IV. Music the Key to Science

May 22, 1986

MEMORANDUM

The Axiomatic Basis for Musical Theory in the Physical Sciences

by Lyndon H. LaRouche, Jr.

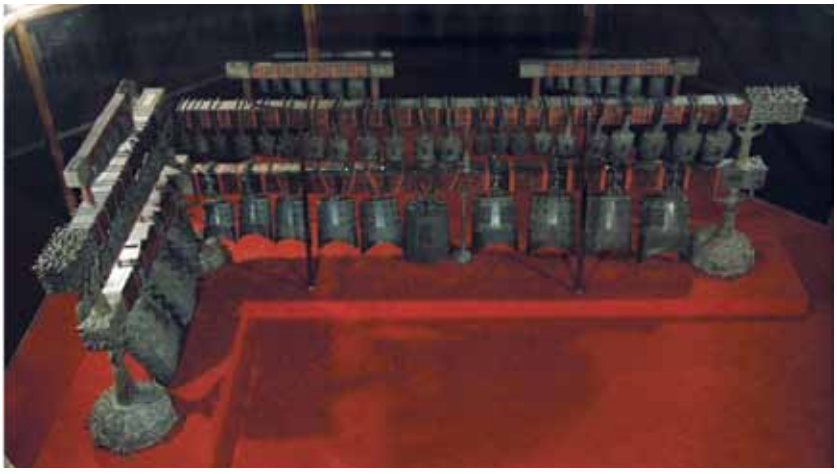
The editors of EIR *are publishing here, a previously unpublished memorandum by Mr. LaRouche intended to be used as the introduction to a polemical book on the principles of classical musical composition—unfortunately that book was never completed. Some details of the projected book have been removed.*

This is the third of Mr. LaRouche's previously unpublished 1986 works that we have published this year. On October 6, 1986, a massive raid on EIR*'s office was executed by the very same forces that are today involved in an ongoing coup attempt against President Trump. Mr. LaRouche was then targeted for elimination by the British Empire forces that had deemed LaRouche's collaboration with President Reagan on the Strategic Defense Initiative (SDI) intolerable.*

For about 100 years, the principles of classical musical composition used by such composers as J. S. Bach, Wolfgang Mozart, and Beethoven have been among the "lost secrets" of art. For about nine years now, a group of my associates and I have been searching for the answers to three questions: (l) What were the principles actually used by the greatest classical composers? (2) How was the use and knowledge of these principles driven out of the memory of modern professional musicians? and, (3) How, and to what practical effect, might that lost knowledge be revived and applied today?

A team of researchers, and has reviewed relevant European archives, and interviews with leaders of the international "music mafia" which controls most of the concert-hall programs and musical-conservatories today. My own part in this work, has been chiefly in directing research into two related areas (1) what biophysical principles underlie well-tempered polyphony; and (2) what is the doctrine of 'aesthetics which subsumes both these biophysical principles and the experience of beauty in a great classical composition? In this text, we report on the way in which the succession of classical, romantic, and modernist genres in musical composition and interpretation was centrally organized, and the motives of those who have guided the emergence of the romantic and modernist varieties of doctrine and taste. My function, in this introduction, is to summarize some of the leading features of my own work, complementing the text.

Vedic-Sanskrit scholarship indicates, that well-tempered polyphony is more than 6,000 years old. As Yehudi Menuhin reported, a set of bells tuned to the well-tempered scale, dated to about 1,000 B.C., was discovered in southern China, a region ruled by the ancestors of the modern Thais at that time. During the time of classical Athens, Plato's faction defended the well-tempering principle, whereas Aristotle's faction attacked it. St. Augustine introduced the principles of well-tempered polyphony to Europe, prompting the application of these principles of harmony to the cathedral designs of the school of Chartres. The modern well-



wikimedia/KongFu Wang

The Bianzhong of Marquis Yi of Zeng, an ancient musical instrument made of bells (called bianzhong) unearthed in 1978 in the tomb of the Marquis. The instrument contains a total of 64 bianzhong; each bell can play two tones with three degrees' interval between them. The tonal range of Zenghouyi Bells is from C2 to D7. In the middle area of the tonal range, it can play all twelve half tones.

tempered, octave scale, was elaborated by al-Farrabi, about 1,000 years ago; his work influenced the development of music in Europe into the period of the Golden Renaissance. The modern development of we11-tempered polyphony was established by the circles of Leonardo da Vinci; despite the influence of the Ptolemaic opposition during the sixteenth and seventeenth centuries, the influence of Gottfried Leibniz promoted the climate in which J.S. Bach established modern well-tempered counterpoint.

