurring in the hands? The physiology of warming up has not been adequately studied. Once it is understood, we may be able to find ways to accelerate this process, or even maintain it permanently, so that concert pianists do not need to warm up prior to performances, and students can save a lot of time. For example, since most of the piano playing muscles are in the forearms, would it be possible to attach battery operated electronic muscle stimulators to critical points in the forearm to warm up the appropriate muscles while performing other chores?

In this age of busy schedules and limited time, permanently warmed up hands may even enable technique levels not possible before. Is it just a matter of dilated blood vessels, or accumulating sufficient supplies of necessary compounds to the nerve system? This warm-up effect is possibly the largest for piano, and is much less in all other disciplines. Therefore, it has something to do with the particular demands of playing the piano. Two obvious demands are speed and control. Studies of such a phenomenon will doubtlessly be complex, but modern biology and science should be able to tackle it. This is a topic that would be an appropriate subject for a thesis at a music conservatory. See section 10 for more such possible topics.

4.8 Theory of Memory Recall

It is now clear that most of human memory is an associative process and that good memorizers use algorithms that associate the material to be memorized with material that is already in the brain. Specific

references are not necessary here because there are numerous publications on this subject easily found on the internet, and improved ones are turning up several times a year. There must also be a period, early in childhood, when visual, auditory, touch, taste, etc., inputs are stored in the brain with little existing memory to associate with, and this process certainly continues all life. One major unanswered question is: how is this memory retrieved? The associative nature of memory suggests that the memory is retrieved by association; that is, by the overlap of memory elements in the brain. What are these memory elements? We don't have a detailed answer yet, but they must be the series of synaptic paths, etc., associated with the memories. There is also the question of what "overlap" means. The most obvious answer is that within the overlap, the memories share the same synaptic, etc., paths. When memory fails, the overlap is either not recognized or leads to the wrong memory. This theory should become much clearer when we determine in greater detail what those memory elements are.

5. Playing the Thumb: Forearm Rotation, Weak/Power Thumb, Pivoting for Legato "Thumb Over" Play

5.1 Forearm Rotation: We emphasize here, the importance of knowing how to play the thumb using Forearm Rotation (FR, P. 79) in tremolos,Thumb Over (TO, P. 89), etc.; basically, practically any time when the thumb must be played rapidly. The muscles for moving the thumb are too slow so that, for fast passages, it must be moved mainly by FR. Thus FR is needed in fast tremolos, albertis, scales, arpeggios, etc. FR can also be used to play the pinky, as well as parallel sets. In the purely FR motion, the thumb is rigidly attached to the hand, and is moved solely by forearm rotation. In practice, some small thumb movement is combined with FR because, although these muscles are slower, smaller movements can always be made faster than larger movements. This principle of combining several ways to play applies to the Thumb Under (TU) - TO relationship also: most of the time, you will use a combination of the two, using mostly TU for slow, legato passages and mostly TO for fast sections.

Practicing FR is best accomplished by contrasting FR with quiet hands, as Bach has done with his Inventions; #8 as an excellent example – here you need both FR and quiet hands and can therefore demonstrate the differences between them. This Invention is also useful for practicing the proper way to play with the tip of the thumb, not its first joint, because of the frequent use of the thumb. It is a mistake to think that, at sufficient speeds, you must always play with quiet hands; Bach made that clear in this Invention by inserting passages where FR is needed: bars 15, 21-3 in RH and 19-20, 24-5 in LH; all other bars should be played quiet hands, so that you can feel the contrast between quiet hands and FR. Other examples where FR is needed are the tremolos and alberti motions in the first movement of Beethoven's Pathetique sonata. Many students struggle with speed in these passages, often developing stress and even suffering injuries because they were never taught to incorporate FR. With FR, speed, power, and endurance quickly cease to be problems, allowing play with complete relaxation.

5.2 Weak/Power Thumb: There are two thumb positions, so it is useful to know when to use each one. In the first one (the **Weak Thumb** position), if you place both hands on the keys in playing position, the thumb nails will face each other – the thumbnails are almost vertical to the keyboard., and the tip of the thumb is bent slightly towards the fingers so that the tip of the thumb is almost parallel to the fingers, as described on P. 29. This position is useful for slow or easy passages. For technically difficult material where relaxation is critical, especially when power is needed, the second position works better. In this position, when you place both hands on the keyboard, the thumbs are not bent but extend straight out, so that the thumbnails now face towards your face (LH thumb on C3, RH thumb on C5); this is called the **Power Thumb** position. This position enables rapid play, makes optimum use of FR, allows complete relaxation, and utilizes the strongest muscles in the thumb. It uses those powerful muscles that you use to push thumb tacks into a wall. This is the position to use when practicing the material of this section,

although each person has his own preferences, depending on factors such as the size of the hand, or the person's age. Therefore, you should explore both positions at high speed to see which works better for speed, relaxation, and power. Bending the thumb is slower and more stressful, but those with large hands may have no choice, because the keys are too close together for their hands.

The power thumb position is attained mainly by raising the wrist. This automatically causes the thumb to point down and engages the strong muscles of the thumb. Conversely, the weak thumb position is attained by lowering the wrist so that the hand is level with the forearm. In general, try the weak thumb position first, and if this is inadequate, gradually add the strong position. Thus the use of weak/strong thumb is analogous to TU/TO; you do not usually use them in their extreme pure forms; they are generally used in combination, somewhere between the two extremes.

Most of us are accustomed to thinking of the thumb as the strongest finger (that's why we use it to press thumb tacks); however, any other finger can overpower the thumb in its weak position, especially at higher speeds. Although many stronger pianists may seldom need the power thumb position, everyone should learn it because it facilitates balancing of all the fingers.

5.3 Pivoting for Legato TO: A pivoting action can be used to play legato TO. In this action, the fingers and hand are pivoted around the tip of the passed finger so that the passed finger stays on the key as long as possible. Thus in the TU motion, the thumb is brought under the hand to play legato, but in TO, instead of moving the thumb, you pivot the passed finger and hand around the fingertip for legato. For RH ascending scale, the pivoting motion results in a slight clockwise rotation of the forearm (supination), like in the glissando position. A good way to practice this is to play C major scale using 123123 . . . . fingering, practicing passing and pivoting of finger 3. Passing of black keys is easy in TO, so you need practice only for passing white keys. Similarly, you can practice passing the 4th finger using 12341234 . . . . fingering.

6. The Future of the Piano: the Digital Revolution

One development that is certain to dominate the piano universe is the ascent of the digital piano and electrification of piano performances. Electric guitars already dominate the guitar universe and electronic violins are gaining acceptance. By separating the mechanical action of the key drop from the process of audio generation, we now have a totally new paradigm for the piano. For example, everyone can now afford the sound of a 9-ft grand (or 12-ft or . . . . .). If modeling is used (Pianoteq), then there isn't even a limit on the size of the piano – a 24 ft piano, anyone? In the future, we should have half size or ¾ size pianos for youngsters (or those with small hands), just as for violins, that produce the sounds of a concert grand. There can also be pianos with oversize keys for those with fingers that are too large to fit between the black keys and each person can carry his personal piano around. In this regard, there is no reason why we cannot manufacture a piano with black keys that are narrow near the fallboard for pianists with fat fingers. A keyboard arranged in a quarter circle will have some advantages: (1) you can reach the highest and lowest notes simultaneously with ease, (2) small hands can reach more than a tenth by playing near the front tips of the keys while those with fat fingers will find plenty of space near the fallboard, (3) you can use a swivel chair instead of a long bench; the disadvantage is that there may not be enough space for two persons to play duets. New developments, such as modeling software (e.g. Pianoteq), will replace the memory intensive and relatively limited audio sampling methods. With modeling, a single digital will play Pleyel, Steinway, Yamaha, Boesendorfer, etc., pianos, and the software can run practically any digital.

We should also be realistic and call the “acoustic” piano a mechanical piano. Both the mechanical and electronic pianos are acoustic. There is nothing non-acoustical about an electronic piano. The present usage of the “acoustic” piano terminology simply results from a sense of respect to give mechanical pianos a better sounding name, at the cost of a confusing terminology and an implied incorrect definition of “acoustic”. The upright mechanical piano is now basically obsolete except as a (expensive and heavy)

decorative furniture.

