JOSEPH SCHILLINGER
A New Look at Music Theory's Deviant Outlier

BY

ERIC TAXIER

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Bennington College

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No "serious" academic theoretician has yet to develop or extensively comment on Joseph Schillinger's (1895-1942) ideas. Although this is not without some reason (or rationalization), I find it indicative of a culture that takes claims all-too-literally, and judges them accordingly. When a man asserts he can fly, others ignore him until he demonstrates his method; even then, if the elite experts of the field—those judges whose opinions seem to matter *a priori*—scoff at the demonstration, the onlooker's reactions are doomed to mean nothing.

Such was the fate of Schillinger's theories, presented to the world after his death in the form of two lengthy texts: *Schillinger System of Musical Composition* (1640 pages in two volumes) and *Mathematical Basis of the Arts*. The latter, I should note, focuses more on a "basis of the arts" than the "mathematical," but this fact is not enough to debunk Schillinger's theories, which actually have their origins in his esthetics.

Since most of the assumptions made by modern theorists about Schillinger's theories derive from 1) a lack of knowledge (ignorance) and 2) confusion about broadly interpreted small bits of knowledge (worse ignorance), I hope in this paper to fill some of those large gaps of awareness and put an end to many of the misunderstandings about Schillinger's work.

My approach will assume the reader has no acquaintance with this subject: I will begin with an introduction to Joseph Schillinger's life, continue with a condensed reorganization of the basic tenets of his theories, and finally give evidence for the assumption behind my approach.

I. A Little Name-Dropping

> When [Schillinger] first arrived in America, other musicians and artists told him, "You cannot succeed unless you have the support of some patron of the arts. And that patron is usually a self-important rich, ignorant, and unbearable woman whom you have to put up with at tea and cocktail parties. Many of the symphony orchestras, concerts, and music projects are supported by these women who demand constant catering." A friend then took him to one such tea party. When he was introduced to the hostess, Mrs. Rich, that lady said in a condescending tone, "Ah, I have heard much about your new theories. It seems you want to revolutionize art and music. Is there anything *I* can do for you?" "Yes, thank you," Joseph replied, "you can pour a cup of tea for me" (Frances, 128).

Schillinger is not a name that I've seen or heard in the kinds of lists that usually accompany discussions on Twentieth-century music theory, and I find it necessary to apply some new method to connect Schillinger with the world, if I am to give his ideas a fighting chance. It would be quite naïve of both myself and the reader to assume that music theories stand entirely on their own merits: although music is an art, *music is also a cultural phenomenon*, and, as such, it and its accompanying theory rely on the same social laws (and misapprehensions) as other cultural phenomena. I do not deny that the theories themselves can be at least somewhat objectively evaluated (as with cognitive theory); but their *significance* in the larger world is usually limited to contributions to/from other academic branches—for instance, aesthetic philosophy or psychology—and, if the ideas popularly disseminate at all, they will do so at the mercy of the aforementioned "social laws."

Some readers might prefer to skip from these assessments to an introduction of Schillinger's theories themselves, so as to discover – without paying heed to the ridiculous social politics of music theory – whether this particular unexplored territory is worthy of his or her further consideration or even approbation. I still urge an eventual return to this section, though, which advocates a model of Schillinger-the-man as an earnest and influential artist, teacher, and thinker.

The following is a shortlist of Joseph Schillinger's notable students: Lyn Murray, Tommy Dorsey, Glenn Miller, Benny Goodman, Oscar Levant, Marjorie

Goetschius, Edwin Gerschefski, Carmine Coppola, Leith Stevens, Belle Fenstock, George Leeman, Paul Lavalle, Nathan Van Cleave, Mark Warnow, George Gershwin, Clarence Cox, Vladimir Dukelsky (Vernon Duke), Margaret Carlisle, Lennie Hayton, Herbert Spencer, Edward Powell, Robert Emmett Dolan, Charles Previn, Frank Skinner, etc.

> [Frances Schillinger]: "Why don't more of the 'serious' composers study with you?" [Joseph]: "Because they don't know what my System is and what it could do for them. Musicians come to me who need help in achieving their professional ambitions as well as their own personal music desires. Among the 'serious' composers, ignorance of what I'm doing has created much prejudice" (Frances, 126).

Schillinger was from the beginning an extremely systematic thinker in all of his affairs, and was credited with having an encyclopedic memory, e.g., when he taught, he never used notes, and he dictated all of his writing to his wife (save for musical and other graphic examples). As a child, he read and studied a great deal on his own, and experimented with music composition and playwriting behind his parents' backs (they were business people, and encouraged him to continue their line). He formally completed his college education at the age of 19 – though he had become a professional teacher at 18 – and then studied for four years at the St. Petersburg Conservatory of Music, where he won the gold medal for composition (the highest prize). He had a continuing interest in classical and oriental philosophy and religion, and even practiced yoga; he also sought out teachers and books on mathematics, physics, acoustics, mythology, literature, etc. (Frances, 154-157).

From 1918 to 1922, he held several official and unofficial teaching positions. He preferred food and supplies as payment rather than money, which was useless in Kharkov, where that dangerous span of four years saw fourteen different local governments. His positions were: Head of the Music Department of the Ukraine Board of Education, Dean of the State Academy of Music in Kharkov, Consultant of the State Opera, conductor and lecturer for the Ukraine Board of Education and the State Symphony Orchestra, Composer for the State Academic Theatre for Children, and Choirmaster and lecturer for several Soviet

regimental and workers' clubs (157).

From 1922 to 1928 he served as consultant to the Board of Education in Moscow and Leningrad, Senior Instructor at the State Institute of Musical Education (Leningrad), and Professor of the History of Arts at the same institution (159). Since Schillinger and Dimitri Shostakovich were friends (163), it is probable that they met during this time, either while Shostakovich was still a student, or just afterwards. According to Schillinger, Shostakovich was the best sight reader at the piano he had ever met (211). Likewise, when an all-Beethoven & Schillinger concert was given in America in early 1929, Shostakovich sent a lovingly doctored painting of the two composers sitting together outside (163). This latter prank was amongst the last of Schillinger's opportunities to contact Russian friends once he lived in America; the Soviet government did not look kindly on his move. Few composers who permanently absconded from the USSR ever got their music performed there again.

In 1927, Schillinger's last full year in Russia, he traveled to the Caucasus and made some of the first known recordings of Georgian folk music – "representative of the European polyphonic forms of the tenth to the eighteenth centuries" – and he organized and directed the first Russian jazz orchestra (167). The group consisted of three saxophones, three brass, four rhythm, two violins, and even an oboe! In the summer of 1928, John Dewey visited the Soviet Union, which assigned Schillinger as its representative of contemporary Russian music (169). This proved to be a fateful meeting – Schillinger's plans to immigrate to America later that year relied heavily on Mr. Dewey inviting him to give a lecture in New York City for the American Society for Cultural Relations with Russia.

From late 1928 to 1931, after moving to the U.S., Schillinger collaborated with [the Russian inventor] Leon Theremin on various musico-scientific problems and in the construction of musical instruments (171). Schillinger wrote the first manual for playing the

Space-Controlled Theremin, and in 1929 he wrote the first ever through-composed piece for that instrument, which he titled *First Airphonic Suite*, Opus 21, for orchestra and solo Theremin. *System of Musical Composition* includes a short melody from the *Suite* as a subject for analysis (orchestral accompaniment reduced to piano sketch). I note this because scores and recordings of his music are in such short supply now that one must turn to the examples in his theoretical writings to get any sense of his music.

From 1930 to 1936, Schillinger lectured on his theories at The New School at New York University and at Teachers College, Columbia University. He also took up private teaching—lectures brought him more prestige than money. By 1936, his reputation, coupled with his waiting list, allowed him to teach full time (175). All lessons were $10 each, no exceptions. He also undertook writing some correspondence lessons, specially-designed for his jazz students who wanted to continue their studies by mail while on tour (38). Eventually, he wrote a complete course of tested pedagogical material: they were $15 a lesson, 300 lessons total. Schillinger made sure to correct all homework, and answer all technical and even extra-curricular questions (39, 67). It is interesting to note that the complete course came to $4500; obviously, Schillinger lived well on teaching! When his *System* was published posthumously, the editors essentially stitched it together from the correspondence courses (themselves a product of shorthand dictation), minus some work on orchestration, and minus the writer's technical and pedagogical assistance, which had been so important to students during his lifetime. It sold for $30.

A note on Schillinger's American teaching credentials, from *Mathematical Basis of the Arts (*or, *Mathbart)*:

> This theory has been presented in part before various learned societies, including the American Institute for the Study of Advanced Education, the Mathematics Division of the American Institute of the City of New York, the Mathematicians Faculty Club of Columbia University, and the American Musicological Society. It has also been offered…in the form of courses and lectures at Teachers College of Columbia University (Departments of

> Mathematics, Fine Arts, and Music), at New York University, and at the New School for Social Research. Students of this theory included educators, architects, artists, designers, composers, and conductors (46).

Of musical criticism, Schillinger told his wife: "Nobody has the right to say that any creative work stinks. He can only say that in his *opinion* it stinks—which is a quite different matter altogether." (66). As a teacher, then, he concluded that music can only be taught like other philosophical and physical sciences are taught – by explaining the possibilities and their effects through analysis and synthesis – thereby leaving the creative act to the student's initiative. In this, he agreed with Schoenberg's belief that "music belongs to the explanatory sciences which teach us what a thing is and not how it ought to be done" (Shawn, 183).

Schillinger's star pupil was George Gershwin, who studied with him in New York for four and a half years, before moving to Hollywood. Gershwin "had studied nearly every branch of the System when he died in 1937" (184). Evidence of Gershwin's studies can be found as early as the *Cuban Overture*, where counterpoint (note the small episodes with woodwinds), form, orchestration, and harmony (listen for the polytonal chord at the end) are all effected. Everything between the *Overture* and *Porgy and Bess* was written under the tutelage and careful supervision of Schillinger and his system (184). Note, however, that "[Schillinger] always gave full credit to his students for their accomplishments" (66). We should do the same, but Gershwin's well-known opera still serves as an asset to the system's practical validity (when correctly taught and used) – or at the very least as an academic curiosity, a rank it does not currently hold.

As another outstanding example of Schillinger's theories in action: Glenn Miller once wrote out a series of harmony exercises for a homework assignment, and Schillinger was so taken with one of them that he suggested Glenn orchestrate it. Glenn made a small fortune with that "Moonlight Serenade" (95); later he remarked, "as soon as I make enough

money I'm going to retire and spend the rest of my life studying with him [Schillinger]" (41-42).