Throughout modern European history, the most consistent and influential opposition to well-tempered polyphony has come from the anti-Augustinians of the Venetian nobility. This opposition has used three prongs of attack: Gregorian chant, Ptolemaic formalism, and irrationalist hedonistic doctrines of composition and performance. Well-tempered polyphony was always in disfavor at Venice; and, except for Georg Friedrich Händel, was virtually banned in Britain from 1603 onwards. Yet, with the rise of the classical composers, in Italy and Germany, well-tempered polyphony was hegemonic on the continent of western Europe until approximately the 1840s' phase of the emergence of Romanticism.

In Germany, the war of Romanticism against classical art, was begun in Immanuel Kant's *Critique of Judgment*. After Kant, the most important sponsors of the Romantic school in Germany, were G. W. F. Hegel and his close collaborator, law professor Friedrich Karl Savigny, under whom Karl Marx studied and took the premises for his own doctrine of "historical materialism." The way in which Kant, Hegel, and Savigny set forth the doctrine of modernist aesthetics, is the key reference-point for those of my own contributions of which I supply summary report here.

Some glimpse of relevant developments during the l8l5-1849 interval, locates the musical setting in which the attempted eradication of classical music was begun. We begin with some observations provided by the pianist Carlo Levi-Minzi.

Levi-Minzi presented a workshop session on the performance of Chopin to a musical seminar, documenting the evidence in a lecture delivered from the keyboard. Except as Paris circumstances influenced secondary features of his compositions, Chopin is essentially a classical composer, rather than as usually misrepresented today, as virtually a follower of the Romantic Franz Liszt.

Chopin teethed on J. S. Bach in his native Poland, as his own earlier compositions underscore. He moved briefly to Vienna, in 1827, but moved on to Heinrich Heine's Paris after discovering that post-1815 musical Vienna had lost that spark which had fostered the work of Mozart and Beethoven. The affinity of Chopin to Beethoven is well known. The "Fantasie-Impromptu" is famously a reworking of a musical idea taken from Beethoven's "Moonlight" sonata; the B-minor sonata is a treatment of the musical idea of Beethoven's "Opus 111." That Chopin sonata is based, generically on the same musical idea originally presented by Bach in his "Musical Offering," in Mozart's famous "Fantasy-Sonata" (K. 475-457), and Beethoven's "Pathetique." Levi-Minzi demonstrated, that while there is a strong influence of Beethoven upon Chopin's composition, Chopin remained predominantly a pupil of Bach.

This illustrative case of Chopin, requires us to turn, at this point, to a seeming digression which is not a digression.

Tonality and Musical Ideas

Our insight into the musical life of the late eighteenth and early nineteenth century, is blurred today, in many ways. One of the important ways, is a shift in the tuning of instruments and orchestras, a change which

Portrait by Joseph Willibrord Mähler

Ludwig van Beethoven

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Frédéric Chopin

Portrait by E.G. Haussman, 1748

J.S. Bach

has made it near to impossible, usually, to hear classical music performed according to the intent of the composer.

Bach's, Mozart's, and Beethoven's keyboards were tuned precisely to a well-tempered scale, with middle-C set strictly at 256 cycles. The dominant concert keyboard instrument into the early nineteenth century, was the fortepiano; this instrument has a registral balance on which the intent of Mozart, Beethoven, et al. was premised, and has a balance with the chamber-music ensemble, which is of importance to hearing works of the "pianoforte" period performed as they were intended to be heard musically. During the middle of the nineteenth century, keyboard instruments underwent certain radical alterations, which fitted them to the Romantic compositions.