I certainly hope that the best grands in existence today will be available for the foreseeable future because they are the standards with which to compare the new technologies. But the present rate of development of the electronic pianos extrapolate to a time, soon, when electronic pianos will be used in concerts to great effect (we are not there yet), especially in concertos where mechanical pianos cannot compete with large orchestras. These developments will make the piano more popular and will be good for the piano industry. Pianists are finally freeing themselves from the old mechanical bondages and will be enjoying the new capabilities appropriate to today's artists. Animes and computer generated movies already compete with human actors for our enjoyment and computer generated voices (complete with librettos) are indistinguishable and, in some cases, sound better than actual human voices, with no limitations on pitch. The piano will not be left behind.

However, at this writing, in 2014, the best mechanicals still outperform even the most expensive digitals by a significant margin for concert pianists, especially for classical music. For non-concert pianists, digitals are now more than adequate in a large majority of cases and provide numerous useful features not available in mechanicals. Students should have no reservations about starting to learn piano on a digital, and teachers should not insist that the student acquire a mechanical piano until the student advances beyond intermediate levels. Note, in this case, that the main reason for the need to practice on mechanicals is that the pianist may have to perform on a mechanical. For advanced pianists, however, the superiority of the best mechanicals become paramount; buying a piano, then, becomes a very expensive proposition. Most uprights are inferior to good digitals that cost much less, although the cost of uprights have declined significantly, in order to remain competitive. Today's digitals are always preferable to any mechanical at the same price. In addition, purchasing and maintaining mechanicals are difficult and expensive compared to digitals (P. 179). Good digitals are so affordable compared to playable mechanicals today that it does not make any sense for beginners with limited budgets not to start with digitals. In fact there is now an bewildering array of excellent digitals to choose from, attesting to the viability of that industry. Fortunately, there are excellent reviews and comparisons on the internet that greatly simplify the selection/purchase process.

Digitals can provide many practice aids for acquiring technique that mechanicals can not. Thus, if you own a digital, it is very helpful to know what these aids are. Besides the well-known advantages such as practicing with head-phones in environments when producing sound creates problems (e.g., a small apartment at night), turning the volume down for those with hearing damage, composing (different instruments/voices), recording, lower purchase and maintenance costs, always in tune, choice of temperaments, smaller footprint, ease of purchase, predictable performance/quality, portability, etc., there are numerous features that can be incorporated into practice routines. Many digitals have adjustable "weight". In that case, technique is generally acquired fastest using the lightest weight. Since digitals have lighter key action weight than mechanicals in general, you may experience difficulty when you need to perform on a mechanical after acquiring technique on a digital. Thus, *after* acquiring technique at light weight setting, practice at the heaviest setting to make sure that you can also play on mechanicals. In some ways, the lighter actions and less expensive construction of digitals are less forgiving than good mechanicals, so that some pianists prefer to practice accuracy with digitals.

Looking into the future, it is already clear that mechanical pianos will eventually become obsolete. Today's best digitals try to emulate the feel of the best mechanicals because concert pianists must still perform on mechanicals. For example, even the feel of the repetitions in grand pianos are being emulated in the more expensive digitals. It is obvious that digitals will soon surpass the mechanicals in both sound and keyboard action. When that happens, the digitals will become free to develop on their own without having to emulate the mechanicals and will lead to new piano music that is free of the mechanicals' limitations. The mechanicals are limited by material and mechanical constraints of wood, metals, felts, etc., and their masses and momenta, making their actions too heavy for human hands. Lighter, faster action will make it easier to play (as demonstrated by Chopin and Horowitz) - today's digitals already have lighter action than

mechanicals. Of course, the weight of high quality mechanical actions can be adjusted to anything you want; however, their momenta, power, etc., cannot, so that the touch of mechanicals cannot be made arbitrarily light without losing some desirable properties. Even today's digitals with "adjustable weight" do not provide truly adjustable weight; they simply change the sensitivity to keydrop force in software which makes the action feel as if it is lighter; however, such "lightness" does not make the action easier to play. Future digitals will have true adjustable weight, something the mechanicals cannot hope to achieve. Thus digitals have all the advantages for future developments. Already, almost all digitals produce the sounds of concert grands and the quality of the sounds are so high that the more expensive models are sold with subwoofers.

In particular, future digitals will have far superior action compared to mechanicals because they will be free of materials limitations (piano size, wood, leather, felt, etc.) and the limitations imposed by the need to emulate the actions of mechanicals. In that future date, professional musicians will never perform on mechanicals because they will be considered to be obsolete collectors' items, and their actions will be so "clunky" that professionals will be unable to perform on them as they can on digitals. The feel of the grand repetition action will not be needed any more. There is a slight chance that the repetition type feel is beneficial to technique; in that case it (or an improved version of it) can easily be added to electronic actions. Unfortunately, the art of piano tuning and regulation will disappear from lack of demand, and this will accelerate the transition to performances on electronics. In fact, this transition has already occurred for some popular music genres. Because there is no way to decrease the cost of quality mechanicals (they will probably increase), while the digitals advance in leaps and bounds while falling in price, economic forces will also accelerate the decline of mechanicals. We will certainly see, one day, when a brave pianist will perform a Beethoven piano concerto on an electronic piano. This will probably first happen at a facility that cannot afford a playable mechanical.

One unfortunate property of digitals is that they will not last a hundred years, as good mechanicals do (with maintenance). However, because digitals are so affordable, and better features are incorporated practically every year, most pianists will be buying new pianos about as frequently as new cars.

Pianoteq: https://www.pianoteq.com

7. Defining Science and the Scientific Method

Near the bottom of P. 203, I wrote "I have had endless discussions with scientists and non-scientists about how to define science . . . . ." , obviously without much agreement. I had wondered all my life about why the definition of what seems so simple was so controversial. This dilemma was embarrassing to me because I am a scientist. I have finally solved that riddle! The definition of anything depends on (1) the person defining it, (2) the person for whom it is intended and (3) the purpose for which the definition was created. For example, to a cook in a diner, an omelet is something he makes and sells; to a customer, it is something to eat for breakfast. Except for scientific terminology (which can include musical terms) defined for specific purposes, relatively few definitions have universal applicability. Therefore, no matter how you define anything, *someone* is going to find it objectionable, in addition to the fact that defining anything correctly for any specific set of circumstances is difficult enough.

Science, in its broadest sense, is the study of the universe (or truth) and is therefore infinitely complex. Such a definition is of no use to a person trying to learn piano practice methods. The definition needed in this book is one which explains the relevance of science to piano practice. To that end, the definition I chose seems quite appropriate: "a scientific method is any method that works". That is, you don't need to be a scientist to use science – in fact, *everyone* already uses scientific methods every day. Then I listed the specific (scientific) methods that help to achieve this goal of finding methods that work (P.

204). Few methods are either scientific or non-scientific; we live in an imperfect grey world in which a procedure can only be more scientific than another. Thus the belief that science is absolute truth and that science is only for the super intelligent are misconceptions. My message is that science allows ordinary folks to do what was perviously impossible or difficult. That is how I used scientific methods in this book.

My attempt at a scientific approach is not the first and is an imperfect one at best. Let's look at the historical imperfection of science itself and compare it to the history of piano pedagogy to see what we might expect of piano pedagogy in the future if scientific methods were more widely applied -- we expect similarities between the evolution of science and that of music because both evolved as new discoveries were made.

Before Columbus's time (1451-1506), the flat earth scientists dominated and no one knew anything about gravity. Jesus knew that the tides were related to the phases of the moon (because he was a fisherman), but he had no idea what the moon was or the existence of gravity that affected the tides. Newton (1643-1727) subsequently worked out some of the early laws of physics, thus correcting numerous old misconceptions. Einstein then showed that Newton was wrong because nothing can travel faster than the speed of light and you had to use relativity theory. Newton's theory led to equation (1) below, for the energy "E" of an object with mass "m" moving at velocity "v", but Einstein showed that the correct equation was (2) at the velocity of light "c":

(1) $E = (1/2)mv^2 = (1/2)mc^2$ Newton

(2) $E = mc^2$ Einstein

Newton was off by only a factor of two without knowing anything about relativity! Of course, when $v<<c$, both relativity and Newton agree and the complex relativistic equation simplifies to Eq. (1).

Then came quantum mechanics which proved that neither Newton's equations nor relativity could explain what happens at the atomic scale. Quantum mechanics is still not totally understood, so that brings us to the forefront of science as it exists today. Physicists still do not understand such everyday things as time, mass, and gravity. Thus there are as many questions today as in the days of the flat earth, although we know much more and can routinely perform feats that would have been considered miracles in Jesus's time. Perhaps better understandings of dark energy, dark matter, black holes, string theory, etc., might shed some light on those questions. Nonetheless, the progress made in physics in such a short time, while music almost stood still by comparison, is nothing short of embarrassing. Imagine what musicians might be doing today if progress, similar to science, were made in musicology. Some progress has already been made, since the dawn of the internet age, but the biggest advances are yet to follow.