Schillinger was, economically, the model American: for every new dollar he earned, he would spend almost all of it. Given his income, and the economic deflation from the Depression, this meant he spent a considerable sum. In his fifteen years in New York City, he lived in fourteen different apartments (97). Whenever he looked for a new apartment, he would say, "let's take everything into consideration except the rent" (148). His monetary habits were such that, "as soon as any appreciable sum had accumulated, he would spend it on the latest musical instruments, scientific apparatus, office equipment, or cameras and materials" (136). He never knew how much money he kept in his wallet, and was an extremely fastidious dresser; in fact, he owned about two hundred pairs of socks of different weights and colors, forty suits, twenty coats, dozens of shirts, and countless ties and accessories. To all of these he applied his theory of rhythmic design, and permuted them all so that he never fully repeated an outfit (35-36).

He did not want the kind of fame that often accompanies fortune, though. More than popular publicity, Schillinger wanted "a foundation that could present his theories and place at his disposal a laboratory and assistants to develop the machines and art products that were the results of his discoveries" (34).

He was completely obsessed with uncovering a system of relations between all of the arts. When he was 25, he wrote a poem called *Theurgian's Commandments* (published in 1920 in Kharkov) that "dealt with the fusion of the senses and the arts of the future" (156). He eventually believed that he had discovered a general system for the analysis and synthesis of the arts. Indeed, even in his last hours, while dying of cancer and heavily drugged with opiates, he saw the arts blend into colors, movements, and music. Nicolas Slonimsky wrote

in 1947, some years after Schillinger had passed away, that “the interesting aspect of Schillinger’s mental make-up was his pantheistic conception of the world. His religion was man’s conquering mind” (163).

II. Overview of Theoretical Approach.

"All this creative power of the mind amounts to no more than the faculty of compounding, transposing, augmenting, or diminishing the materials afforded us" – David Hume, *An Enquiry Concerning Human Understanding*

From *Mathbart:*

> Seven points upon which the pragmatic validity of this theory rests:
> (1) It establishes esthetic principles which remain true in any special instance.
> (2) It provides a foundation for more efficient creation and a more objective criticism.
> (3) It does not circumscribe the freedom of an individual artist, but merely releases him from vagueness by helping him to analyze and to realize his own creative tendencies. It gives him a universal knowledge of his material: the principles and the techniques of this system permit an infinite number of solutions, which satisfy any requirements set forth by art problems.
> (4) It offers the student of this theory a manifold of techniques that enable him to handle individual and combined art-forms. Since these techniques are interchangeable and interrelated, designs and melodies may be plotted as graphs, and the student may dance or sing a design, or translate a melody into a drawing.
> (5) It is scientifically valid in that it establishes the basic principles underlying creative processes and correlates esthetic reactions with generating excitors (i.e., the works of art) of definite forms and defined variations.
> (6) It stimulates art production and reduces the years of training, thereby making creation a process associated with pleasure, accomplishment, and satisfaction.
> (7) Its social significance lies in the fact that it leads toward unity and tolerance and away from disunity and intolerance through an understanding of the basic principles of interrelatedness and functional interdependence (46).

I will not critically discuss these heavy claims except to extract and point out from them that Schillinger intended his system to be positive in two senses of the word: positive rather than restrictive in its rules and formulations, and positive in its cultural effects. As Frances Schillinger stated several times in her memoir, and Joseph Schillinger implied in all of his writings, he envisioned a world where everyone could create – for their own enjoyment – truly individual art. This was the goal of his life's work. In the following explication, I will discuss the basic axioms of Schillinger's theories as I derive them from *System of Musical Composition* and *Mathbart*; I will organize them a little more selectively, I think, than the original writings, which Schillinger dictated to his wife. This is for an obvious reason: if so few people have demonstrated a rigorous understanding of his theories as they stand, there might be some difficulty in the original manner of their presentation.

According to Schillinger, one can analyze the process of creation through the use of three interrelated (and thus unordered) categories. It is important to remark now that he believes these categories are unified:

1. Subjective Materials (ideas, intentions).
2. Objective Materials (possibilities).
3. Style (medium, or primary and secondary selective sets).

In the first category, the composer has a creative intention. "We have the first requisite for the building of an art product…*an idea as realized through the correlated components of an art material*" (*Mathbart,* 52). Here, Schillinger attempts to evolve a system whereby all attitudes of intent and judgment can be generalized and translated systematically from/into any art medium, which I will also discuss under the heading, "Mechanics of Reactions." The filters between ideas and artistic components must be as objective as possible, and thus not include particularities of style.

In the second category, the composer [or artist] has a nearly infinite set of possibilities that one may establish (and eventually understand) through an analytical method, of which I will discuss only the basics under the heading, "Mechanics of Pattern-Making" (more information is currently available regarding these technical resources than about their use as discussed under the first category).

In the third category, the composer must select a medium (or style) through which to filter his creative intent. For Schillinger, this third category rests only partially in the field of esthetics, and thus prevents his theory from pedantically prescribing a style. Strictly speaking, the third category is a combination of the first two, as the idea informs stylistic choices, which the synthetic techniques of the second category direct, but it is so general and independent in its interaction with them that I include it independently in the list. In his technical descriptions (*The Schillinger System of Musical Composition*), Schillinger performs

the same kinds of abstractions and combinations. To him, music and the other arts express ideas through a process of selection that one can analyze to provide the artist with a general understanding, where no single style takes precedence over others, yet where the composer can evolve and crystallize any single style.

Other theorists who have attempted to deal with one, two, or all three of these categories in practical pedagogy (i.e., in a system intended for application by students) have done so without any or much allowance for a non-standardized language of music. Although one can argue that every system ends up standardizing its materials to some degree – and I have no objections to this claim – we should not discount a theory that does this to an immaterial extent *just because* it does so at all. One might as well describe a haystack as a safety hazard, merely because a needle waits somewhere inside; our only practical conclusion would be to stop using haystacks until someone found and removed the needle. It is not surprising something like this has already happened with music theory.

Why a "scientific" theory?

Schillinger acknowledges that his theory must address the question of "Engineering vs. Spontaneous Creation." To him, problems in scale and coordination can get so complicated for artists that, using the spontaneous model, it would take "the lifetime of a genius to make a sizable contribution to any art" (*Mathbart* 30). He goes on to state that art forms develop from several coordinated components (recall the synthetic method I described earlier), and then he makes an analogy – a similar analogy, in fact, to Hindemith's in *Craft of Musical Composition* – "A building is not erected by magic. First comes the architect's idea…After the architect makes a blueprint and the contractor is called upon – only then does materialization of the idea begin…A spontaneous creation in the field of architecture would

probably result in nothing more complex than a log cabin" (*Mathbart* 30). He finds that spontaneity as a *process* of art creation (i.e., intuition) usually results in the composer continually working and reworking the same combination of components; this process gets so complex that the artist must either sacrifice efficiency for innovation or vice-versa. He proposes a solution. "Creation directly from *principles*, and not through *imitation*, is the real way to freedom for an artist. Originality is the product of knowledge, not guesswork. Scientific method in the arts provides an inconceivable number of ideas, technical ease, perfection, and, ultimately, a feeling of real freedom, satisfaction and accomplishment" (*Mathbart* 3).

Schillinger's approach from the start is a practical, pedagogical one. Rather than continue the historical line of rationalizing music already written and generating a set of rules from that music, Schillinger sets out to apply the analytical principles of western science to the composition process itself. Any problems with this approach have not been well articulated (usually they're along the lines of, "I just don't believe that…"), but I feel it's sometimes possible to argue with Schillinger on his own grounds, as I will do a little at the end of this paper regarding the relationship between intuition and reason that he assumes is the case.

I would like to mention that the process of abstracting multiple concepts from a single one can and must be reversible in order for that process to have any applicable use. If Schenker's theories were designed for application to composition, they would follow this same procedure.

Schillinger calls this reversal **synthesis**, or sometimes **synchronization.** In every special case, principles of a general nature are at work; whenever the composer reaches *any* decision using Schillinger's System, he synchronizes his intentions with the possibilities and

his selected medium, which involves the synchronization of all possible components. "The mental growth of humanity…may be stated as a tendency to fuse seemingly different categories into a complex unity, into which previous concepts enter as component parts. The evolution of thought is a process of synthesizing concepts. Assuming this as a methodological premise, we can build complex concepts from concepts which previously seemed dissociated" (*Mathbart* 51).

As an example (of synthesis in general, without an esthetic component): two carrots and an apple form a group that we compare with another group of two apples and a carrot; the entirety can then be described as a group of three carrots and three apples, ordered 2C+1A+2A+1C. The durational order (2+1+2+1) and the spatial order (C+A+A+C) can obviously be expressed independently, but in their actual representation they are synthesized into a unified form. If the number of terms did not match, they could be synchronized through repetition. For example, if the durational order is 2+1+2 and the spatial order is C+A, then the complete synthesis (without any changes made to repeated groups) becomes the more complex unity of 2C+1A+2C+2A+1C+2A.

Esthetic Basis

The next question for Schillinger is, "Just what are we engineering – what physical laws must we manipulate to keep a piece of music from 'failing'?" The question requires an esthetic answer. Our first step is a definition of esthetics:

"Selective (esthetic) perception is a capacity to discriminate relationships through senses and to associate such interrelatedness with the functionality of the structure (30)." For Schillinger, this definition provides the initial conditions for making judgments regarding the beauty of a piece of music, as composer or critic. It assumes that discriminations can be

made between complex (structural) features as well as simple features, and that the role of simple features within complexes can be understood. This is entirely consistent with his methodology of synthesis.

Schillinger qualifies the interrelatedness of sensible relations and structural functionality with these operational conditions:

> *"Coherence of structure which enables [the work] to survive, and high associative (semantic) potential which results from such coherence* (32)."

One can see that these two requirements relate directly to his definition of esthetic perception by ascribing positive qualities to it:

discrimination of relationships through senses ⟷ *High associative (semantic) potential.*
functionality of the structure ⟷ *Coherence of structure*

I am sure that it would actually be a contentious issue now whether structural coherence and meaning are necessary, and if so, whether one can possibly measure them. Surely, the latter problem makes Schillinger's work seem only more difficult. I should therefore point out that the burden of measuring these qualities falls entirely in the realm of subjectivity, and only then to those who consider them important. Schillinger believes the concepts themselves can be detected in any work of art, and that there are certain factors that contribute to their degree – for each composer, performer, and listener. Furthermore, he believes these factors are generalizable – that is, based on one's own experience, each person can approximate for themselves the degree of structural coherence and meaning communicated in any work of art. Schillinger's purpose is not to discover some simplified Birkhoff-like esthetic equation; rather, he suggests a system for understanding the factors that contribute to a complete artistic experience.