The wind voices of the orchestra were redesigned in such a way that the out-of-tune character of modern wind instruments makes it impossible to perform a Mozart or Beethoven symphony in which the winds' voices cohere exactly, contrapuntally with the strings.

The upshift toward "concert A," seems a small difference in pitch, until we note the discomfort of trained vocalists who attempt to sing their usual repertoire at its original reference key of middle-C at 256 cycles. Often, a shift in pitch has significance for the singing register at which a passage is delivered, a matter of no small importance in well-tempered compositions.

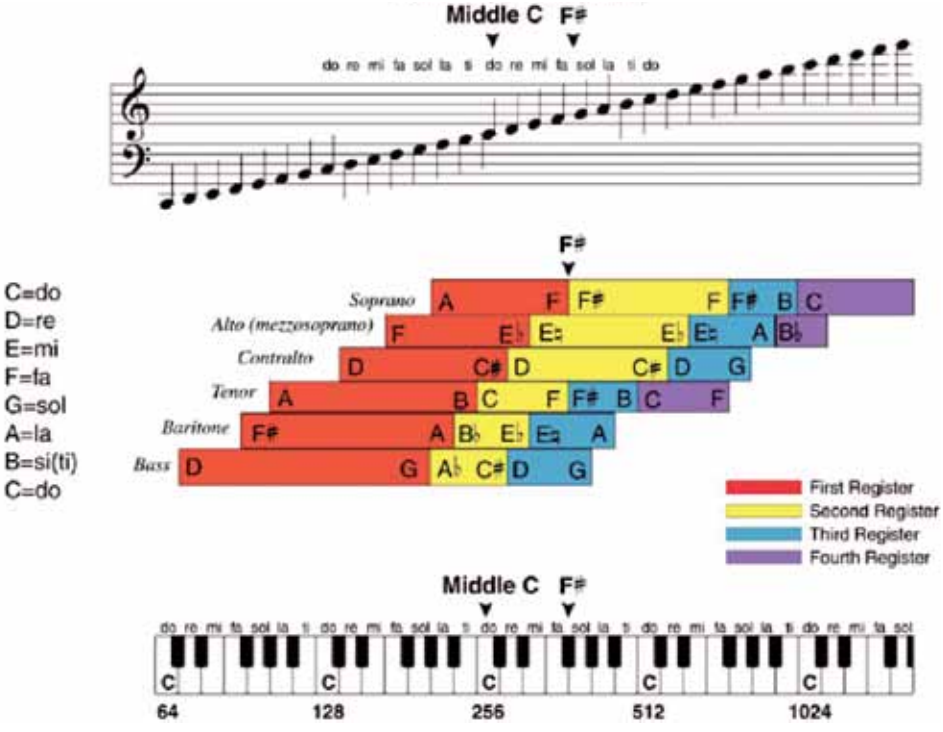
In classical composition, succeeding passages for a single singing or instrumental voice are often intended to be a different voice than the preceding passage; in effect, a singer, for example, may be singing two or three parts, each at different points in the composition, often in successive lines of a strophe. The skilled composer places passages within tonal ranges which tend to aid the singer in producing different registral "color" for each of the two or more voices that singing part must represent in the composition as a whole. A slight shift, away from classical values of well-tempered middle-C, toward a modern "concert pitch," can thus either muddle the performance of the composition, or at least create difficulties for the singer's attempt at contrapuntal "voice transparency" in the rendering.

The adjustment of the musicians to "relative pitch," rather than a rigorous childhood solfege training in "absolute pitch" as a well-tempered scale at middle-C equal to 256 cycles, introduces difficulties. It becomes more difficult for the musician to recognize the purpose of the classical composer's choice of a specific key-signature. The classical composers based their work on the well-tempered scale of C-major, at middle-C equal to 256 cycles. Thus, for them, any shift in key from well-tempered C-major has well-defined significance. The base-line in musical composition, especially since Bach's "Musical Offering," is the developmental relationship between the keys of C-major and C-minor. Among well-educated musical audiences, the entirety of classical music is, in effect, a single, growing totality, to such effect that any composition not in C-major/C-minor is heard with respect to the base-line of

C. The very fact of a different key-signature, or a different key arising in the development of the composition, produces an effect which may be described as a shift in "color," or as "aesthetic tension."