How does piano pedagogy compare to this timeline of scientific development? Hanon and Czerny might represent the flat earth times because of the large number of obvious misconceptions; in fact, from an evolutionary point of view, Bach was ahead of them. This is an illustration of a major problem in music pedagogy because it evolved backwards as well as forwards -- a problem that scientific methods are designed to avoid. Publication of my book might bring us to the time of Newton, when many everyday problems were solved. Thus there is still much serious research that needs to be conducted and we can expect some very important improvements still to be discovered in music. The inefficient, time-consuming practice routines of the past had prevented musicians from getting a broader education outside of music and even the major conservatories have not made any significant advances in music pedagogy for over a century. With the advent of improved education, musicians can now conduct more research and reap the rewards of the scientific approach which so many musicians of the past have attempted, but failed because of a lack of education and total dependence on "talent". Progress cannot be stopped -- it is only a matter of time when scientific methods will propel music into the future and those with the courage and initiative to do what needs to be done will reap the rewards of greater efficiency and deeper understanding.

The main elements of scientific methods have been discussed starting on P. 203, and will not be repeated here. Of course, each topic was only briefly discussed (P. 203), and when fully expanded, each can become an entire chapter. For example, *documentation* is a wide, complex field and is profoundly important. Even assuming that an idea was written down (which was often not done in piano pedagogy),

without proper documentation procedures, the same idea can be repeated in a hundred publications with as many variations, thus making it difficult to know which is the correct one and where to find it. In scientific documentation, authors must research previous work and *reference* it if an idea had already been discussed or the author can correct mistakes or improve upon the idea after referencing previous work. This creates a single chain of improvements leading to the best version available at any given time and prevents the proliferation of hundreds of books all saying similar (or contradictory!) things. This is why my book reviews note if there are references; books without references are not scientific. Yet the majority of books on piano lack references. The concept of referencing is somewhat foreign to musicians. In music, you want to compose as many different pieces of music as possible but, in scientific documentation, you want to distill everything into as few publications as possible.

On P. 17, I wrote, "*For years, I had been applying (these practice methods) with good, but not remarkable results. I experienced my first awakening after finishing (my 1994) book, when I really read my own book and followed the methods systematically – and experienced their incredible efficacy. So, what was the difference between knowing parts of the method and reading a book*?" The difference was that the book was written scientifically, and the methods were subjected to scientific scrutiny, complete with theories of why things work or not, and developing a better *understanding* of the underlying principles (instead of cook-book type recipes). I wrote as a trained scientist. Thus the scientific approach is central to the success of the book, and distinguishes it from practically every other book on learning to play the piano. Complex concepts can then be discussed concisely and accurately because each idea or relevant item is defined precisely (parallel sets, HS practice, glissando motion, hand motions, post practice improvement, speed walls, mental play, etc.). Without these definitions, we don't even have a language with which to discuss advanced concepts in piano practice.

In defining the scientific method, we must realize that, in today's technological age, everyone is a scientist to a greater degree than many of us realize because so much science has become a routine part of everyday life. If an average fifth grader today were time ported five thousand years back and wrote down all the science he knows, he would have been recorded in history as the greatest scientist genius that ever lived. In discussing science, one remark I hear too frequently goes something like "I'm not smart enough for science", which only reveals a lack of understanding of what science is. What that speaker is obviously implying is that he thinks he is not smart enough to becoming a scientist. But practically everyone who studies science does not become a scientist! Everyone studies science to empower themselves, to be able to do things they couldn't do before, to solve problems and to simplify life. Thus not studying science because the person is not smart enough makes no sense because it is the same as saying that you are not smart enough to go to school. The more one has difficulty in figuring things out, the more he needs science to figure it out for him. Thus it is important to distinguish the two reasons why we study science: (1) to become a scientist and (2) to simplify life; this latter reason is what we are talking about here. Of course, there is the third possibility: that you learn science to do difficult things that most people cannot do; but we are not asking that of pianists, who have already committed to study piano and simply need better ways to learn. The science we are talking about is far simpler than what is needed to become a concert pianist.

Pianists have historically had a valid excuse for not studying science. Piano pedagogy was so inefficient that, even devoting all available time to piano practice was not enough, leaving no time for learning anything else. Thus the advent of more efficient learning methods will produce an unstable equilibrium, a run-away positive feedback loop whereby more efficient methods lead to more time available for study and research which leads to more efficient practice methods, leading to better teachers, etc. Thus this transformation can conceivably occur in about one generation of teachers, if conservatories and teachers begin to understand this evolutionary process. This hopeful future is hindered by a vicious cycle of inefficient pedagogy leaving no time for extra education, leading to poor teachers, leading to inefficient teachings, etc. The way to break this vicious cycle is for students to research the efficient methods on their own, for a few good teachers to start using the efficient methods and attracting all the students, and for a few progressive conservatories to start this revolution and leave all others in the dust of competition.

Perhaps the greatest discoveries in music will come from brain studies and neuroscience. Music conservatories must take the initiative to research music scientifically and apply knowledge-based methods of teaching. Sadly, neuroscientists today know more about the musical brain than conservatory professors (Levitin). Instead of assuming that you must be a genius to be a musician (which discourages any research), we must research how to make musicians into geniuses.

Darwin's voyages have now been replaced by molecular science, alchemy has evolved into today's chemistry based on quantum mechanics, economists now routinely use advanced mathematics, and philosophy evolved into physics and cosmology which cannot exist without the highest mathematics. Yet music pedagogy has changed little in centuries. It is now time for musicians to take advantage of the inescapable advances achievable using scientific methods for performing miracles daily that even writers of the bible could not have imagined.

8. How to Teach Piano

This book provides most of the basic information needed to teach piano. Here we outline a specific procedure so that interested teachers can find all the components and see how they fit together.

(1) Every teacher must have a computer and be able to email and access the internet. That is, communications among teachers and constant education are necessary ingredients of a teaching profession. A smart phone can be an acceptable substitute, and it can often be tethered to a computer, so that a separate internet line may not be necessary.

(2) A text book, such as this book, should be used so that teachers can assign relevant pages to read for the students and parents. Ideally, there should be several standardized textbooks for each level of student, and this will surely become available in the near future. All basics taught in the lessons should be in the textbook(s). For young students, the parents must also read the same textbooks.

(3) Next, the teacher must decide what to teach; these topics include:
Reading,
Memorizing,
Musical notations and elements of music theory (scales, intervals, chords), and the circle of 5ths,
Key and time signatures,
Rhythms,
Technique development methods (practice methods of sections I to III of Chapter One),
Relaxation,
Fake books, chord progressions, improvisation, etc.,
Mental Play and music composition (dictation),
Absolute pitch,
Performance skills, including control of nervousness using mental play,
Temperament (elements of piano tuning), and most importantly,
Musicality.

Students can be taught from age two. For those younger than age 4, an important component of lessons is listening to all the major compositions from Bach to Chopin, etc., including piano concertos and symphonies. Yes; no child is "too young" for Chopin! This can be achieved by playing the music while teaching the students to read music or theory, or even when they are doing school assignments or other work. Classical music has a beneficial effect when engaged in school work. The teacher can also play pieces, such as Chopin's raindrop prelude, and explain the music as it is played (drops of rain falling, an oncoming storm, etc.). While playing symphonies, the teacher can point out various instruments by showing pictures of each instrument. Parents should be encouraged to let the students listen to a list of good

music and the teacher should have a set of such music (DVDs, internet sites) ready to lend to the parents.

8.1 The First Lesson

The first lesson is important because (1) it sets the tone for all following lessons and informs the students and parents what is taught, (2) the student is evaluated during this lesson, and (3) the type of piano available for practice should be discussed.

At the end of this first lesson, the teacher should be able to tell the parents what the students need to be taught and how much the students already know and where the students stand relative to others of similar age. This lesson can be as long as 2 hours even for youngsters down to age 6, and should be broken up into two or three sessions with breaks in between for rest and snacks. Obviously, the parents must attend this session and also be informed whether they should also attend the following lessons (which will depend on many factors, such as how busy the parents are, how much music they know, the degree with which they are involved in their children's education, etc.) and what the parents need to do at home to help the student's development. The parents must set up a specific time each day for the student's practice and monitor the student's progress. Here are the three sections of the first lesson:

(1) The beginning session consists mainly of discussions with parents and student. The teacher discusses how learning piano raises the effective intelligence and improves memory. How these teaching methods are different from the old (intuitive) methods, with much faster progress and more relevant music to play, bypassing most exercises such as Hanon and Czerny. Education, musicality, and performance (making music) are the main objectives. The concepts of Mental Play, absolute pitch, learning tricks, musicality and controlling nervousness are explained briefly, why they are necessary, and how they all fit into the program of teaching. Finally, the benefits of such a piano education are explained, such as learning project management, brain development, and preparation for better performance in school, at home, and at work. Elements of teaching talent and genius should be discussed. Take your time to make sure all the major concepts are fully understood; this may take close to an hour, so plan for a break here.