If Schillinger's synthetic method holds true, he must unify a) intentions with possibilities *and* b) structural function with sensible discrimination. As stated earlier, he believes that all of these categories can synthesize into a single complex unity. To accomplish this, he applies the fundamental basis of his theory: **periodicity.** The definition of "periodicity" for Schillinger is "*the recurrence in time or space of some phenomenon*" (*Mathbart* 682). I now claim that discrimination of relationships only occurs with periodic associations; that is, if we first differentiate two qualities, A and B, and then associate A with B over a time-span Δt, then A and B at time-point t_0 must maintain their relationship at time-point t_n and at all time-points between t_0 and t_n. The same claim holds true with the functionality of structure: structural function A is coherent if and only if we recognize the temporal sequence of its components as a single group through the periodic equivalence of one or more variable aspects of its parts (i.e., through some form of identity – according to David Hume, by one or more of the principles of association: *Resemblence*, *Contiguirity* in time or space, and *Cause or Effect* [Hume, 101]; all three are special cases of periodicity). Similarly, intentions and possibilities both develop in one's experience by their recognizable features—i.e., periodic occurrences.

His phrasing of the case is in two parts:

> [1] Every work of art conceived and executed by man is a modified counterpart of actuality… Music makes one believe it is alive because it moves and acts like living matter…Everything that moves is a mechanism, and the science of motion is mechanics. The art of making music consists in arranging the motion of sounds…thus the science of making music becomes the mechanics of musical sounds (*Mathbart* 5).
>
> [2] One of the most remarkable consequences of primitive man's experiences, which placed him far above the animal world, was that effect is caused by the extensive repetition of identical or analogous processes…[e.g.,] fire results from rubbing wooden surfaces together…With the advent of science, it was discovered that repetitious application of waves in motion may affect matter itself and be of constructive as well as destructive power…And if we look more analytically into the source of various stimuli producing both physical and psychological effects, we find that they spring in the end from the same source…In short, we

> discover that the fundamental aspect of all stimuli is one or another form of regularity of occurrence, i.e., periodic motion (*Mathbart* 37).

To simplify the argument: music is a counterpart of actuality, gleaned from the structure perceived by all of our senses and arranged into sounds; the fundamental feature of all stimuli is periodic motion (self-reference through identity); thus, *music, like every other perceived natural phenomenon, derives from periodic motion*, *or periodicity.* Later on in the final section of this paper, I will show that his esthetic conclusions have a rigorous philosophical precedence (standards in the academic world are only met when one's ideas have little originality), but here we will continue on with Schillinger's theories.

We can divide our experience of natural phenomena into the twin concepts of perceptions (passive) and interactions (active). An understanding of practical music theory can then be described as a synthesis between: 1) The mechanics of pattern-making, and 2) The mechanics of musical reactions. These correspond with the objective materials (possibilities) and subjective materials (intentions) mentioned earlier, only now they are understood and unified by the concept of periodicity, by way of structural coherence and semantic potential.

Schillinger undeniably spends most of his theoretical effort in the *System* on the "mechanics of pattern-making." A list of his planned projects gives one potential explanation – he was planning to devote an entirely separate book to esthetics. The relationship between his studies of reactions and patterns suggests another possibility:

> *Reactions*—a) semantics, i.e. associations between sonic configurations and sensations, b) coherence, i.e., associations between tendencies, contrasts, and goals.
>
> *Patterns*—periodicity (repetition, contrast)

Since the esthetic basis of Schillinger's theories is *periodicity*, which he says manifests itself universally in nature (including physiological reactions), he most likely

decided from this to spend more effort studying patterns and periodic relations themselves, rather than our reactions to these patterns (which science scarcely understands even now). This particular theoretical concentration had repercussions – some caricaturized looks at the System have ignored Schillinger's proposed esthetics or have confused them with mechanical inventions of arbitrary patterns. Since Schillinger's study of periodicity relies heavily on the serial development of possibilities, and he saves the *meaning* of those possibilities for the "mechanics of reactions," (also leaving subjective taste up to the student), one can easily see how the confusion occurred.

A. Mechanics of Reactions

In "Overture to the Schillinger System," Henry Cowell acknowledges the pedagogical importance of Schillinger's concentration on patterns: "The Schillinger System makes a positive approach to the theory of musical composition by offering *possibilities* for choice and development by the student, instead of the rules hedged round with prohibitions, limitations and exceptions, which have characterized conventional studies." On the other hand, if one were to interpret the other half of Schillinger's studies, "the mechanics of reactions," as a system of rules, somehow prescriptive where the aforementioned possibilities can't be, one would still never successfully finish a piece of music: semantics and coherence in music represent the first step in the planning process of a composition—the formation of an idea—and the glue between decisions, but not the decisions themselves. Those must come from the individual artist's synthetic process. Translation between intentions and musical possibilities presupposes the option of translating an abstract meaning into a musical one, and vice-versa.

1. Meaning in Music (Semantics)

It is generally a mistake to directly relate the meaning of music to *conceptual language*. Such an approach can never have universal significance; one would have to attach specific connotative symbols from an individual language to a set of specific sound configurations. Although conceptual connotation is possible in music (try C down to G up to E down to C, C up to E down to C down to G ⟶ I think of a doorbell or a grandfather clock), one *automatically* learns this meaning, and requires no instructive assistance. Furthermore, we eventually wonder what the configurations of these symbols themselves mean (which helps explain why lingual semantics has so little worth to writers, who already have a grasp of their language). A universal semantic concept would apply to all of the arts, and would have practical value in describing the relations between different configurations, different art forms, and even different sensory phenomena. "Since we react as a unit, dissociation of the partial responses is impossible in actuality. For this reason there is a great advantage in using one concept which can emphasize reflexes, associations, and judgments" (*System* 1413).

"Meaning" signifies a relation between an expressed symbol and an intended idea. If a universal semantic system is possible in music, it requires an absolute concept that applies to every sensory component and has a similar reactive meaning for all components, thus relating the expressed symbols (sonic configurations) with intended ideas.

Given the above requirements, and given that the fundamental feature of our experience of all natural stimuli – including physiological stimuli (reactions) – is periodicity, we can make two further arguments. First, "sonic semantics is altogether possible because of the configurational interdependence of the activating (stimulative) and the reactive patterns" (*System* 1410). Second, this meaning exists universally through periodic relations. Uniform

periodicity is neutral, i.e., A (t_0) =A (t_1) = A (t_2) = A (t_3)…, so a specific configuration only has meaning relative to other possible configurations (e.g., two different uniform periodicities have meaning relative to each other, evinced by the consequent non-uniform periodicity, like in polyrhythm). Any non-uniform periodicity results in an associative response within that configuration. Thus, one possible operational definition for "meaning" is *the resultant association formed between an expressed symbol and an intended idea by a non-uniform periodicity of any variable or set of variables*. We call any state of change "motion," which includes differentiated periodic relations – so the universal concept that links the meaning of all stimuli is **motion.**

> *"Music is capable of expressing everything which can be translated into form of motion* (System, *1411*)."

Although this statement embraces by implication all natural processes, including those that are independent of human emotion or "artistic integrity," we must remember that semantics do not describe the *value* of any piece of music, just the *meaning*.

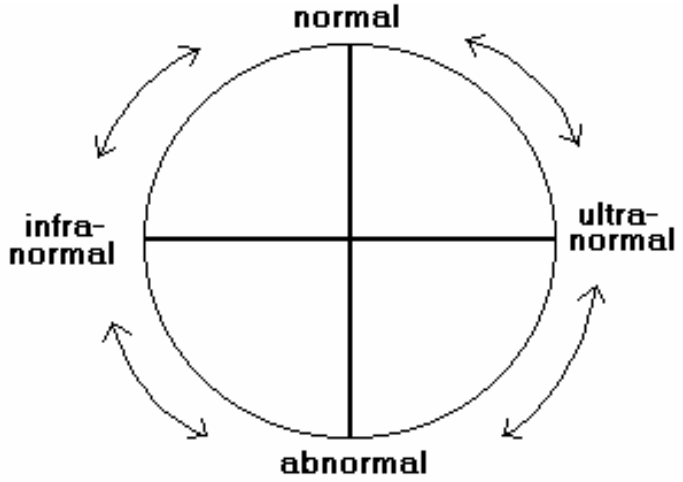
Since reflex derives from automatic, unlearned physiological responses, it is immediately subject to the same laws of periodicity as all other natural phenomena. Thus, a reflexive muscle movement in the arm has a corresponding reflexive intonational signal, at least semantically. Reflexes also have a certain degree of *aggression* or *defense*. A lack of either would be characteristic of *neutrality*. These concepts relate by degree:

Defense ---------- **neutrality** ---------- **aggression**

Of course, the listener will usually attempt to translate pure sonic configurations into configurations taken from experience to give music a personal meaning. One person may hear Beethoven's Sixth Symphony as a "description of the countryside," another may hear it

as a "long day of golf," and still another may correlate it with a sequence of physical tensions and releases in the muscular anatomy (the reality of course is a far more complex combination; these I offer as simple examples).

Schillinger, however, is only interested in the sonic configurations themselves, which he describes according to a scale of configurational responses, based on the defense-neutrality-aggression model: he calls it the "psychological dial."



The psychological dial can be divided along two axes: Normal ⟷ Abnormal, and Infranormal ⟷ Ultranormal. Beginning at Normal, which represents calmness, introspection, uniform periodicity, balance, inactivity, etc., we can either go clockwise toward Ultranormal, the upper limit of normality, or counterclockwise toward Infranormal, the lower limit of normality. Within these bounds of the upper quadrants of the psychological dial, Schillinger says the composer expresses all mental states possible for the lower and upper limits of *normality*, from deep depression up through ultimate ecstasy.

Both Ultranormal ⟶ Abnormal, and Infranormal ⟶ Abnormal lead to equally improbable states, which Schillinger calls the lower and upper limits of *performance*. Psychologically, we may describe the lower half of the dial as the range of absurdity.

Schillinger is always careful to maintain that these psychological states are relative to the expectations of the listener. A murderous rampage might be entirely within the bounds of normality if the killer is a known ruthless psychopath, but this same rampage belongs below Infranormal if the killer is a friendly next door neighbor. Approaching the possible limit (Abnormal), onlookers might describe the killer as a 4'', orange-skinned goldfish.