Thus, the transition from the Classical to the Romantic, following approximately the 1815-1849 interval, was accompanied by a shift of tonality away from well-tempered scales, notably in the altered design of winds, and shifts toward "concert pitch" and the notion of "relative," rather than "absolute" pitch. It is near to impossible, to cause a modern orchestra to produce some of the most essential features of a classical composer's intent. For these reasons by themselves, excepting the case of certain exceptional vocalists and string performances, the modern performer and audience usually has a "blurred" perception of the original intent of classical compositions, at best.

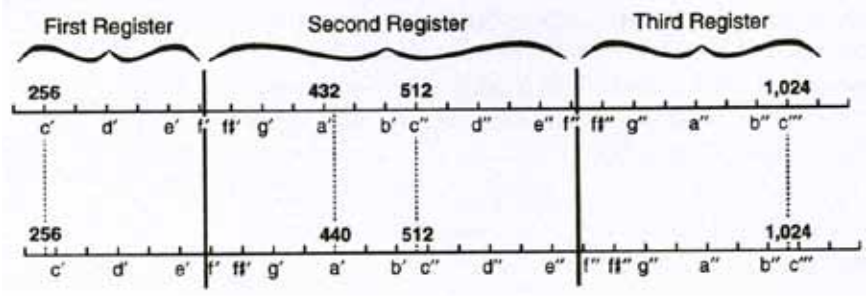
The Six Species of Human Singing Voice, and Their Registers



This argument is not merely a matter of musicological "archeology." There is some advantage, especially for musical research, in attempting to reproduce the exact pitch and sound of instruments and orchestras, as the classical composer intended them to be heard; but, that is only a secondary matter. The primary issue, is the reproduction and communication of musical ideas: A well-tempered polyphony, set at a 256 cycles value for middle-C, is indispensable for accurate presentation of the musical ideas of classical composers, but this is only the precondition for that presentation; the nature of musical ideas goes deeper.

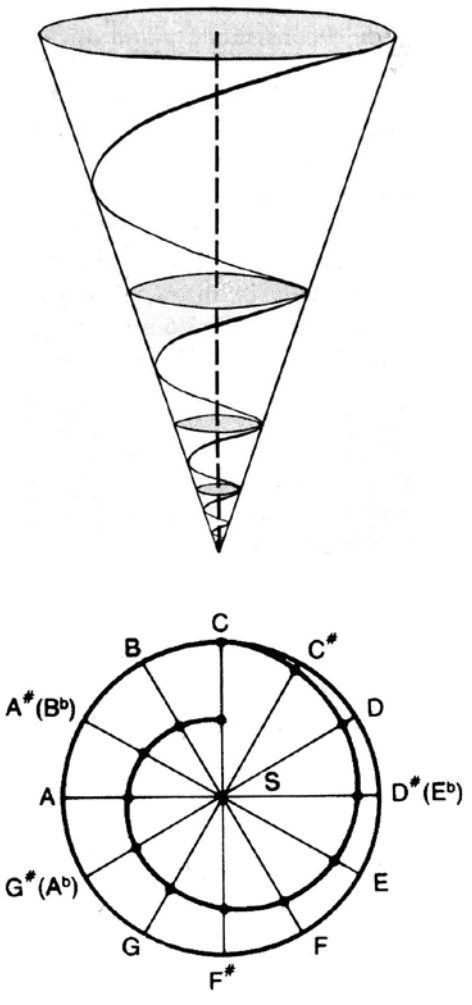
Every musical instrument, including the human singing voice, should be strictly set to a well-tempered scale of these specifications. However, there are additional distinctions among instruments, which distinctions often bear upon the way the composer presented a musical idea. The registral characteristics of the different strings or ranges of strings, of bowed instruments or keyboard instruments, are to be included in this; similar principles apply to wind instruments. The balance among different instruments of an ensemble, is of the same general significance. For such reasons, transcription of a composition from one instrument to another, does not always succeed. The issue is not "an authentic sound;" the issue is the way in way the registral interplay among voices within the composition is presented. This registral interplay is an essential part of what is conveniently described as "voice transparency;" the clear communication of musical ideas usually depends upon such "transparency."