(2) The student is evaluated in the second part. Teach the student a well known duet, such as Chopsticks. The teacher first plays the melody part and the student the accompaniment. Test the following:

1. Learning ability, learning rate: can the student learn the accompaniment quickly?
2. Rhythm: explain waltz (Chopsticks); check for rhythm ability, accuracy.
3. Communication: play softer or louder, faster or slower, see if the student can follow by just listening to your play, without your telling her/im to follow you -- can you communicate with the student using music alone? This tests the student's ability to communicate using music.
4. If the student can learn the accompaniment, change parts and teach the student the melody part; this will be a harder test of learning ability. Use hands separate, segmental practice, etc. Now you can immediately show the parents that the student can play both the accompaniment and the melody in the first lesson! Now for some home work.
5. Teach C Major scale, using doremi, from middle C, how to pass the thumb (TU). This must be practiced for the next lesson.
6. Check for pitch capability (relative pitch) by letting student sing the notes.
7. Check for absolute pitch. Sometimes, this is the first time that the students or parents find out that a student has absolute pitch!
8. Assignment: most students (especially parents) already know the melody to the doremi song from the movie Sound of Music. Give the student the assignment of figuring out how to sing the song using doremi instead of the lyrics. Play the melody several times to make sure that the student knows it. The assignment is that the student should be able to sing it using doremi in the next lesson: do-re-mi,-do-mi-do-mi,-re. . . . .etc.

(3) If appropriate, discuss what type of piano to use for practice. In general, electronic pianos are best for beginners unless they already have a piano. Most home mechanical pianos are out of tune and will destroy the students' absolute pitch and are not adequately maintained. By the time the students are good enough to require a mechanical piano, they will need a high quality grand, which is not needed for beginner students.

Finally, the teacher gives an assessment of the students' abilities: learning rate, rhythm, RP, AP, communication, mental maturity: what the students lack, what they know.

8.2 Subsequent Lessons

Most teachers will have their own teaching routines for subsequent lessons. The most important point is to start right away with meaningful music that can be performed in preparation for the student's first performance. Mental Play (MP) and absolute pitch (AP) should be taught as soon as possible, preferably from lesson #1.

Nervousness is best controlled by assigning readily playable pieces for that specific student, and using Mental Play (MP). Controlling stage fright must be discussed and taught just as anything else in a piano lesson. The emphasis must be on classical music but popular music, and improvisation, should also be taught from the very beginning; this will help greatly with controlling nervousness and practicing performing and learning music that is more easily understood by a majority of today's population. There is always the tendency to assign the most difficult piece that a student can handle for performances, but this is exactly the wrong approach. The desire to perform more difficult pieces should come from the *student*, not as part of the teaching program. Students should be informed that nervousness is a normal consequence of inadequate preparation (including a lack of education on nervousness), and be given an outline of the program that will be followed for learning to control it, starting with MP, good memorizing techniques, and adequate technique. Students should be evaluated for susceptibility to nervousness and be informed on where they stand with respect to others because some are not nervous at all while others get terribly nervous under the same circumstances.

Today, MP is still difficult to teach because this is the first time that it has been included as an integral and major component of piano education and the teaching protocols have not been established and tested. Because MP occurs in the students' minds, it is difficult for the teacher to evaluate it, just as rhythm and counting are difficult to evaluate without a piano unless the students are asked to count vocally or make hand motions. One good way to teach MP is to teach dictation and photographic memory. The teacher can ask the student to write out a few bars of the lesson piece, at some randomly chosen point. Of course, the best evidence for good MP is music composition, so it should be encouraged as the student begins to compose. Formal composition lessons are not needed until the student asks for them, when they feel the need for help to achieve certain musical objectives. Playing modern music, especially improvisation and playing from fake books, is also a good way to practice MP.

Absolute pitch should also be taught, see 8.2. The best way to teach absolute pitch (AP) is to begin by accepting the fact that at least 90% of students will eventually learn it; the past misconception that AP is possible only for a gifted few is the greatest hindrance to teaching AP; it is already routinely taught in some music (piano) schools today to all students. Since many piano teachers had not been taught AP, their young students will learn AP faster than the teachers, and those teachers must accept that fact and nevertheless teach AP -- teachers without AP can teach it just as well as those who have AP. Of course, teachers without AP should immediately start practicing it, which will give them a better idea of how to teach it. Every lesson should include a session on AP.

The first lesson described above was very long, about 2 hours. Subsequent lessons should be shorter -- much shorter for the youngest students (less than 4 yrs old), 15 - 20 min., but as frequently as possible, 2 to 3 times a week; if this is not possible, break up the lesson into several short sessions with

breaks in between. For more advanced students, because there is so much to be taught, lessons often go more than 1 hour.

9. Project Management

There are only a few basic rules for project management (PM); what makes PM complex is the fact that it is knowledge based. As you might expect, the success of any project depends on your relevant knowledge base. Therefore we discuss here the basic framework and some examples and classes of useful knowledge. We also look at some illustrative examples.

9.1 Basic Rules

(1) Any project must have a *plan*; one based on knowledge of what is needed to start, execute (with test and modify), finalize, and maintain the project after the it is completed. It must have a clearly defined *objective* and a *time table* for each stage. In order to create a viable plan, you must first gather all the information needed to successfully complete the project.

(2) Start: there is no universally applicable starting plan for all projects. The start is usually the most important part of the project because it is determined by everything that follows and therefore reflects the main plan of action for the project. The wrong start can doom a project from the beginning. Therefore, in order to know how to start, you must know how you are going to execute, finalize, and maintain.

(3) Execution: there are certain rules governing execution:

1. Never try the impossible; or equivalently, work in manageable chunks -- even easy chunks, if possible. In general, successive chunks should be contiguous.
2. Make sure that each chunk is finished before going on to the next one, or at least have a plan that will ensure successful finishing of that chunk. Practically all chunks of a project support each other; this is one reason why they should be contiguous.
3. This is the stage at which knowledge of the system you are working on is paramount. Every system has knowledge or experience based "tricks" that lead to success. Any level of education is helpful here because education not only provides knowledge, but also teaches how to search for knowledge.
4. The project must pass periodic tests to see if it is progressing according to plan and even the best laid plans often need to be modified or improved.

(4) Finalize: this is where many projects fail, either because of insufficient planning or because of faulty execution. Most failures occur due to incorrect assumptions, unattainable goals, or insufficient/wrong knowledge base. Again, education is important here because it gives you the knowledge needed to evaluate your assumptions, knowledge base, etc. In order to be able to finalize a project, you must have a precise definition of what it means to achieve the goal of the project, and to do this in the time according to the original plan.

(5) Maintenance: few projects are finished and then abandoned; worthwhile projects produce products that are useful for a long time and therefore require maintenance. This maintenance schedule must therefore be an integral part of the original project.

9.2 Example: Learning Absolute Pitch

Suppose that you had decided that you must learn Mental Play (MP) and that Absolute Pitch (AP) was absolutely necessary for MP. So you embark on a project to learn AP. One such project is outlined starting on P. 155. In this project, you do not practice AP as such, but acquire it as part of a memory and

MP process. The idea here is that you acquire AP (effortlessly!) as a byproduct of practicing MP. Thus it becomes a long term project with no deadline pressures but with the disadvantage that there will be no clear idea of when you will acquire AP; unfortunately, this violates a major project management principle (see 8.1). However, this procedure works for the very young (less than about 6 yrs old), because they learn AP so quickly that a deadline becomes meaningless. For older adults, it can take a long time, and can become frustrating; it may take years for those over 60 years old, while a 2 year old might learn it in a day.

The first order of business is to learn relative pitch (RP). Without it, you will not have enough pitch recognition ability to even start practicing AP. Therefore, if you encounter difficulties in acquiring AP, check and make sure that your RP is good. Play middle C, then imagine its octave, fifth, fourth, major third, minor third, full tone, and semitone (in decreasing order of importance), and check each one on the piano. That is, practice the octave first, until you become good at it, then the fifth, etc. It might take you days or more just to get the octave. Because you will most likely start learning AP using the C major scale, test your RP using this scale (white keys). Learn the black keys after you have acquired AP with the C major scale. Do not practice other scales at this time as will be explained below (paragraph on memory confusion). In practicing RP, it is most important to practice the octave, as this will allow you to acquire AP on all the notes of the piano by acquiring AP in just one octave.