I can only hint further at Schillinger's development of this concept, which takes up several chapters in the *System*. One can usually understand the relationship between the "psychological dial" and actual musical components intuitively, though I will discuss these briefly near the end of the "Mechanics of Pattern-Making" section. Schillinger describes many other spatio-temporal associations (as with dimension, distance, texture, smell, taste [these two are not well developed in humans, and often go no further in their semantic associations than "pleasant" or "unpleasant"], density, extension, luminosity, saturation, etc.) and non-cutaneous sensations (hunger, pain, sexual urge, etc.). He acknowledges the existence of non-kinetic connotative symbols (usually words) that are not "immediate and self-sufficient" (1431), and which usually only have significance to a specific culture or style. These he considers auxiliary and unimportant pedagogically, since the student probably has a firm intuitive grasp of them already. I mentioned this before, giving a "doorbell" example. Of course words themselves have various implied degrees of motive semantics (take the word "gargantuan" versus the word "tall"), and this can always be taken into account when combining them with music.

He analyzes all four quadrants with respect to their applications in rhythmic forms, pitch-scales, melodic forms, harmonic forms, relations of melody with harmony (tension forms), contrapuntal forms, and instrumental resources (density, range, dynamics, attacks, tone quality, register, arpeggiation…); he gives short examples of each type. One could use

such descriptions as an aid when teaching harmony, counterpoint, etc.; by encouraging the student to associate what s/he hears with degrees of various associative scales, especially relative to their context, the teacher encourages an instant grasp of the materials' usage.

Schillinger discusses humor (in relation to the lower quadrants), modulations between sonic symbols ("neutralization" and common patterns), and finally he describes the coordination of multiple sonic symbols – "in actuality we have no pure sensations" (1471) – for which he gives a few story examples, counts the possible 1:1 time combinations of sonic symbols given an 8-symbol scale (255 total combinations), and discusses non-constant relationships between sonic forms. "The field of connotative music is so broad and its applications so numerous that in this course of study we are only able to direct the student's attention toward the problems and the method by which they can be solved" (1477).

He also discusses, somewhat ahead of his time, the role of saturated events on our perception of time. "The effect of time being eventful is due to the presence of many thematic impulses in a relatively brief period of clock-time…The length of a relatively short musical composition psychologically depends largely upon the *degree of its thematic saturation*" (1352).

2. Coherence

A production without a design would resemble more the ravings of a madman, than the sober efforts of genius and learning. – David Hume, *An Enquiry Concerning Human Understanding*

Recall that we split Schillinger's "mechanics of reactions" into the categories of semantics (just discussed), and coherence. In the latter, he concludes that the two factors that control the beauty and coherence of a piece of music are "value" (goal) of the intended idea, and "reliability." The former is a relative phenomenon in the arts, and can only be judged *between* individual art products and genres; the latter is a prerequisite for internal

coherence, which Schillinger says can be understood and controlled through "the scientific method of art production."

If the origin of a work of art is an idea, then our analytic-synthetic method implies a series (i.e., "we *begin* with an idea…"), and the idea must have some value, or goal.

> The value of such an idea is to produce a [motor or mental] sensory stimulus…Thus, *stimulus* is a term in a chain that results in the phenomenon of an art product. [Once] we have obtained these two terms ("idea" and "stimulus"), we can develop the rest of this complex concept by the method of series (*Mathbart* 52).

The total development of the series representing the complex concept of an art product can be represented:

IDEA…MEDIUM…STIMULUS

IDEA…generator…MEDIUM…transformer…STIMULUS

IDEA … record … generator … transmitter … MEDIUM … receiver … transformer… …impression … STIMULUS

> For the successful projection of an art idea: 1. All the terms of the series must be valuable or reliable in the adequacy of their functioning (the idea should have value, the record must express adequately the idea; the generator should be plastic, precise and reliable, etc.). 2. The consuming individual must be reliable in his focused attention and parametral discrimination.
>
> There is always a certain amount of the unknown in a work of art which we cannot discriminate until we go through several analogous experiences. If the amount of the unknown equals zero, we have perfect banality. If it is not too great, the majority enjoys it immensely. If it is too great no one enjoys it at first, for the simple reason that he does not understand the language in which it is brought to his attention. The ideal for a discriminating group of people lies between these extremes (both quotes, *Mathbart* 54).

For Schillinger, the value of music is relative to the culture in which it is expressed ("In relation both to instruments and esthetic forms, musical trends are dependent upon sociological, economic and technical forms" [*Mathbart* 15]), and depends on the adequacy of every term in the art-product series, including the written composition, the instrument(s), the performer(s), the listener's ears, the listener's context, and the new stream of ideas produced in the listener. To further the point and to express what he means by "beauty":

> "Beauty" is a psychological complex and a derivative of physiological reflexes. In order to produce an effect of "beauty," the percentage of excitations previously experienced must be quite high… One of the necessary moments in artistic enjoyment is a standard deviation from the nearest simple relation…Beauty may be expressed as a *differential variation of a rational term* (a relation, or a system of relations), where the rational term and the differential derive from one homogenous harmonic series.

Or in other words:

> Esthetic satisfaction comes mainly from the sensation of being off balance, but in an obvious relation to balance…Then the joy of discriminating simple relations in a sensory form possessing a standard deviation is psychologically similar to solving problems or riddles. The element of the unknown stimulates curiosity and the process of associating it with the known produces a feeling of satisfaction (both quotes, *Mathbart* 83-84).

There is no universal way to guarantee a *valuable* idea from all this, though one may use these conclusions intuitively. Schillinger mentions, however, another important judgment of quality when he says "all the terms of the series have to be reliable…" Schillinger expresses the reliable formation of an idea in *System of Musical Composition*:

> [T]he degree of perfection in a work of art, and hence its vitality as a factor of the probability of survival, depends upon the *relation of a tendency to its realization*. If, for example, the tendency in a given work of art is toward a certain form of regularity, we may compute the degree of perfection on the basis of the percentage of adherence of the realized form to such regularity… It is only reasonable to seek to evolve works which embody refinement of structural organization, mutual fitness of components, and the complete realization of a tendency (1277).

"Refinement of structural organization" can be controlled by semantic planning of the piece's structure before composing out the components themselves (this foreshadows the methods of many twelve-tone composers, for example Charles Wuorinen). By now, it should be obvious to the reader that Schillinger thinks the "mutual fitness of components" results from a kind of unity (hence what he would argue is the mutual fitness of the components of his System), which I will describe in the next section. "Realization of a tendency" implies the work has some dominant characteristic(s) – I include the plural because, according to Schillinger, this realization only occurs within a thematic unit, and a composition can have any number of

thematic units. In fact, the thematic units don't even need complete expositions in each appearance (analogous to editing the episodes of a movie out of sequence).

If the composer feels his music requires none of the qualities that Schillinger finds important (e.g., coherence from the realization of a tendency, the sensation of being off-balance in an obvious relation to balance, etc.), and if he finds no use for Schillinger's semantics, he need not use the System as a generating factor. He may still find plenty of use for the methods developed through the "mechanics of pattern making," though, which are based on a general analytical method that guarantees some degree of technical discovery.

B. Mechanics of Pattern-Making

Using the "mechanics of reactions," the prospective composer might have graphs, connotative ideas (metaphorical descriptions), and maybe even some structural planning in the form of durational ratios, etc.; in other words, he would know what he wants to express and the means of correlating it with his given artistic components. At this point, a strong analysis of pattern-making in general would provide the technical know-how of the actual musical processes.

I should point out that in Schillinger's method of specification, selection and coordination, "the specifications must be chosen in accordance with semantic requirements, which define the purpose of the production" (*Mathbart* 45). The basis of his System is esthetic, not mathematical. Furthermore, his system is not based on acoustical relations:

> From the physical point of view, it makes no difference whether chords change at one speed or another, while musically such variations in speed might completely transform the artistic meaning…The fact that the science of musical sound (not the science of musical composition), during the 5000 years of its existence, did not explain the mechanism of musical composition is sufficient evidence that acoustics is not adequate to provide such an explanation (*Mathbart* 57).

The technical means to his System derive from a synthetic analysis of the compositional process itself.

According to the aforementioned series representing the complex concept of an art product, "composition" is the process that occurs between the first two terms, IDEA ⟶ record. Any compositional choice requires **selection**. *How* one makes a selection depends on all the factors discussed in "mechanics of reactions." *What* one can select is the object of this discussion.

The selective process can be divided into two types: selection of sets, and selection of relations.

1. Selection of Sets

Selection from the complete manifold—or "dense set"—of possibilities requires first that the infinite continuum be transformed into a selective dense set. "According to the geometric concept of extension, one can insert as many points as are desired between two given points, 'a' and 'b'… This amounts to dividing length into a number of uniform units (*Mathbart* 81)." Uniformity can be represented by number: 1, 2, 3, 4, … , ∞. Division of uniformity would then be the result of splitting the dense set between each integer into smaller uniform units. In the generally accepted western division of musical frequency, 1 ⟶ 2 is split into 12 equal logarithmic intervals. This is an example of a **primary selective system**. A primary selective system does not have to be uniform, but, since it serves as the first selective set in the process of composition, it usually is. One could, of course, reverse the process. Full saturation of the primary selective system produces a dense set.

Before continuing with the selective process, I will discuss the two primary selective systems that concern Schillinger in his System.

a. Pitch

The first, as I just mentioned, is equal temperament, or the twelfth root of two. Once this becomes the selective system, then every step can once again be expressed by integers or other simple differentiated symbols, e.g., 1, 2, 3, 4, … , ∞. If C = 0 and C'= 12, F# would be 6, and so on. He says this tuning system came about historically from a need for versatility, rather than for simple harmonic ratios (impossible in practice, anyway). "No other number between 12 and 59 exhibits greater versatility than the number 12 itself" (*System* 144). In the 17th century struggle between the more perfect consonance of the mean temperament system and the versatility of new equal temperament, "the technical expediency of the new system won, and the entire cultural inheritance of the preceding century's vocal music was automatically transplanted to the new system" (*System* 145).

b. Time

Rhythm is a sequence of events in time, where the time-lengths between events are definable ratios. A series of selective events originates in a primary set derived from uniformity (e.g., metronomic tempo). The artist must qualify every degree of selectivity with semantics, exacting a choice between equality (repetition), inequality, and silence from the meaning of their relations. Just as before, we begin with a dense set represented by integers up to infinity. There is no literal "octave," and thus no technical need to relate any particular value logarithmically (in other words, the temporal "octave," or tempo, is up to the composer's semantic initiative), but like an octave, the chosen unit represents the scheme of uniformity. Thus, the number of smallest rhythmic subdivisions per uniform group determines the primary selective set for rhythm. Schillinger calls this number the **determinant**. If the determinant is 8/8, then the smallest time value is 1/8; if the determinant is 12/12, then the

smallest time value is 1/12, etc. Obviously, the larger the determinant gets, the greater the plasticity of rhythmic expression within a grouping becomes. We should express every uniform step in the primary selective system as an integer, so the determinant loses its denominator. For example, if the determinant is 4/4, I write "4." If I decide to represent that scheme of uniformity with a whole note, then I will write the smallest possible division of the whole note as 1+1+1+1, or four quarter notes. Likewise, if the determinant of 4 represents an eighth note, 1+1+1+1 would be a group of four thirty-second notes. It follows that the determinant in no way relates to tempo, but rather to *relative* rhythmic groupings. Schillinger called representation of time on the smallest hierarchic level (that of the determinant itself) "fractional."