The location of "musical ideas" is found by examin-



At A=432 or below (top scale) the register shift occurs between F and F♯; at A=440 or above (bottom scale), it is forced downward to between E and F.

ing the characteristics of well-tempered polyphony as a language. We are "language" in the proper, broader sense, that geometry is also a language. There is nothing accidental or arbitrary in this definition of music. The origin of music is classical poetry, as, for example, in the sung character of Vedic hymns, which neither have nor require a written-out musical score to guide the trained singer to as precise a rendition as if a scoring had been provided. Musical ideas are poetic ideas freed of the restricting significance of a verbal setting; in terms of spoken language, musical language is a language of pure metaphor and related forms of poetical irony. By studying the characteristics of music as a language, with immediate and simultaneous reference to classical poetry and a constructive geometry seen as a language, the meaning of the term "musical ideas" is more readily defined. To unravel the syntax of well-tempered polyphony, once we have grasped the origins of music in classical poetry, we must place the greater emphasis thereafter upon the principles of synthetic geometry.



A self-similar, or logarithmic, spiral on a cone, and its projection down to the cone's base.

As such a language, the essence of music is that it performs the same kind of underlying functions for people as does classical poetry or synthetic geometry. Musical ideas reference rea1-life experience, although in a very special and limited way. Contrary to the commonplace program-notes on concert programs and record dust-jackets, musical ideas can not be equated to the kinds of ideas commonly conveyed by prose.

The challenge which confronts the performing artist, is an accurate representation of a composition's musical ideas. The artist's performance must point clearly to the musical ideas with which the composition is begun, and show clearly how these first statements are evolved, through various stages of new musical ideas, to reach a concluding musical idea.

The best analogy for this process of musical development within a classical composition, is geometry. In deductive Euclidean geometry, we begin with the assumed self-evidence of infinitesimal points and straight lines. We add an assortment of other axioms and postulates. Every idea (theorem) introduced after that stage, is nothing more than the working-out of the original set of axioms and postulates, by successive layers of development. The original set of axioms, is a geometrical idea, analogous to the musical idea used as the starting-point idea for working out the development of a musical composition.

The layers of theorems developed, are also geometrical ideas, ideas which differ from the original axioms, but which have a hereditary-logical connection to those axioms. To that degree, the analogy to musical ideas holds up.

Beyond that point, the analogy to a formal-deductive kind of geometry fails. Musical ideas are in one-for-one correspondence with the kind of developmental process represented by what is called a "synthetic geometry." In such a "synthetic" geometry, otherwise called a "constructive geometry," there are no axioms or postulates, and no deductive methods of proof are permitted. We start with the unique self-evidence of circular action, as shown by the isoperimetric theorem of elementary topology. By nothing but circular action upon circular action, we construct a straight line and a point, and go on to construct various kinds of lines, surfaces, and solid figures, never introducing any new assumption to circular action. At a later stage, the process of extended construction passes beyond the scope of Euclid's geometry, into Fourier Analysis and Gaussian higher geometries.

The proof that the well-tempered scale is the only natural musical scale, and precise measurement of that scale's tonal values and principal harmonic intervals, is supplied by an elementary, Gaussian conic construction in the complex domain. The construction within the

scale of C-major, which determines the C-minor scale by the principle of complements, leads directly to proving the existence of, and nee for every one of the twenty-four major and minor key-signatures. Bach's musical idea elaborated in his "Musical Offering," is the model example of this in Classical composition as a whole. All of the harmonic principles of polyphony are implicitly constructible from this geometrical starting-point. We shall turn attention to more on this, in the conclusion of this introduction.

That concluding section of this introduction will return to this matter of synthetic geometry. We shall describe there, the reason why all musical ideas belong to the level of Riemannian geometry, why the construction of the well-tempered scale can be only approximated at more elementary levels of geometry. This fact ought not to frighten the student of music, but quite the contrary. The fact that classical musical ideas are congruent with nothing less than the most advanced geometrical levels of mathematical physics, should encourage us to recognize that the possibilities of classical composition are as far-reaching as the most advanced scientific thought, and the ideas developed in a major classical composition, such as the later major compositions of Beethoven, are as profound as ideas encountered in the work of physical scientists.