AP is learned in one of two ways: (a) learn one note, or (b) learn a series of notes such as a scale, or a "simple" composition such as a Bach Invention (simple because it is based on parallel sets, P. 197), as outlined from P. 157. Obviously, AP practice must be combined with MP practice. After some practice period, your AP accuracy should improve gradually. This period will vary greatly (from a week to over several years) depending on the person, and on age.

Many become frustrated when progress is slower than expected and begin to fear that they will never get it. It is important to understand why progress is slow. AP is a type of memory, so if you can memorize a Bach Invention, you can attain AP. It is also similar to memory because in memory, the failure to memorize is not because the memory is not in the brain (it is permanently in the brain after hearing it only once), but because it cannot be recalled. So what is the cause of the failure to recall? It is confusion -- instead of recalling the correct answer, the brain either recalls the wrong one or follows a recognition path that leads to nowhere. This tends to happen when there are many wrong recall paths already in the brain. This explains why youngsters learn AP so fast -- there are few other paths in a young brain. Once the AP path is established in a young brain, it tends to get reinforced so that it remains dominant as long as AP is maintained.

This explanation of recall may also explain why the subconscious can often recall something that the conscious could not. When the conscious fails a recall, it reinforces this wrong path every time it tries to recall the same thing (and fails), making it harder to recall the correct answer. The subconscious is not used for establishing new memory, so that its search process does not reinforce the wrong search paths. So it can search more paths without getting stuck on one as the conscious does.

In older adults, chances of confusion increases because adults have heard so many wrong notes and different musics that the correct recall path becomes one of thousands of other possibilities and the chances of the brain locating the correct one becomes extremely small. This reasoning teaches us that, in order to acquire AP as quickly as possible, you must avoid as much of these confusing musical sounds as possible, and listen only to those sounds that you are using to practice AP. Therefore, one reason that your progress is slow may be that you are listening to too many other sounds between AP practice sessions.

Unless you are a singer, it is not a good idea to try to hum the notes while practicing AP because untrained singers will tend to sing off-key, tending to be flat for high notes and sharp for low notes. There is nothing wrong with learning to hum on tune, but that is best done after acquiring AP, because humming off tune will confuse your AP. Another advantage of not humming is that part of practicing AP is practicing mental play. Thus by not humming, you are also practicing pure mental play. Play a note on the piano, then try to hum it accurately -- some will find this to be very difficult. In that case, do not hum while practicing AP. It is generally much easier to learn to "picture" the note more accurately in the mind, just as you hear it

from the piano.

If, in spite of tremendous efforts, AP cannot be acquired, it is not productive to keep trying and building up frustration, because you are only building more confusion, similarly to building a speed wall or fast play degradation (P. 64). It is best to give the effort a rest, stop practicing and then restart some time later (usually over 2-3 months later). You should find that progress is much faster the second time around and the frustration level will be much lower. At this time, it is also important to re-read all the instructions for acquiring AP.

9.3 Example: Lawn Care: A Weed Free Lawn

Although this subject is not related to piano, it is an excellent example of good Project Management; in fact, I learned a lot of project management principles, that are used in this book, while weeding my yards. The article is quite long, and is on my Wisdom World site.

10. New Methods, Explanations and Discoveries of this Book

Although the major objective in writing this book was assembling the relevant information and organizing them into a useful structure, I also made some new discoveries that are not discussed anywhere else in the literature. I have listed these new elements in this section.

1. Mental Play must be taught as a major component of piano lessons.
2. How to control nervousness must also be taught, using Mental Play, memory methods, and efficient technique acquisition.
3. The concept of Parallel Sets is generalized and explained; it is at once a diagnostic tool, and a means of solving technical problems.
4. Bach's Inventions are based on Parallel Sets.
5. Genius can be taught (memorizing, Mental Play, absolute pitch, learning tricks and efficient practice methods); teaching efficient technique acquisition is the key element in creating geniuses and is most effective at the youngest ages; music composition is a natural consequence of this process.
6. Music is an Algorithm for Memory.
7. Why Gravity is the Basic Force in the Arm Weight Method.
8. A list of the disadvantages of Hanon type exercises.
9. Explanations of the ineffectiveness of intuitive methods and the counter-intuitive nature of the correct practice methods.
10. There are simple microstructures in music such as the use of repetitive small units of just a few notes. Although this has been known for a long time, my point is that microstructure analysis is a necessary first step in analyzing music (and eventually answering the question "what makes music, music?"), because it leads to the second step, which is to explore the question "what are the relationships between these units that create the music?" Part of the answer seems to lie in the fact that harmonies and certain chord progressions follow the simplest mathematical relationships that are especially easily processed in the human auditory system, which is based on the logarithmic nature of auditory processing. This theory also explains why dissonances and certain chord progressions are unpleasant (because there is no simple way to process them in the brain).
11. The starting "arpeggio" of Beethoven's Appassionata is a schematized, inverted form of his main theme, which starts at bar 35 (P. 70). This "arpeggio" is played in double octaves to increase the "stretch" (tuning; Addendum *Theory of Music,* P.
12. Explanation of how the beginning of Beethoven's 5th symphony (and Appassionata, 1st

movement, bars 235-239) fits into group theory (P. 209).

13. The first movement of Beethoven's Appassionata is composed almost entirely of modified forms of the fate motif of his 5th symphony.

14. The two speeds for the fast sections (first and third) of Chopin's Fantaisie Impromptu straddle the vibration/sound transition, suggesting that Chopin may have heard this effect (P. 74-5). Even Chopin may not have been able to produce the second sound, but he almost certainly noticed that, at the higher speed, the multiplication effect disappears.

11. Theory of Music: With illustrations from Beethoven's Sonatas

12. Disadvantages of Learning Piano

By now, we have seen enough reasons why learning piano is so beneficial; but, are there disadvantages? Of course there are, and turning a blind eye on them only hurts the pianist. The biggest disadvantage is **lack of education.** A youngster starting to learn piano seriously must make the agonizing decision between education in language, economy, science, mathematics, information technology, or engineering, etc., etc., and her/is love of music. It is no surprise that many rational, intelligent youngsters opt out of music. Every parent and potential musician must address this question because the wrong decisions can lead to a life of unnecessary hardships and failures, even if the music part is reasonably successful.

An accomplished pianist is frequently in an untenable situation in which he is viewed as “talented” or even “genius”, yet is at a distinct disadvantage in fields outside music. Thus interviews and books by accomplished musicians often become self-serving vehicles with no meaningful content, because a rounded education is needed for meaningful discussions on advanced topics. There is generally an embarrassing gap between the general educational levels of concert-pianists/piano-teachers and their exalted positions as gifted individuals. Why does this happen? Because the inefficient teaching methods do not leave enough time for aspiring pianists to learn anything else but piano. Most conservatories specialize only in music and have negligibly small departments providing non-music education. Conversely, large, well-established universities generally have relatively small music departments. This situation has to reverse if we are to produce musicians who can navigate in developed countries. In today's more efficient society, this does not have to be, and there certainly have been exceptions in the past to this generality, and these “exceptions” have been increasing with acceptance of improved teaching methods.

It is no surprise that learning piano can raise the IQ if done properly, but can lower the IQ and prevent the students from getting their much needed education, if done improperly. This is why it is so important to know what “done properly” means.

Thus the key to not falling victim to disadvantages of learning piano is to find efficient learning methods so that the student has time to study other skills needed in modern society. This means standardized textbooks and teaching methods, and application of scientific methods of pedagogy, something which has been recognized since the beginning of piano teaching, but has not been fully executed in the past (e.g., Whiteside - P. 249, Prokop - P. 246, etc.). It is my hope that this book is a significant contribution to that effort.

Book Reviews (Click here for links to Amazon Books)

Bailie, Eleanor, "Chopin: The Pianist's Repertoire, A Graded Practical Guide", Kahn & Averill, London, 1998, 573P., index of persons mentioned in the book, bibliography, index of Chopin works. Strangely, there is nothing in the book (or anywhere else) about Eleanor Bailie herself. **Recommended**

A monumental compendium (573 pages!) of practically all information available on Chopin's works, from history to technical details and interpretation.