The determinant also expresses the structural division of the composition. For a determinant defined by x uniform time intervals, larger structural rhythms related directly to the determinant are defined by x^n. Every division of music larger than the initial determinant is called "factorial" measurement (other more recent theorists call these measurements hypermeasures). For example, let a piece divide into measures of common time, let a quarter note = t, and let the determinant, $x = 4$; so in this example, ¼ = t. Then, 4t=T, 4T=T', 4T'=T'', etc. In other words, the first temporal division is a measure of four quarter notes, the next is four measures, the next is sixteen measures (four groups of four measures), etc. There are then two possible explanations for a piece where the time measurements change: 1.) The combinations of different measurements represent binomial, trinomial, or polynomial divisions of larger units of time, e.g., a bar in 3/4 plus a bar in 5/4 could actually be a larger factorial measure of 8 (5+3=8). 2.) The piece uses hybrid rhythm, either with multiple determinants on different *factorial* levels, multiple determinants on different *fractional* levels, or both. The reader should be aware that Schillinger's System allows for every type

of temporal organization possible, though he seems to personally prefer single determinants in any single piece (so he would prefer that the first explanation I gave account for strange meter changes). Again, where a single determinant is present, Schillinger calls the rhythm "pure," and where more than one determinant is present, he describes the rhythm as "hybrid."

We may call the next choices in the artistic (selective) process the "secondary selective sets." His derivation of these sets follows the same reasoning that leads to his semantic descriptions. In this case:

> *Any basic musical configuration can be described as the result or partial result of a combination of two or more unequal uniform periodicities in time or space.*

I will focus more on these after I discuss Schillinger's ideas on the secondary selective organization of pitch relations.

c. Pitch [secondary selection]

With pitches, certain sequences of tones may be abstracted from the tuning system. The initial secondary selective set we might call a pitch scale. Schillinger says pitch scales in their initial forms are either asymmetric (diatonic), or symmetric, though he later explains this distinction is made only for convenience. An asymmetric scale has one root tone. It can be arranged within an octave (Group I), or its units from Group I can be expanded to beyond an octave (Group II).

e.g., Group I: C-D-E-F-G-A-B-(C)
Group II: C-E-G-B-D-F-A-(C)

Scales of Group I and Group II are actually just special cases of symmetric scales where every root tone occurs at the octave; but because of this octave division, which follows the reasoning for the construction of the twelve-tone scale, they do not have the kind of

"modulatory" quality of the symmetric scales. The next two groups of scales are symmetric scales with multiple root tones within an octave. There may be two root tones (C, F#; or second root of two), three root tones (C, E, G#; or third root of two), four root tones (C, Eb, Gb, A; or fourth root of two), six root tones (C, D, E, F#, G#, A#; or sixth root of two), or twelve root tones (chromatic scale; or twelfth root of two). Except for this last category, intermediate units can be added between roots. An example of such a scale would be the octatonic scale. The difference between the third and fourth groups is again one of octave displacement.

e.g. Group III: C-Db—E-F—G#-A—(C)
Group IV: C-Db—G#-A—E-F—(C)

The number and specifications of every possible scale in equal temperament (or any other type of temperament, if the composer so wishes) can be deduced by many analytical methods. In terms of stylistic consistency, Schillinger proposes two, which he says relate scales by "style families," from which any number of scales may be used in the same composition, by the same composer, or even by all the composers in one era or culture: 1) identity of intervals, 2) identity of pitch units. "The problem of unity of style in intonation, when approached from an analytical angle, becomes nothing but a methodological problem" (*System* 1253).

Evolution of pitch-scale "Styles" – Identity of Intervals

Identity of intervals may be used on any scale. Select a scale, and apply permutations to its intervals (Schillinger prefers circular permutations, displacing one term at a time, which is usually more selective and indicative of a logical process than permutations in general). For example: 4+3+2+1⟶3+2+1+4⟶2+1+4+3⟶1+4+3+2, or C-E-G-A-Bb⟶C-Eb-F-Gb-Bb⟶C-D-Eb-G-Bb⟶C-Db-F-Ab-Bb. The process of evolving scales with more

units from scales with less units falls under this heading as well. Select a range. Equate the range to any non-reducible binomial, unless you are looking for a scale in geometric expansion, which will be discussed in the section on "Selection of Relations." (6+4 is reducible to 3+2; 5+5 is reducible to 1+1; 7+3 is not reducible.) First synchronize every permutation of the binomial, and then synchronize the "resultant of interference" (i.e., the synchronized result) with each of its permutations, and so on until neutral uniformity is all that is left.

For example: 5=2+3; 3+2=5. 3+2 synchronized with 2+3 yields 2+1+2, which we may call "the resultant of interference" of the binomial with its inversion. There are three possible ways of stating the resultant trinomial: 2+1+2, 2+2+1, and 1+2+2. The next resultant of interference (between the trinomials) is uniformity: 5=1+1+1+1+1. This process can develop from any non-reducible binomial of any desirable range (the number 5 has one other: 4+1). Notice that in the above example, there are no four-term scales in the family, such as 2+1+1+1. No scale evolved in this manner will ever have an even number of terms (see below, "time: secondary selection"). By splitting one or more terms of a reducible binomial, one can achieve an even number of terms (e.g., 10 = 5+5 = 3+2+4+1), but these are only unique to the original interval if the split portion(s) can not be reduced.

Evolution of pitch-scale "Styles" – Identity of Pitch Units

Identity of pitch-units may be used on any scale. Select a scale, apply circular permutations to its pitch units, and transpose the results to the original root to generate related scales with new notes. For example: C-D-E-G-A ⟶D-E-G-A-C ⟶E-G-A-C-D⟶ G-A-C-D-E ⟶A-C-D-E-G; transposed to a common root, we have the following scales: C-D-E-G-A, C-D-F-G-Bb, C-Eb-F-Ab-Bb, C-D-F-G-A. Interference between such scales can be determined quickly: just add pitch-units from one or more scales to any related scale that

doesn't have those units. For example, C-D-Eb-F-G-A-Bb, derived in this manner from the above pentatonic scale. Of course, many modern composers may wish to "share" this process with the listener: simply evolve the scales chronologically in accordance with the scales' evolution, from least to most number of units.

One can analyze the possibilities further, by limiting one or more variables or defining correspondences between seemingly unrelated variables. For instance, we can define a direct correspondence between any unique scale structure (*X*) and ascending melodic motion, and do the same with any second unique scale structure (*Y*, where $Y \neq X$) and descending motion; many readers may find it surprising that, in terms of raw materials, such an analysis generates possibilities far beyond the traditional melodic minor scale. One can reverse the synthesizing process by simply adding any two or more members of a scale (e.g., [2+1+1]+2+1+1+[2+1]+1 $\longrightarrow$ 4+2+1+1+3+1). We might also organize the contents of a scale in a specific order for performance (melody), arrange them into chords and chord-sequences, and develop them by any of the means which I will discuss under the heading "selection of relations." As an interesting side-note, any twelve-tone composition can have its resources classified according to these methods.

In the second volume of the *System of Musical Composition*, Schillinger discusses the possibility of using these techniques to find tones for use only in melodic figuration of harmony (rather than as actual units of the scale) and to create stylized symmetric scales that retain much of the quality of "folk" scales. Of course, one can invent just about any technique to find every possible scale within a certain range; I have discussed Schillinger's Symmetric and Diatonic categories, as well as his general method for grouping scales according to stylistic considerations to show a) that the tools of his System are developed toward the end of helping students adequately communicate an idea, and b) that the

traditional system of classification is entirely inadequate. The major-minor classification system prevents music students from learning a variety of possibilities, and encourages the performance of only a particular historical idiom.

d. Time [secondary selection]

If our process of forming the primary selective set is one of dividing uniformity into a certain number of equal values (factorial relations), and these uniform values can also be broken up into a certain number of equal values (fractional relations; the determinant), then it is theoretically possible to develop all possible relations of temporal values (or rhythms) by combining uniformities of unequal value. Central to this process of discovering all possible rhythms are the serial methods of permutation and synchronization. They relate in two ways: one is the general method, meant to efficiently produce "all the possible rhythms of the past, present, and future", and the other is a special offshoot, meant to evolve every possible rhythm within a given "style family" (and is similar to the methods described above in "evolution of pitch-scales").

The *general* method is, simply, synchronization. Synchronization may occur between any two or more uniform or non-uniform rhythms (treated as a group). We may use just uniform values here to adequately illustrate the process. 2+2+…+2 synchronized with 1+1+…+1 results in groups of (**1**+1)+(**1**+1)+…+(**1**+1), where the first value of every group has a factorial (metrical) accent, since both uniformities "articulate" at the same time. Every group repeats, so we'll reduce our notation for the synchronization of these two uniform rhythms to 2:1, and the resultant of their interference to **1**+1. 3:2 produces the resultant of interference of 2+1+1+2. 4:3 produces the resultant of interference of 3+1+2+2+1+3. We can observe from this or by constructing further examples that meter (defined as a uniformity

of equally reducible time-units), derives from the least common multiple of any combination of uniformities (4:3 produces a 12-beat uniformity; 3:2 produces a 6-beat uniformity). The resultants of interference of different uniform ratios are always symmetrical (Messiaen's "charm of impossibilities"). The method of permutation – generalized mathematically by group theory – guarantees the appearance of every possible rhythmic ratio. This makes sense intuitively, since the infinite group of uniform divisions of integral time allows for an infinite number of synchronizations, and therefore an infinite number of rhythmic relations. We may call the resultants of interference of these ratios "temporal scales," in that they are often too rich for literal use in composition, but provide a great deal of useful relations.

e.g. determinant = 4. Use 4:7 4+3+1+4+2+2+4+1+3+4. Since the determinant is 4, I could repeat or apply any number of operations to the groups (4)+(3+1)+(4)+(2+2). For example: 4+3+1+4+2+2 + 4+3+1+8 + 3+1+2+2+4+4 + 2+2+3+1+8.

The unity 1+1+1+…+1 is neutral to any style, just like with the pitch scales.