Generally speaking, the formal difference of interpretation between a Classical and Romantic composition, is that the Romantic composer views music as a matter of a sequence of sensual effects. The Classical composition is designed to produce a rigorous unfolding of musical ideas, in a manner analogous to a synthetic geometry. Classical composition is not "emotionless;" the emotion of Classical composition is of the type a child experiences in making what is for that child, a valid recreation of a rational discovery. Essentially, Classical music's emotion is agapē, whereas the Romantic is erotic.

At first glance at the page of a score, the early Romantic compositions seem not to be absolutely distinct from the Classical. The Romantic composers were, initially, persons educated in the Classical musical tradition, and were therefore influenced by certain features of that tradition; the distinction appears to be merely the Romantic's practice of introducing rather arbitrary sensual effects, effects which are irrationalist incompetence from the standpoint of strict polyphony. The way in which passages are constructed around these thematic, arbitrary sensual effects, is the aspect of the composition which resembles the polyphonic principles of the Classical composers.

One may say, fairly, that the difference is "emotional." The Classical composer adheres to rigorous polyphony, to the effect that the creative features of the composition are analogous in form to a valid new scientific discovery in physics. The emotion, therefore, is agapē. The Romantic's so-called "freedom," is comparable to a married man's pleasure in illicit sex; he breaks the rules arbitrarily, on impulse. He thus becomes a pornographer, the exponent of the irrational erotic in music.

The contrast between Chopin or Schumann, and Liszt, is exemplary of the point. The former are classical composers, whose musical ideas demand the clearest possible polyphonic transparency; Liszt is polyphonically trivial, by contrast, as is Richard Wagner. In a classical composition, every not of a chord is a voice; a chord of four notes signifies four voices associated with that chord (putting subtleties to one side for sake of simpler illustration). So, in presenting a Classical work, clarity of articulation of polyphonic voices, and emphasis upon their "interaction," is paramount. Relatively speaking, a Romantic piano composition is an overpedalled blur of erotic progressions of sound-clusters, for which the tendency is to perform slow movements too slow, and faster movements too fast.

The scores of Romantic compositions, to a large degree, parody the structural features of Classical composition. It might appear, mistakenly, that one theory of composition and interpretation could subsume both genres. Yet, respecting the kinds of musical ideas involved, the two genres are respectively distinct languages, the Classical the language of agapē, and the Romantic the language of eros.

The shifts in tuning and characteristics of keyboard and wind instruments, which erupted during the 1840s, had the effect of spoiling the possibility of accurate performance or Classical composition, while blurring tonality and register in a manner agreeable to the Romantic school. So, bad performance seems to be proof to the ear, that Franz Schubert was a prophet of the Romantic school, and Chopin and Schumann exponents of it.

The widespread misrepresentation of Heinrich Heine as a "German Romantic poet," is analogous to the representation of Chopin and Schumann as "Romantic composers." Heine published the most devastating, accurate denunciations of the Romantic influence, and also identified Immanuel Kant as key to those German influences which had made toleration of Ro-

Painting by Josef Danhauser

"Franz Liszt Fantasizing at the Piano," 1840.

manticism possible. The relevance of this comparison is made clear by the Heine-Schumann "Dichterliebe," quite literally a musical-poetic Socratic dialogue, in which the poet and composer are of one mind in damning the folly of Romanticism.

How was the emergence of Romanticism possible, and how, similarly, did the sundry varieties of "modernism" supplant nineteenth-century Romanticism? We describe that process first, and then conclude this introduction with an outline of the elements of the geometry of music.