Starts with brief reviews of general technical issues (especially as they apply to Chopin), but is not an organized textbook for learning piano. Examples: Play Bach to prepare for recitals, Chopin's music originates in Mozart. Pianissimo more important than FF. Importance of strict rhythm, especially in LH. Chopin's fingering and pedaling, especially the soft pedal. There is a section titled "Chopin's Teaching" but it contains little of substance; instead she defers to Eigeldinger's (P. 23-64) summary.

The main body of the book is the ~500 pages of comments on each composition. Hidden within these comments are numerous hints on how to practice, which is obviously valuable for anyone trying to learn these pieces; moreover, a compendium of all these hints would have produced one of the best textbooks on correct piano practice methods. Thus this book is much more useful to pianists than Eigeldinger.

Cook, Charles, "Playing the Piano for Pleasure, The Classic Guide to Improving Skills through Practice and Discipline", Skyhorse Publishing, 2011, 187 P., no index, has list of "books consulted". **Not Recommended**

The skimpy Table of Contents and lack of an index makes it almost impossible to find any specific topic in this book; suggest that you write notes (with page numbers) the first time you read through it. Some good advice mixed with some now discredited concepts. Read my FOPP book before reading this one so that you can distinguish between the useful and questionable advice. This is an update of a 1960 edition and reads like some newer ideas grafted onto old, incorrect beliefs. Mainly for adults, including beginners.

Written from the point of view of amateurs, defined as non-professional pianists who do not routinely have to perform on demand. This reduces the demands on practice time and technical skills and makes it easier to make piano playing pleasurable - thus the title. However, in order to maintain the type of repertoire he suggests (which is critical to success), the amateur must practice an hour every day. This is understandable; compared to a hand that has not played for a week, a well conditioned hand (same person, practicing every day) will perform miracles (my observation - he does not explicitly state this).

Written by a (music) reporter for The New Yorker, with a serious piano hobby and who had interviewed Horowitz, Hofman, Schnabel, Arrau, Rosenthal, Brailowsky, etc. Researched piano learning methods by consulting writings by famous pianists. An excellent example of how a serious, diligent pianist/reporter can be brain washed by interviewing famous personnel who feed him self-serving statements that make them sound like geniuses but in reality contain no useful information or knowledge. Students and teachers of the "intuitive methods" (P. 28 in FOPP) fall for this and accept the intuitive methods religiously when they are not sufficiently informed. The famous artists who pour out these statements have little other choice because they do not know any better.

Some nuggets of info: amateur pianists comprise the single largest population of musicians; once you become a "good" amateur pianist, you realize that the "pros" are not that good, after all; practice softly; fast play can be bad and slow play is generally good for technique; scales and arpeggios are the foundation of technique; the more you memorize, the more you can memorize; use "memory aids" P. 83; some famous pianists have never really used exercises to become proficient. No need to practice Czerny. Many others.

Some misguided advice: P. 113 - technique = exercises = scales + arpeggios + Hanon! Stresses the importance of acquiring a sufficiently large repertoire and memorizing them, but gives no instructions on

how to do that (such as practice methods). P. 55 - don't memorize from the beginning. Many others.

As you can see, there are numerous contradictions in this book, a hallmark of uninformed/misinformed teaching methods.

Cortot, Alfred, "Rational principles of pianoforte technique", Salabert Editions, 1930 (!), Paris, France, English translation; 102 P., Table of Contents (labeled "Index"), no bibliography or index. The translation from French is horrible; reads like a translation produced by a computer translation software with no knowledge of piano terminology. **Not Recommended**

Bad: The title is misleading because this book is just a book of exercises, reflecting on the lack of understanding concerning "exercises" almost a hundred years ago. It was written because, by the 1920s, there was effectively an infinity of exercises for piano students, presenting the dilemma "WHICH exercise to use?" Cortot decided to reduce this "infinity" to the smallest set possible, but still needed 102 pages. Obviously, it was written during the height of the period of exercise craze, before piano teachers began to realize (slowly - hasn't completely ended yet!) that exercises are mostly a waste of time, is mostand have numerous disadvantages such as loss of musicality (Cortot was aware of this), development of brain laziness, a general loss of the understanding of what it means to practice and make music, etc.

This book is also way out of date; it discusses Thumb Under (TU) as a very essential part of fingering compared to previous fingerings using only 4 fingers! There is no mention of Thumb Over (TO), which is unconscionable because Cortot's group of French pianists claimed to teach the "Franz Liszt Method" and a few pianists were already aware that Liszt used TO. Use of the thumb also leading to wider reaches (P. 60), even exceeding one octave! Reads like the history of piano that is just emerging from the dark ages and into the Renaissance and far from contemporary (but that doesn't mean there aren't useful ideas in it).

Filled with "conventional" advice that are now considered obsolete: unusual, difficult fingering exercises that are almost never encountered, "don't be discouraged by monotony of repetitions" - i. e. "exercise is not music" (P. 53), considers only finger, hand, & wrist motions (nothing else!), Quote (P. 72) "no teaching here (practically all teaching/learning left to teachers & students)", Czerny, etc., are necessary, etc.

Good: Describes method of sliding fingers from one note to next. Correct method of practice is soft play (P); in fact, one effective method is to touch the keys without depressing them. How to play 2 notes with the thumb. Good treatment of how to play glissando (wrist motion, black key gliss [P. 74-5]). There are 2 types of jumps, one skimming the keyboard surface, the other raising to shoulder height, because both are needed for hand crossing. Stresses the importance of repeat notes, and their relationships to tremolos and octaves (this is topic 4 above!). Good descriptions of wrist and finger motions.

Humphries, Carl, "The Piano Handbook", Backbeat Books, San Francisco, CA, 2002, no references or index, 290 pages, and CD of lesson pieces; wire bound so that it can be placed flat on the music stand. **Recommended**

The most comprehensive book on learning the piano, from beginner to intermediate levels, covering all the genres from classic to modern. For more details, go to the Amazon page and read the Table of Contents and Preface. The Table of Contents does not list the beginning chapter on "The Story of the Piano" (30 pages of history with beautiful photos) and the final "Reference" section (30 pages!) on buying/maintaining pianos, musical terms, repertoire guide, listening guide, and recommended reading. Each lesson is complete with actual sheet music and some instructions on how to practice and details of interpretation, musical nomenclature/structure, theory, and basics.

The biggest drawback of this book, like practically every book on piano, is the insufficient information on practice methods. Actually, there is a lot embedded in the lessons, such as fore-arm rotation, relaxation, etc., as needed, but if you are looking for a specific method to solve a specific problem, how are you going to find it? Also missing are essential concepts such as thumb over, parallel sets, mental play,

memory methods, details of the jump, information on digital pianos, etc. Thus, in order to fully benefit from this book, you should read my FOPP book first. Then you will have a deeper understanding of what he is trying to teach and be able to master the lessons in much shorter time.

This book treats every genre equally: Bach Invention on P. 214 and ragtime (Joplin's Entertainer) on the next page! – a very musically healthy approach appropriate for today's students. This is a great companion to my FOPP book because: it covers beginner material, provides a complete piano education, explores most genres of music, and offers numerous suggestions for music to learn. Great value for the price, and a book that comes closest to getting a teacher.

Levitin, Daniel J., "This is Your Brain on Music", Dutton, NY. NY., 2006, 314P., bibliography, index.

General:

This book is characterized by the words: definitions, classifications, science, errors, and statistical/illustrative details, as explained in the following paragraph; overall, a good start in the neuroscience of music, but the difficulty of the subject matter (the human brain which is mostly not understood) is painfully obvious.

Appropriately for a scientific treatment of the neuroscience of music, all basic terminologies are defined and various subjects classified so as to enable precise communications (first 3rd of book). This definition and classification process is in itself an enormous scientific endeavor because you need a lot of knowledge in order to define anything in a scientifically meaningful way. There are descriptions of musical, neuroscientific, psychological, etc., experiments that spawn explanations and theories -- just what we look for in this book. Unfortunately, there are a few misinformations, errors and omissions that shouldn't be in a book published in 2006 which may cast doubts on the quality of the rest of the book. This was written for a wide audience with very different levels/types of education; it provides a glimpse into the community of neuroscientist musicians working to unravel the mysteries of music using modern science.

Details:

The Introduction asks some (very relevant) questions but gives no answers. The first chapter introduces and defines relevant terms and concepts such as pitch and timbre (pronounced tamber). The surprise is how, in defining the terminologies to their ultimate depth, you develop a deeper understanding of music which he makes crystal clear with lots of examples. Sample: pitch is detected by the ear's basilar membrane in proportionate scale (mathematicians would say logarithmic scale) which is similarly mapped onto the brain; this determines the nature of musical scales and harmonies (followed by examples).