A special method comes directly out of the use of a determinant (or determinants). I base this method on one of Schillinger's (*System,* 84), but at first glance, it does not seem to succeed as a general model. I find it important to describe this method carefully here, since the outcome is *every possible rhythm unique to a determinant.*

First, split the determinant into any non-reducible binomial (we take a binomial to be reducible if both units equal each other or have a common divisor), like 3=2+1, 4=3+1, 5=2+3, 5=1+4, 6=5+1, and so on. Synchronize the binomial with its inversion; find all the circular permutations of the resultant (number of circular permutations equals the number of terms) and synchronize them, etc. See below for an example. This process results in a generator's "interference groups." For all determinants, the number of terms (rhythmic attacks) in the *n*th interference group, expressed as i_n, equals one less than the product of

two times the number of terms in the previous interference group; or, expressed symbolically, $i_n = 2i_{n-1} - 1$. Since $i_0 = 1$ in all cases for this method, the number of terms in the interference groups of *all* determinants is the same: 1, 2, 3, 5, 9, 17, etc. There is often more than one set of these interference groups; e.g., $x = 8$ has two different sets produced from the binomials 5+3 and 7+1. I call the interference groups produced from these different sets the subfamilies. For Schillinger, "all the consecutive interference-groups generated by one determinant constitute the evolution of all rhythmic patterns in the corresponding [style] family" (*ibid*). Let's look at an example of one such evolution:

e.g. $x = 8$. First subfamily i_1: 5+3; 3+5. i_2: 3+2+3; 3+3+2; 2+3+3. i_3: 2+1+2+1+2; 1+2+1+2+2; 2+1+2+2+1; 1+2+2+1+2; 2+2+1+2+1. i_4: 1+1+1+1+1+1+1+1. Second subfamily i_1: 7+1; 1+7. i_2: 1+6+1; 6+1+1; 1+1+6. i_3: 1+1+4+1+1; 1+4+1+1+1; 4+1+1+1+1; 1+1+1+1+4; 1+1+1+4+1. i_4: 1+1+1+1+1+1+1+1.

Schillinger's method begins only with a split monomial, preventing the possibility of an interference group having a number of terms other than those defined by $i_n = 2i_{n-1} - 1$ (except for the last interference group, where the number of terms always equals the determinant: 1+1+1+…+1). On the one hand, it makes no sense to say a rhythm with four terms – or six, or seven, or eight, or ten... – does not correspond to a pure style family, but on the other hand, both the method and the formula work beautifully as a serial development of the evolution of determinants split into binomials. Sounds a bit like a catch… But the solution is quite simple: when we wanted to create a rhythm from the single determinant, we split it into a non-reducible binomial. We can do the same thing with one of the interference groups whenever we want a number of terms like 4, 6, 7, 8, 10, etc. In other words, *any interference group can have one or more of its terms split into a non-reducible binomial*. This resembles the method described for pitches in the earlier section, "identity of intervals."

One might wonder how to deal with styles where the determinant varies throughout by a factor of the least common denominator – usually through augmentation or diminution. For example, music in common time often switches between x = 2, 4, 8, and 16… It turns out that this question suggests we take the above method one step further. If we accept the notion that multiple determinants (exponentially related to a small common denominator) occurring consecutively form a non-hybrid style, then we can create a complete list of the rhythms unique to that style by going through the interference group process for each successive (related) determinant. I should add that as the sizes of determinants increase, the possibilities for their related rhythmic styles become more plastic and less distinctive.

I will not discuss hybrid rhythmic styles at great length, except to note that these come about as a consequence of two or more unrelated determinants, and that all hybrid style selections tend toward uniformity (like pure styles), even though they categorically differ from styles defined by a single determinant. As an example: the determinants 3 and 4 form a hybrid style when used interchangeably at random, but they imitate the pure style determinant 12 when one is factorially synchronized with the other. In jazz, triplets organized into four uniform groups fits the description nicely. A hybrid style is also formed whenever one pure style follows another in succession (where $x_1 \neq x_2$), though I should note that if this happens with regularity, a third pure style is created ($x_3 = x_1 + x_2$).

The reader should keep in mind that these are just the initial tools used to form a secondary selective set. Applying various other relations to rhythmic groups, like growth series or mutual displacement [$5 + 4 = (5 - 2) + (4 + 2) = 3 + 6$] furthers the possibilities. Also, factorial organization (rhythm of the bars) can be treated like fractional organization (rhythm in the bars)… Schillinger encouraged his students to find new and exciting

possibilities for abstracting and synthesizing concepts, particularly with relation to rhythm and form.

2. Selection of Relations

I will not go into too much detail here. By "selection of relations," I mean the manifold of techniques used to vary given pitches and rhythms. This includes "geometrical" relations, permutations (circular and general), transpositions, additions and subtractions of elements to/from any variable component, synchronizations with other components, and abstractions of variables from each other.

A geometrical relation to Schillinger is any inversion, retrograde, expansion or contraction (of either pitch or rhythmic variables). I assume the former relations are known to the reader. Expansion of a scale or a chord can follow any additive series. The simplest form of expansion is of course multiplication of the entire set (e.g., 1+2+3 ⟶ 2+4+6). When we represent musical instructions graphically, expansions and contractions appear as "stretches" inwards or outwards in the vertical or horizontal directions.

Permutations have already been partially discussed. They may occur both with sets of pitches and sets of rhythms (or any other variable, for that matter). One interesting application of permutation is with voice-leading. Schillinger says classical voice-leading can be accurately explained by the concept of "transformations of the chordal functions" (*System* 376). If the chord C-E-G transforms into a chord with a root A (defined by a special case of triadic identity, i.e., Western tonality), we could conduct a circular permutation of the chord functions of the first chord (1-3-5) to uncover the next chord's possible structure (3-5-1 or 5-1-3 in the same position; i.e., C-E-A or E-A-C). Of course, one can generalize the method to

include symmetrical structural identity (*no* permutations) and *all* general permutations (adding 5-3-1, 3-1-5, and 1-5-3 to the above example).

By "additions and subtractions," I mean changing the saturation of a given set. For instance, one can vary a melody by splitting any one duration and assigning new pitches to each new attack. Take 2+1+2, and split the first unit, resulting in 1+1+1+2. Or add a seventh and a ninth to a triad. Changing the saturation of any component's set has direct semantic connotations, which I will leave to the reader's intuitions except to note that saturation in the natural world relates inversely with distinctness and directly with inertia.

I have already discussed synchronization in general. A set or sequence defined by any musical variable can synchronize with a set or sequence defined by any other musical variable, and one can compute (predict) the resultant synchronization. The elements of a set of pitches in sequence can temporally synchronize into chords; a certain number of attacks can synchronize with a rhythm. The number of performance parts can synchronize with a rhythm, a number of attacks, and an instrumental combination, etc.

"Abstraction from a component" is the reversal of synchronization. Any variable can be singled out; a chord can arpeggiate, a pitch sequence can receive a new rhythm, etc. Abstraction requires separation of variables from their group identity (usually repetition or simultaneity).

The reader may appreciate how "Selection of Relations" gives a simple, accurate, and powerful account of the possibilities open to a musician for altering given musical materials into new forms. This particular subject can only open more doors and lead students to discover innumerable remarkable correlations of musical identities.

C. Harmony, Melody, Counterpoint, Form, etc.

I will not discuss these three broad topics, but one can imagine that Schillinger treats them similarly to his treatment of the initial selective steps. In much of the first volume of *System of Musical Composition*, he discusses harmony and counterpoint historically, as well as technically, and the result is a new look at older forms. In the other books of the first volume and in most of the second volume, he sets up and generalizes the possible pitch relations into a single set of principles, which he eventually calls "Strata Harmony." From this, he says the composer can create melodic forms, contrapuntal forms, block harmonies, correlations of any of these, etc.

I have also ignored Schillinger's discussions on form. The reader might have gotten a taste of it when I described "factorial" continuity; larger form comes about from a specific division and combination of that continuity, with thematic material divided into episodes. "Episodes" to Schillinger are not what we commonly associate with episodic forms, since for him one can devote any portion of one or more episodes to neutralization, modulation, etc., so that well-defined structural episodes for the composer do not necessarily form a one-to-one correspondence with obvious audible cues.

As an example of semantic relations of form, here is a Schillinger suggestion for coordinating music with story:

> Select a plot. Distribute the plot over a group of events (episodes). Analyze the sequence of episodes on the basis of our semantics (i.e., establish the relationship of episodes to balance, tension and release, anticipation and fulfillment, climaxes, etc.). Classify the episodes according to their importance. Give the episodes of primary importance the longest time-periods…Organize the entire temporal scheme according to such a selection. Write a continuity of sonic symbols to satisfy the temporal scheme of the plot… (1462)

D. Coordination of Patterns with Reactions

In *System*, Schillinger uses the topic of "melody" to introduce the coordination of patterns with reactions. It has not been my intention to discuss this topic in depth, so I will

merely offer some suggestions to the reader.

Earlier, I mentioned a model of reactions along the lines of **defense—neutrality—aggression**. Imagine, then, a continuous horizontal axis moving from left to right. If we remain attached to this axis, we are neutral. Applying the graph to pitch, we immediately intuit an unchanging pitch, in the middle of its register representing this neutrality; we are at the top (0 degrees) of the psychological dial.

Similarly, moving *away* from this balancing axis stimulates aggression-responses, thus moving us clockwise on the psychological dial, usually toward a climax. In rhythm, for instance, a change from uniformity (4+4+4+…) to *unbalanced* binomials, trinomials, or polynomials that tend toward acceleration (3+1, 2+1+1, etc.) produces this aggression-response. With pitch, a move away from the neutral axis (including below it) tends toward an aggression-response. A move toward the balancing axis stimulates a defense-response, and the psychological dial spins counterclockwise. Remaining anywhere for very long transposes the melody to a new neutral axis (without necessarily changing the scale or pitch set). The psychological dial applies to other musical materials, like dynamics, tone-quality, harmonic density, etc., like with rhythm and melody.

About gaining momentum (either toward or away from balance), Schillinger says: "Impetus is caused by resistance which results from rotation [in time, represented by wave motion]…The kinetic result of rotary motion is *centrifugal* energy" (*System* 279). Imagine a drama where the hero must climb a hill. Nothing dramatic would happen if he merely walked up the hill. The obstacles he meets slow him down, push him back, and ultimately require an enormous exertion of energy on his part to make it to the top. This is what Schillinger means by "the kinetic result of rotary motion." Resistance can be created by simple repetition (e.g., *Rite of Spring*), or by various rotations around an axis – either the

primary axis (neutral) or any secondary axes (axes which lead toward or away from balance). Any dramatic musical example would suffice to prove the point. Take the more passionate moments in Wagner's operas; the violins travel up and down scales, but head in a general upwards direction. Schillinger would call this periodic rotation around a secondary axis.