Kant & Savigny Versus Schiller

Nineteenth-century Romanticism was spread throughout continental Europe, and into the precincts of Harvard and Concord, from the boudoir of the notorious Madame de Staël. It was the pathetic ideology of Jean-Jacques Rousseau, and Voltaire, spread by the Swiss banker-sponsors and accomplices of both. Yet, its roots in modern Europe go back much earlier than the eighteenth century; Claudio Monteverdi must be seen as the true forerunner of Liszt and Wagner, in respect to the pagan-cult ideology dominating the operas of both Monteverdi and Wagner, and in Monteverdi's, explicitly proposed emphasis upon erotic effects. However it was the rise of German Romanticism, out of the left-wing, Mazzinian radical movement of the 1840s, which tilted the balance, to establish the dominant influence of Romanticism in both European and American culture.

With that qualification, Immanuel Kant, G. W. F. Hegel, and Friedrich Karl Savigny, are the principal authors of nineteenth-century German Romanticism, and so, implicitly, of Adolf Hitler's regime.

The issue was first most clearly posed in Germany, by Kant's *Critique of Judgment*. Thereafter, the principal conflict internal to the history of nineteenth-century German physical science and culture, is an elaboration of the conflict between Kant and Friedrich Schiller during the 1790s. The leading points at issue in Kant's book, are two: Kant insisted, for one, that human creative discovery could not be accounted for in terms of any knowable sort of rational principle. He also made the corollary assertion, that there was no knowable rational principle governing the definition of beauty in works of art. Carl Friedrich Gauss was later to identity Kant's reasoning as dangerously absurd in the domain of physical science. Immediately, Schiller wrote his *Letters on the Aesthetical Education of Man*, both to refute Kant, and to set forth a positive basis for the rational comprehension of human creativity. Without knowledge of this controversy, no competent understanding of nineteenth-century German science and culture is possible, and no comprehension of the Romantic movement in particular.

Kant opened the doors of intellectual Germany to the corrupting influence of de Staël, by asserting that there was no rational basis for judging artistic values. Kant insisted that artistic taste was arbitrary, in the sense that taste was something redefined, from time to time, by shifts in popular consensus. The elaboration of this assertion of Kant's into a full-blown doctrine of aesthetics, was accomplished partly by Professor G. W. F. Hegel, but more emphatically, more influentially, by Hegel's fellow-conspirator at Berlin University, Professor of Law, Friedrich Karl Savigny.

There was nothing accidental in these specific roles of Kant, Hegel, and Savigny. Even in an introductory essay, such as this one, summary reference to the non-German backgrounds of all three must be included, before turning to the character and consequences of Savigny's influence on modern aesthetics and law.

Until the appearance Kant's most famous Critique, the *Critique of Pure Reason*, Kant's reputation was established in Germany as a fanatical enemy of Gottfried Leibniz, and the leading German apostle of Scotland's famous professor and British spy, David Hume. Second-generation Scottish immigrant to Germany Kant, had so defined himself. Kant's partial break with Hume occurred when Hume veered toward a more radical version of his empiricist philosophy. Hume, like his famous disciple, Adam Smith (of *Wealth of Nations* notoriety), had prohibited individuals and governments from attempting to discover any body of natural law by means of which mankind could select policies according to the pre-calculable moral effects of such policies. In opposition to, and in place of reason, Hume had proposed the substitute of customary moral opinion. This, Kant held his entire life. He distanced himself from Hume, in the Critiques, when Hume veered toward a more radically immoral empiricism akin to that later elaborated by Jeremy Bentham, Bentham's radical break with custom.

At first glance, the non-German influences principally shaping the outlook of Hegel and Savigny appear to be of a different nationality than Kant's. Not strictly so. The continuing origin of David Hume's and Adam Smith's views on philosophy, morals, and economics, was the Franco-Swiss patrons of Voltaire, Rousseau, and Robespierre's Jacobins, a Swiss circle centered upon Geneva and Lausanne, of which de Staël was a representative. These were the Swiss influences which shaped Hegel's philosophical and political outlooks, and also Savigny's.

In the manner of the times, the Prussian secret police discovered, by intercepting and reading Hegel's mail, that Berlin Professor Hegel was working as a spy for Vienna's Prince Metternich. During the period from the anti-Schiller Carlsbad decrees, until Hegel's death, Prussian State Philosopher Hegel and Savigny collaborated in an effort to prevent Alexander von Humboldt from introducing science to that university. Von Humboldt got around Hegel's and Savigny's sabotage of science, by making the university's department of classical philology the center of mathematics education, and by the Prussian military's habilitation of science professors whom von Humboldt nominated over the objections of Hegel and Savigny.