There are "this is not known . . ." type of sentences throughout the book which is indicative of an expert in his field who knows the limits of our knowledge. Some statements are controversial: "Pitch is purely psychological . . .", while others are wrong: "the eye sees a continuum of colors (frequencies) . . ." (it actually sees combinations of discrete colors [determined by quantum mechanics], much like color TVs and printers and is therefore based on an absolute scale, unlike the ear). Or this innocuous sounding but totally uninformed statement ". . . most people cannot name the notes except for the one in 10,000 who have absolute pitch." Doesn't he know that absolute pitch is learned? The level of ignorance in some sections is inexcusable, P. 204:

"I recently asked the dean of one of the top music schools . . . at what point is emotion and expressivity taught? Her answer was that they aren't taught. There is so much to cover, repertoire, ensemble, etc., etc., etc., ... there simply isn't time to teach expressivity . . . . . some of them come in already knowing how to move a listener. . . . .etc."

Unbelievable! Yet, probably true of too many music schools; sad. Moreover, this book has no discussions of the correct/wrong practice methods and their effect on "talent", technique, and brain development.

Best treatment of rhythm that I have ever seen; Whitesides repeatedly emphasized the importance of rhythm, but never explained it. Rhythm is "a game of expectation" and is highly complex -- we find here the precise explanations, definitions and examples that were missing in Whitesides that tell us what rhythm

is, and how to create and execute it.

Loudness is also complex; the ear compresses loudness to prevent ear damage and the brain compensates by expanding it back, so that loudness response is logarithmic, just as frequency is in the ear. The brain has the capacity to increase sensitivity in order to detect small changes -- something composers exploit to great effect. Most properties of music are not orthogonal; e.g., variations in loudness can be used to create or alter the rhythm.

Gestalt psychology, systems neuroscience, SSIR (shared syntactic integration resource), functionalism, cognitive psychology, cognitive neuroscience, etc., have been involved in brain/music analysis. Music uses practically every part of the brain - more than language and probably predates it - and much of music is concerned with producing (musical) illusions. Modern scientific methods, such as the use of MRI and fMRI, are identifying which part of the brain is involved in certain functions. "Constructionists" and "Relationists" argue about the nature of memory, but basically, the brain's memory function is still a complete mystery. Known methods of music memory are far more advanced than the discussions in this book, another weak point.

The last section deals with effects of music from before birth, through childhood and adolescence, to sexual relationships.

This book is a strange amalgam of a musician scientist and a writer who had not completely grown out of the old, "intuitive" school of music.

Macmillan, Jenny, "Successful Practising: A Handbook for Pupils, Parents, and Music Teachers", Jenny Macmillan, Cambridge, 2010, 103P., excellent index, list of additional reading material, and references - a professional quality teaching manual. **Recommended**

An organized and structured textbook for learning piano, based on Project Management principles (and therefore has applicability not only to other instruments but also any project in general). A fairly comprehensive treatment of practice methods, including segmental and hands separate practice, outlining, Mental Play, performance preparation, etc. Suggestions for practice methods/planning for students, parents, and teachers.

Neuhaus, Heinrich, "The Art of Piano Playing", Kahn & Averill, London, 1993, 240P., index of pianists mentioned in the book, no references. **Recommended**

One of the best ways to see what one type of the "Russian School of Piano" represents (the "Russian School" is quite diverse because, historically, nothing in piano was well organized). Full of detailed descriptions of how to deal with advanced technical situations that can not be found in my book. However, in order to fully appreciate the benefits and pitfalls of Neuhaus, you should read my book first, as he rarely defines anything, there is no organizational structure in the book, and is written in the "artsy" style, an intuitive approach, but mostly in a good way -- the deep culture of the Russian School has built in some protections from the most obvious pitfalls. He is aware of, and tries to answer, critics that the Russian method is all work and unfriendly to those without talent. Nonetheless, he follows the established self-serving pattern of ascribing success to talent instead of telling us how it can be done. That is, you practically have to know what it is before you can find it in the book, if at all. Although he disavows this self-serving tendency on P. 22, he keeps falling into it. Perhaps the best example of this is the claim on P. 22 that hands separate practice is only for emergencies -- what an (un-intended) endorsement of this method from one of the world's most respected piano teachers!

He also makes fantabulous claims about what he can teach, but then follows with statements to the effect that they can't be written down in a book. But at least, this gives hope to the reader that he is aware of those dreams and that they have apparently been achieved. This is an improvement over sweeping everything under the talent rug. Because the book is not structured, and there is no useful index (only pianists' names), it is nearly impossible to find discussions on any specific topic, although it is probably somewhere in the book.

I will not go into the numerous gems in this book -- there are too many of them. This is a MUST READ for serious pianists, with the reservation that it is far from a scientific approach (which some may prefer because these are the very topics artists struggle with, spoken in their own language), but is densely packed with anecdotes and pointers from a lifetime of experience at the highest level of pianism. P. 16: "As for the piano, I was left to my own devices practically from the age of twelve" in spite of the fact that both of his parents were piano teachers. Beginners reading his book may feel the same way; he was never completely freed from the intuitive approach, from his youth to his death in 1964 (and including his book); but Russian culture and dedication gained him world respect.

Onishi, Aiko, "Pianism", Anima Press, 1996, 124P., index, no references; originally published in Japanese as "Approach to Pianism", Zen-On Press. **Recommended**

Tone (single note, etc.), technique, melody and harmony, interpretational expressions, exercises (stretching, finger lifting), learning new pieces, memory, imagery (of musical emotions), performing, teaching, pianistic analysis using Chopin, Debussy, Ravel. A compendium of correct methods by a well educated teacher.

Has clear discussions of Thumb Over (P. 27), use of Parallel Sets for practicing trills (P.33), double thirds (P. 33), repeated notes (P. 36), etc. Very concise, but profusely illustrated with diagrams and music examples. One of few books with instructions on how to practice. She comes close to, but does not discuss Mental Play.

Richard, Francois L., "Music in your head (Mental practice, how to memorize piano music)", FLR Music Resources, Texas, 2009, 30P., no index or references. **Recommended**

Mental Play, memorizing, ear training, chord progressions. Author is a pilot, aviation instructor, and pianist, living in the self-proclaimed Piano City, Fort Worth, TX, home of the Van Cliburn competitions. This is the first book I have found on clear step-by-step instructions on using Mental Play to memorize. Extremely brief, but concrete instructions with actual examples of music. Expensive: $23 for a 30 page paperback.

Sacks, Oliver, "Musicophilia, Tales of Music and the Brain", Vintage Books, Random House, NY, 2007, 425P., index, references (bibliography).

A most comprehensive and detailed compendium of accounts of the relationship between brain (human behavior) and music, written by one of the foremost experts in this field. Although the book is not organized in a structured arrangement, the extensive index and detailed Table of Contents make it possible to locate most of what you want in this enormous assemblage of accounts, observations, and analyses. Because the subject matter is so complex and inadequately researched and understood, there are almost no theories that underlie the observations or solutions to the problems addressed. However, all the hypotheses, popular theories, and possible explanations are discussed, as well as flat statements to the effect that the phenomenon is not understood – something only the experts can tell us.

This is a "What's out there" book from a phenomenological, medical point of view, not a "How to" book for music students or pianists. For example, in Part III, there is nothing about how to memorize music or how the brain accomplishes that task. There is precious little, if any, useful instructions on how to practice at the piano, although the headings in each Part sound so tantalizing. However, it is truly an eye opening experience to read, in vivid detail, about the enormous range of effects that music has on the brain. In almost every case, Oliver Sacks does not try to explain them, simply because the explanations aren't there, but he does tell us how far (or little) we understand them.

The entire book consists of case studies and detailed accounts of actual events and people involved with each of the topics listed in the Table of Contents:

Part I: Haunted by Music

1. A Bolt from the Blue: Sudden Musicophilia
2. A Strangely Familiar Feeling: Musical Seizures
3. Fear of Music: Musicogenic Epilepsy
4. Music on the Brain: Imagery and Imagination
5. Brain Worms, Sticky Music, and Catchy Tunes
6. Musical Hallucinations

Part II: A Range of Musicality
Sections 7-14
Part III: Memory, Movement and Music
Sections 15-22
Part IV: Emotion, Identity, and Music
Sections 23-29

Scoggin, Nancy, "Baron's AP Music Theory with Audio Compact Discs", Barron's Education Series, NY, 2010, 648P., index, no references. **Recommended**

An excellent, comprehensive starter book on music theory, composition.