E. Analysis

I will not provide an analysis here using Schillinger's theories, since I have not explained all the symbols that he uses. Traditional analyses and reductions only reveal general components; a complete analysis would be a complete reproduction of the piece with non-musical symbols [technical content], graphs [semantic content], and important structural information. Such an analysis would be intended as an aid for critics, musicians, and composers as a universal tool that contributes to the diversity of critical discourse, and as an aid to composers, theorists and musicologists in relating principles with practice. It can be used to study aspects of style, and in general it can be used statistically in comparative analysis.

Most composers prefer that some intuitive invention take place when they write music. Given such material, a composer can still describe his music in terms of Schillinger's nomenclature and techniques (only a very few of which I have described here), and from that have the resources to intelligently and artistically edit and develop his material. If he produces a semantic plan, he may then develop his material within the plan. One can also use Schillinger Theory to methodically develop general musical and specific compositional skills, and intuitively apply them at a later time. This was probably the use most of Schillinger's students found for his System, but his critics have ignored any possibility other

than using numbers and various serial transformations to generate a contrived substance. They do not realize that pedagogy and composition are, in fact, two different things.

As this is supposed to be a universal method, other theorists' ideas can conceivably be explained and analyzed under Schillinger's conceptual framework. It would be interesting to attempt such a project.

III. Criticism

"We are opposed only to vagueness and haphazard speculation." – Joseph Schillinger, *System* (1356)

A. What Could be Called Criticism

I mentioned at the beginning of this paper that "most of the assumptions made by modern theorists about Schillinger's theories derive from 1) a lack of knowledge (ignorance) and 2) confusion about broadly interpreted small bits of knowledge (worse ignorance)."

The only published academic resource on Schillinger that I found over the course of my research was an article published by Elliott Carter in 1946, titled "Fallacy of the Mechanistic Approach." I imagine this article has served scholars time and again on the few occasions that they have considered taking up the current subject. I have found some other articles that mention Schillinger, some kindly, some unkindly, and all problematically**.** I will first discuss the Carter article in some depth, then I will provide a philosophical precedent for Schillinger's esthetic assumptions, and finally I will discuss an example of anti-Schillinger propaganda.

Carter uses *Schillinger System of Musical Composition* as *the* prime example of a "mechanistic approach" to composition. This terminology – "mechanistic approach" – is incorrect, as the reader must now realize, and its inherent fallacy injures most of Carter's arguments. I refer the reader to the entire section on Schillinger's esthetics (regarding the need to express an idea, not an arbitrary mechanism), and to the points I made on the possible applications of a Schillinger analysis ("…to methodically develop musical and/or compositional skills, and intuitively apply them at a later time"). Still, we should take a more careful look at Carter's complaints: "[*System*'s] form of exposition is really a rhetorical method not particularly aimed at careful scientific rigor but at a kind of surprise and shock effect, [with] violent invective, dogmatic assertion…and a certain megalomania." These

statements are inherently ironic, since they appear with no accompanying evidence. Nonetheless, I will address them. Schillinger had an unswerving patience in his life for others' opinions, and did his best to save his own for when he wasn't teaching, although in his writing he often makes hefty statements that he believed were objective. In any case, Schillinger's criticisms always directly relate to his topics, and in *Schillinger System of Musical Composition* his topics have a pedagogical basis – i.e., they are teaching tools. For example, in the book on melody, he gives three examples from Beethoven's Pathetique sonata, in order to illustrate what he means by the "primary axis" of melody. Out of context, it would seem that in the third example he directly criticizes Beethoven ("violent invective"), and implicitly states that he is somehow superior ("certain megalomania") by finding fault with the proportions of the excerpt's axes. Even according to Schillinger, though, "the location of the primary axis is…relative to the amount of continuity retained by our memory" (*System* 246). He uses Beethoven's music in all three examples only for pedagogical consistency, to demonstrate pitch axes that gradually over the course of the three examples become more and more ambiguous; a Schillinger analysis of more or less of the melody used in the final example (from the last movement Rondo theme) would yield different results, *and* the example could be reinterpreted using Schillinger's methods to demonstrate a modulating primary axis (which he doesn't discuss at that particular point), *and* the example could be reinterpreted with a Schillinger harmonic analysis that clarifies the primary axis. In other words, Schillinger's brief analysis is not meant as pure contextual criticism, but as part of an isolated example created for the student's benefit. He actually uses this *same* melody earlier on in *System* for an entirely different and far more obviously educational purpose: to show how one melody, when altered by inversion, retrograde, and retrograde-inversion, can have a variety of characters (inversion brings out the Haydn in Pathetique's Rondo theme;

the retrograde version sounds Hungarian!). Schillinger would never use an inadequate melody for this purpose. The same argument applies to numerous other examples in *System of Musical Composition*.

"The terminology is unfamiliar: musical terms are referred to by letter symbols which even a generous glossary at the back does not always clarify." This statement is a bit embarrassing for Mr. Carter. Whenever new nomenclature shows up, Schillinger provides both ample explanation *and* ample exemplification. Apologists of Schillinger's theories occasionally do the same disservice to the work that Carter did – in a recent dissertation written by Jeremy Arden for City University in London, he mentions a problem similar to Carter's, stating that at one point, "Schillinger introduces an idea which he refers to as 'textural density'. This is one of the most impenetrable discussions because it is largely written in Schillinger's own highly complex system of algebraic notation" (Arden, 45). Arden discusses the matter further saying it "deserves further clarification" (45). I therefore have a suggestion for Carter, Arden, and any who share their strange dissatisfaction, and yearn for a little explanation: try another read-through, and you might discover entire sections devoted to such clarification throughout *System's* two volumes, and if you are still stuck, try out Chapter 7 in Book XII, titled "Nomenclature and Notation."

Carter eventually states that the book "makes many interesting contributions." More specifically, he believes that "the system aims at the all-inclusive, under the one aspect of mathematical patterning." Even at the end of this slightly positive moment, though, Carter diverges back to his original misconception, to which I must again reply: Schillinger *does* believe that the fundamental basis of our experience of the universe is periodicity; he does *not* believe, or ever state, that this experience is entirely explained by mathematical patterning. He believes that a simple understanding of our natural responses to the world

provides the tools and the basic thought processes necessary for initiating the student's journey toward a truly comprehensive grasp of musical materials. Schillinger's older contemporary Arnold Schoenberg also carefully "contrasts this natural process with the mannerisms of those who simply graft devices gleaned from speculation and the fashion of the day onto a 'minimum of idea'" (Shawn, 184). Although Schillinger says some mathematical series of natural growth have an esthetic component, he does not at all believe they represent the whole picture, "for we know very little about the technique of pattern formation at the present" (234). Any hypotheses he makes on the subject of growth series can even be rejected by modern theorists without harming the main theory itself. (The latter neither requires nor necessitates the former, except as a possibility for raw material.)

"This conception of 'resultants' of 'interference' creeps into every part of the book like a Pythagorean refrain, with not too musical results." It's a short article, so I will not criticize Carter's failure to describe just what "musical results" are; but the fact that Carter thinks Schillinger intends the "resultants of interference," like 3:2 or 4:3, for universal use (thus dictating a style), gives strong proof that Carter only gave *System* a skimming. Resultants of interference are the subject of the earliest chapters of the first book of the *System*, and only come back when rhythm is not the topic at hand. To Schillinger, resultants are like rhythmic "scales," so using them in a technical manual is like using the same set of notes while discussing several different rhythms. It's an age-old approach: isolate the current subject by neutralizing all potentially interfering variables. I'm amazed Carter hasn't written a similar article about the uselessness of Fux's "unmusical" examples and "mechanistic" approach, from which Schillinger takes his cue.

Carter makes two more points that call for some discussion. One is that "all this material is presented with no particular regard for when to use what, for whether it is good or

bad. It is here that Schillinger's system falls down." From my previous discussions of Schillinger's esthetics, and the semantics (which do appear in *System of Musical Composition*, though not to the same extent as in *Mathbart*), the reader can see clearly by now that Carter's assertions fail here. The *point* of the system is to excite the student with worlds of infinite musical possibility!

With his other final point, Carter leaps from his previous statements' incorrect assumptions to almost complete senselessness: "The basic philosophic fallacy of the Schillinger point of view is of course the assumption that the 'correspondences' between patterns of art and patterns of the natural world can be mechanically translated from one to the other." How else would an artist draw a fig leaf, if it couldn't be translated from the natural world to an art medium? Are not our emotions, our beliefs, our "dogmatic assertions," our loves, our jealousies, our dramas, our travels, our ecstasies, our lives, and our creations all a product of our experience of the world, and are not all of these things expressed in art? Carter could then inquire, "how does art do these things in terms of *PATTERNS*??" And here, though Carter might feel he has caught Schillinger in the midst of an elaborate hoax, I will very briefly show that Schillinger's confidence in the power of pattern-making has philosophical precedence.

The eighteenth-century philosopher David Hume states, in *An Enquiry Concerning Human Understanding*, that "wherever the repetition of any particular act or operation produces a propensity to renew the same act or operation…we always say, that this propensity is the effect of *Custom*." That is, "custom" for Hume means the same thing as "periodicity" for Schillinger, so we shouldn't be surprised when Hume also says, "**all inferences from experience are effects of custom…custom, then, is the great guide of human life. It is that principle alone, which renders our experience useful to us**." If

Carter has a philosophical problem with Schillinger's methods, he should first address Mr. Hume.

Ivor Darreg also directly tackles Schillinger's theories in his article, "Should Music Be Composed with the Aid of Systems?" He mentions the Beethoven example, adding "how would any composer as busy and as full of novel ideas for compositions as Schillinger said he was, have the *time* to go around trying to improve on the classics?" I will repeat that Schillinger was not trying to improve on "The Classics;" he was using in that example, as he does *everywhere else* in his system, other composers' music to help explain his concepts. Most humans refer to this method as a "common teaching tactic," rather than "an arrogant waste of time."

Darreg says "other divisions of the mathematical field would have been far more suitable [than the simple mathematics Schillinger employs]." Like Carter, Darreg offers no further explanations or constructive suggestions. Schillinger's theories were designed for traveling musicians in the 1930s – perhaps this clue prevents Darreg from suggesting other divisions of mathematics to Schillinger and his oh-so-academically-oriented students, such as differential equations or multivariable calculus. In any case, Schillinger uses the simple tools that he does because those are the only tools he needs – a composer combines, subtracts, multiplies, and divides, though almost always on several hierarchic levels and with several variables at once. I can think of only one suggestion to help Schillinger organize his concepts: group theory; but even without that mathematical theory of symmetry, Schillinger rigorously provides the necessary content. His students learn to produce all the transformations, repetitions and permutations included in group theory. (A note: *Mathbart* includes fairly meticulous theoretical discussions of various transformations and patterns.