Slenczynska, Ruth, "Music at Your Fingertips", Cornerstone Library, NY, 1976 (reprint of 1968 edition), 162P., no index or references.

By today's standards this book is somewhat outdated although it contains a lot of useful information. Statements like "The point I'm trying to make is that the pianistic problem doesn't exist that cannot be solved by determined imagination. No individual, no book, has all the answers. Many of the most important solutions are in *your* heart, *your* hands." do not help the student, is typical of the "intuitive method", and reveals a sorry lack of pedagogical education. It is not a well organized textbook for learning piano, but a set of opinions and experiences of a world renowned concert pianist. Click on the title above and look up the Table of Contents. Even this Table of Contents is not a good guide to what is inside because she picks and chooses what she thinks are important according to older traditions that do not address the topics that most students need. Although you may not be able to find what you want, reading the entire book and discarding what is obsolete will yield gems that confirm many of your suspicions, such as always playing with the lid open for a grand (P. 18) and "silent play" (P. 119), one way of practicing Mental Play. There are 9 pages of suggested repertoires of compositions, with each composition labeled from E (easy) to T(technical), discussions of suggested performance programs, and explanations of ornaments.

Stannard, Neil, "Piano Technique Demystified, Insights into Problem Solving", NoSuchThing Press, 2013, 120 P., no references or index, but has list of suggested reading books.

The author tries to make this reading lighthearted; consequently, about a quarter of the book consists of remarks not directly relevant to the subject matter; P. 32-33 are good examples of this, but will not be reproduced here as it will take too much space. The Introduction basically says: "You need practice methods!" Also, "You can't learn to play the piano just from a book and you can't teach someone to play the piano without one".

As befits a pianist/teacher familiar with the Taubman Method, he starts with explaining forearm rotation, but then proceeds to define movements such as shaping, grouping, in, out, over, under, etc., that have specific definitions that are initially difficult to grasp (impossible for beginners to reproduce, and not as all-important/effective as implied in this book – there are many other factors) which makes slogging through the pages mentally tiring and time consuming. Although most subjects of interest for solving problems (jumps, "Thumb Over" type play [P. 9], memorizing [P. 40], performance anxiety, relaxation,

etc.,) are discussed, they are too brief and many essential practice methods are missing, such as the continuity rule, parallel sets, mental play, post practice improvement, etc.

Most of these post-2010 publications are finally trying to emerge from the intuitive methods towards knowledge/methods based learning (but are not yet completely successful); examples: P. 38, Performance memory depends on hand memory, although other memories are also helpful (but these other methods are not fully explained); P. 26, the note just before the jump determines jump accuracy (but incomplete explanation of jumps); P. 38, memorize as much as possible (not quite there yet!), P. 43, Horowitz did not teach because he couldn't figure out how he learned (validates FOPP - P. 178), P. 45, performance anxiety – "take with you the idea of the music" (i.e., mental play); P. 70-73, Hanon and Czerny are basically useless; P. 105, 50 pointers on how to practice mostly Bach (and a few Mozart) pieces; etc. Clearly, he knows what the solutions are, but can't spell them out in sufficient detail (which may too difficult with such a relatively small book that covers as much material as he does). This is why this book is such a great companion to FOPP – it states the problems eloquently, and explores similar solutions to FOPP.

There are extensive examples of difficult fingerings that are fairly standard, mainly from Chopin, Beethoven, Mozart; he presents numerous examples from Bach, but does not mention the fact that most of the Bach examples he cites are for technique development of specific fingers and, therefore, fingerings should not be changed (from standard fingerings) to make them "easier" to play.

For more details, go to the Amazon link at top and see the Table of Contents.

Taylor, Harold, "The Pianist's Talent", Kahn & Averill, London, reprint 2009, 112P., no index, bibliography (20 books).

This book represents the "Alexander School of Piano" and makes fascinating reading for comparing it with other schools of piano pedagogy. I will highlight this comparison by comparing this book designated by (T) - for Taylor - with my book, designated (F) - for Fundamentals of Piano Practice. Before you read (T), you should read this review and (F); otherwise, you will miss a lot of information contained in (T) because unlike (F), (T) does not always define terms because (in my opinion) they are not totally understood or even definable -- that is the nature of the "artistic approach". The name of the term (such as mind/muscle co-ordination) or its use in context is supposed to serve as the definition, or, as in the case of "talent", it is discussed in an entire section without pinning it down to anything specific. Without reading (F), (T) can seem quite impressive because of its (unsubstantiated) promises and claims; however, armed with sufficient knowledge, (T) is at times a comedy of errors that can be easily exposed. Nonetheless, (T) is a time-tested, highly developed discipline and, where it is correct, it should agree with (F) if (F) is also correct, as we shall see.

My opinion is that (F) *tries* to be knowledge based [nothing can be *absolutely* knowledge based because we never know everything, which ultimately limits (F)]; (T) has no such limitation because it depends on the ability of the human brain to accidentally discover whatever is needed at the moment, and (T) is all about how to do this, see below, so that we need both (T) and (F). However, the limitation of (T) is that unless you have the right parents, teachers, circumstances, etc., such discoveries might never happen. Thus we might summarize this comparison by postulating that in the absence of knowledge, (T) is superior, but with sufficient knowledge, (F) should be better.

(T) starts by trying to define "Talent": "Talent may be briefly defined as the ability to perform without training . . ." P. 14, an opinion that is now largely discredited by those who have studied this phenomenon under controlled conditions. This is confirmed by (T)'s own later assertion "The super-talent of today may well become the accepted norm of tomorrow" - which is exactly the thesis of (F) because knowledge can only increase under scientific processes. Another confirmation: "A student once asked me, 'What has Horowitz got that I haven't?' The short answer is 'Nothing!'" (T) finally comes close to a working definition of talent: "the highly talented pianist is neither a biological 'sport' nor the possessor of extra-human capacities, but merely an optimum example of the way in which these capacities operate when

applied to piano playing." In (F), this is succinctly stated as "Talent can be taught", whereas (T) uses 6 pages without reaching a definitive definition.

The first half of (T) is mainly an exposition of the theory of piano learning or technique acquisition based on the concepts of "expansion" (good) vs "contraction" (bad) co-ordination, etc. I could not understand the physical bases of these theories even after trying his examples of standing at a wall (P. 27) or trying to lift a match box (P. 31). I found practically no useful information up to P. 63; in fact there are many incorrect/outdated statements throughout the book. However, reading between the lines, I concluded that the entire methodology is based on relaxation. Such a basis can confer significant validity to the method.

The second half consists of reviews of the teachings of Raymond Thiberge; these methods eventually blossomed into the Alexander and related techniques and share many basic principles, especially relaxation. Another basic tenet is that you either make music or you don't play at all. Those who memorize and practice bar-by-bar are derisively called "end-gainers" who end up with "black-smith music" P. 17. There are too many excellent suggestions to list here, so this book is worth reading, although the correct explanations and details of execution are too often lacking.

Chapter 7 is an excellent description of how you typically start to learn this type of (Alexander, etc.) method (the first lessons). How to play octaves [add the "finger splits" discussed in (F, P. 99) which is described as a hand rotation in (T)], uses of the thumb [TO type motion in (F, P. 91) described as an arm rotation in (T)], how to avoid playing between black keys by using the thumb, importance of imaginative fingerings, etc. Technique practice is P or even pianissimo, in agreement with (F). Chopin was the most progressive teacher. Chopin's Pleyel had a very light touch and there are some doubts as to whether his teachings could be applied to today's concert grands. My reaction to this was the question of whether today's digital pianos, with their lighter touch, might have resembled the Pleyel more than today's concert grands in touch weight. (T) recommends "sight reading" which is a process similar to Mental Play in (F).

So when it comes to valid specifics, (T) and (F) come to the same conclusions; that is, (T) is also knowledge based when it comes to specific practice/technique methods. The one glaring difference between (T) and (F) is that in (T), you should never practice anything beyond your skill level. I don't know if this is correct. I certainly hope not because (F) is essentially a compendium of methods for breaking the technical barriers that previous methods could not overcome. (F) is faster because you quickly acquire technique so you can play relaxed, but risk losing music, erecting speed walls, or injury if you do not carefully observe the precautions. (T) plays it safe by learning relaxation first because it does not have enough knowledge to overcome all technical difficulties or avoid injuries and is therefore much slower. Clearly, the chapters/comments on relaxation in (F) are critically important, and (T) and (F) are gradually merging into one school, although (T) still contains many misconceptions.

END OF ADDENDUM