These are not necessary for understanding and applying the concepts, though, as Schillinger demonstrates in *System*.)

Darreg also looks for specific cases to nibble at Schillinger about, like "a sequence of numbers which Schillinger arbitrarily applies to semitones to produce an ascending series of notes." Darreg is mistaken, though – such sequences usually derive from recognizable entities, like growth series and large intervals that can break into multiple smaller parts. Consider the octave, split into one of Schillinger's "arbitrary" sequences, say, [2+2+1] + 2 + [2+2+1].

Unlike Carter, Darreg does more than just misinterpret Schillinger's theories; he actually lies about them. "The customary 12-tone equal temperament tuning is accepted without any explanation being given--no whys or wherefores--and the conventional musical notation is taken for granted without any explanation of the odd way Schillinger uses enharmonic equivalents." Since tuning is the primary selection for pitch, one can bet that Schillinger mentions it, and his reasons for limiting explanation of techniques to 12 equally tempered tones, several times. For example, see the introduction to "Special Theory of Harmony" (*System,* 359), the first chapter of "Theory of Counterpoint" (*System,* 697-707), and page 273 of *Mathbart*. If Darreg ever preferred various forms of microtuning, he would have been happy to learn that in *Mathbart* Schillinger describes a keyboard he designed with 144 possible notes per octave to demonstrate an alternative tuning system. To Schillinger, developing general concepts are far more important than proving the legitimacy of one tuning system over another, as long as one understands the implied conditions of every choice (including tuning): "Enclosing an unbounded space in a rational boundary *ipso facto* introduces regulations that are the inherent laws within the boundary. The act of limiting converts potentiality into a tendency." (*Mathbart*, 193). Schillinger also explains his use of

chromatic notation and enharmonic spellings when their use is first necessitated. As far as I can tell, the spellings are clear and even somewhat conventional.

Darreg makes another untrue statement: "Schillinger had his pupils write music from numbers in telephone directories, stock-market charts, the silhouette of the buildings in the Manhattan skyline, etc. This is better than inspiration? Well, Schillinger said it was not only better, but was more scientific and efficient!" The only historical record of Schillinger ever using things like telephone directories and skylines was a description by his wife of a musical prank he played on a conference of educators (where numbers from an arbitrarily chosen series created a "Mendelssohn effect") . When Darreg asserts that Schillinger believed these forms are more efficient than inspiration, he ignores Schillinger's true belief that a strong understanding of musical options and semantics is the most efficient tool of all.

I will not continue too much longer along these lines, since I include Darreg's comments here mainly to demonstrate the kind of heedless scorn that Schillinger has received… "The graphs are alleged to show tonal relations more accurately than the conventional notation does, but they *leave out* information contained in the ordinary notes and markings, and terms like 'axis' and 'trajectory,' denoting structural features that are not discernible by the ear or particularly relevant to music-as-played-and-heard, are bandied about." When he uses the graphs in his Theory of Melody, he explicitly says they are intended only to reproduce the most essential features of melody (pitch, time). Darreg's problem is similar to Carter's – he ignores Schillinger's intended use of his material. In the second volume of the *System*, Schillinger gives graphs and notation for every musical parameter. As to the comment made about the "axis" and "trajectory," if Darreg can not tell when a melody is generally "rising" and "falling," and when a single note is obviously emphasized more than others, or if he feels these "structural features…are not discernible by

the ear or particularly relevant," then I must confess a complete lack of confidence in any of his musical insights.

There have been a variety of cases where writers have mentioned Schillinger in articles on other subjects and have incorrectly characterized his theories. Cal Arts teacher William Moritz wrote an article about an experimental animator, Mary Ellen Bute, who happened to collaborate with Schillinger in the 1930s. Apparently, Schillinger "reduced all music to a series of mathematical formulae" and failed to account for "non-mathematical factors, such as orchestral tone color, and nuance of mood and interpretation." I should note that Schillinger made "orchestral tone color" the specific subject of his book on orchestration in *System*. In program notes on Gershwin's *Cuban Overture*, Orrin Howard completely evades the argument, mentioning in passing that "it's a testament to Gershwin's genius that such a curriculum didn't kill his inspiration." I refer the reader back to the shortlist of Schillinger students, all of whom endured that inspiration-killing curriculum.

B. Reason, Intuition, and Suggestions

Many of the suggestions that I would make refer directly to some of the techniques – for instance, one can expand Schillinger's contrapuntal methods to several voices, and even generalize them to a point where they equally compliment his "General Theory of Harmony." Of course, such suggestions have no place in this paper, since I discuss few of the *techniques* themselves. Instead, I would like to make a few critical comments on the theoretical background to Schillinger theory, and offer some pedagogical suggestions implied by my criticism, especially regarding the practical application of Schillinger Theory.

First, Schillinger assumes there is a categorical difference between reason and intuition, which seems like a natural assumption. I would like to suggest, however, that intuition and reason are part of the same continuum. Let's try a little experiment:

2 x 12 = ?
4 x 3 = ?
2 + 8 = ?

I doubt you used reason to discover the answers to these three questions, yet I would also bet that you're sure you made the reasonable choice. Similarly, it seems that once someone truly learns a multitude of possibilities – either by rote (brought on by fascination) or by application – and at least understands their effects on her/himself, then the possibilities will find their way to her/his "intuition." Intuition and inspiration are merely words meant to describe the instinctual speed and enthusiasm employed in any action. Indeed, aural analysis of any musical work can only be intuitive, unless the listener has a great deal of practice with counting.

Of course, the speed of intuitive thinking has many drawbacks for the composer. It is often inexact when relating qualities with quantities. It relies on imitative procedures, immediate fallback memories, and automatic gestures a great deal more than reason does (though it also often encourages the same kinds of responses). It makes "mistakes," in a strange kind of way, since it doesn't always take into account some important variables.

The measure of rational "efficiency" is a difficult one to make as well. Engineered planning can take quite a long time, depending on the number of details, and intuition's random leaps and exceptions can result in almost superhuman compositional speed.

Remember my claim, though, that intuition and reason form part of the same continuum. If one thoroughly absorbs the musicals tools, combinations and their effects through reason, these become available to the fast-working intuitive mind. Suddenly, "one of

those" gets changed around "like this" to produce "that kind of effect" while maintaining "these qualities." I must also stress that all the technical training leading to this understanding only makes sense if the student can hear it, if techniques associate with sound through the development of discrimination. Since Schillinger provides a descriptive method, ear training can more accurately and consistently encourage the student to make associations between sounds and symbols (which encourage a deeper understanding of the sounds themselves).

Here are some suggestions, then, for the further development and explication of Schillinger Theory. I believe a new approach is necessary. I believe that Schillinger's technical resources can be encouraged and developed in the whole musician, beginning with non-notated general forms that excite the student (written semantic structures, instrumental improvisations of semantic structures, intuitive analyses of meaning and structure in the student's favorite music, etc.), moving on to permutations and syntheses of these structures (combined with general concepts and analysis of form), and so on. As all of this happens, the musician also learns the applications of these ideas to small-scale pitch and rhythmic structures, encouraged in improvisation and ear training (with harmony, keyboards/guitars/ensembles are required). Once the techniques are grasped on an intuitive level – especially with regard to Schillinger's semantics – the student can employ them on paper without having to plan every aspect of the composition quantitatively and without immediate reference to sound. Outdated theoretical resources can be described and explained in terms of Schillinger's esthetics. People can use his techniques to publish musical games, instrumental methods, and etudes, which students themselves can create. His semantics provide ample material for improvisation "methods" and an infinite number of

interpretive exercises, and his "pure contrapuntal method" (not explained in this paper) has immediate value to students looking for some connection between ancient and modern contrapuntal techniques. A whole enterprise of music publishers and educators can reinterpret Schillinger's old coffee-colored pages of strange technical procedures and theories, and all for the benefit of young music students (this writer included), who find themselves faced with the daunting combination of thousands of styles in an enormous fixed ratio against a single obsolete music education format.

C. A Postscript…

A short review of Schillinger's esthetic theory came to my attention after I completed this paper. It was written by John Myhill and published in the September 1950 issue (Vol. 11, no. 1) of *Philosophy and Phenomenological Research*. Although it does not deal directly with any of the issues presented here, I still feel obligated to reference one of the only secondary sources on this topic.

Myhill makes an important observation in his review: "Schillinger has given us a *terminology* for describing art objects, rather than a set of canons for evaluating them." The statement speaks well for itself.

On the other hand, Myhill also claims that "in Schillinger, the sketch determines the final product uniquely." This belief has been shared by critics and enthusiasts of Schillinger's theories since they were first published. It seems incorrect. None of Schillinger's students ever agreed with the myth that one merely has to *initiate* an otherwise mechanical process; for this process would have little meaning and in most cases would certainly not be very enjoyable for either the composer or the listener. Even the Russian crystallographer Shubnikov, who thought that the structure of music can be understood scientifically, said that "music [reflects] the dynamics of phenomena, their development, the

struggle between opposing forces, and conveys not only the world of feelings, but also that of thoughts and ideas" (Shubnikov, 361). Actual natural processes carry far more structural baggage (in a dialectic between symmetry and asymmetry, with numerous variables and structural levels) than simple equations and processes ever really dictate. Like a scientist, Schillinger lays down some simple organizing principles that interact in complicated ways in actual music, and these principles help to thoroughly teach the art.

Works Cited

Carter, Elliott. *Collected Essays and Lectures*. "Fallacy of the Mechanistic Approach." University of Rochester Press. 1998.

Darreg, Ivor. "Should Music Be Composed With the Aid of Systems?" Date unknown (~1961?). http://sonic-arts.org/**darreg**/dar7.htm

Howard, Orrin. "Cuban Overture" Program Notes, for the Los Angeles Philharmonic.

Hume, David. *Enquiry Concerning Human Understanding*. Oxford University Press. 1999.

Moritz, William. "Mary Ellen Bute: Seeing Sound." *Animation World Magazine.* Reprinted: http://www.awn.com/mag/issue1.2/articles1.2/moritz1.2.html

Myhill, John. "Review: *The Mathematical Basis of the Arts* by Joseph Schillinger." *Philosophy and Phenomenological Research*. September, 1950.

Schillinger, Frances. *Joseph Schillinger: A Memoir*. Greenburg Press. 1949.

Schillinger, Joseph. *Mathematical Basis of the Arts*. Carl Fischer, Inc. 1948.

Schillinger, Joseph. *The Schillinger System of Musical Composition*. Carl Fischer, Inc. 1941.

Shawn, Allen. *Arnold Schoenberg's Journey.* Farrar, Straus and Giroux. 2002.

Shubnikov, A.V., Koptsik, V.A. *Symmetry in Science and Art.* Plenum Press, New York. 1974.