In opposition to Leibniz and Schiller, among others, Hegel introduced a principle of mystical irrationalism into philosophy, history, and art: this mysterious agency, with clearly recognizable kinship to Adam Smith's mystical "Invisible Hand," he designated as the *Weltgeist* ("World Spirit"). In order to give the appearance of rationality to this pagan mysticism, Hegel composed histories of philosophy, and a philosophy of history, which, like his "dialectics," are completely delphic frauds. As to aesthetics, the late Benedetto Croce typifies, more or less accurately, the aesthetical doctrine specific to Hegel. Hegel's significance for modern doctrines of aesthetics, is chiefly his influence on the work of Savigny.

Savigny is famous on two principal grounds, and should also be more or less famous for a third reason. In law, he is famous and continues to be influential worldwide today, by fusing the characteristics of Roman imperial law with the Romanticism of de Staël. in aesthetics, Savigny, more than any other person, introduced a policy of insisting upon an airtight separation of the rationality of the physical sciences from the study and practice of law, political science, social science, theology, and aesthetics: the separation of *Geisteswissenschaft* (the liberal arts from *Naturwissenschaft* (the physical sciences). Not only did Karl Marx study law at Berlin under Savigny, but Marx's doctrine of "historical materialism" is chiefly a plagiarism of Savigny's irrationalist doctrine of law and culture, with elements of Ludwig Feuerbach's Gnostic dogma added in.

Savigny's version of Hegel's *Weltgeist* was the *Volksgeist* (the spirit of the popular consensus). Savigny's *Volksgeist* dogma, sometimes called the *voelkisches* principle, was not perfectly implemented until Adolf Hitler's dictatorship made this the fundamental principle of Nazi law-doctrine. The congruence between Savigny's dogmas of law and aesthetics is almost absolute.

Essentially, Savigny, like Friedrich Nietzsche and Aleister Crowley later, was committed to eradicating the influence of the western Judeo-Christian tradition from modern law. Western European culture and law were first defined by St. Augustine, who outlined a comprehensive replacement for the irrationalist law and degraded moral culture of the imperial Rome then collapsing of its own rot. With one very specific and essential qualification, as expressed in the *Filioque* doctrine of the Latin Christian Creed, Augustine adopted the scientific method of classical Athenian republicanism, as best typified by Solon's constitutional reforms and the writings of Plato.

Through development of the divine spark of potential reason, embedded in every human individual as the

essential distinction between man and the beasts, man's capacity for scientific, creative reasoning in a rigorous way, enables us to discover certain higher principles of causality and law, principles which are at worst an imperfect reflection of the intent of the Creator. This is the body of natural law, as the term "natural law" is understood by Augustine, by such authors of the Golden Renaissance as Cardinal Nicolaus of Cusa, and by Gottfried Leibniz.

By its nature, by definition, Augustinian natural law is superior to any nation's constitution, any legislative act, any deliberation by judges, any passing majority of popular opinion. As the 1776 U.S. Declaration of Independence references this principle, when the inferior forms of the merely positive law come into conflict with the natural law, the natural law must prevail, and the relevant law of a nation or popular opinion must surrender to the authority of the natural law.

Painting by Sandro Botticelli, 1480

"St. Augustine in His Study."

Savigny was committed to destroying natural law, to eradicate the influence of St. Augustine and the Golden Renaissance from civilization, and to restoring the tradition of Roman imperial law, adding to Roman law only the modern innovation of empiricist irrationalism. Essentially, Savigny insisted, that, using the tradition of Roman imperial law as a set of axioms for the system of law and culture generally, the specific qualities of positive law enacted, and popular opinion on liberal-arts matters, must be treated as merely arbitrary, but authoritative. Moral values, and cultural values, for Savigny, must shift in accord with shifts in prevailing opinion's choice of values. The connection to Hume's empiricism, Adam Smith's "Invisible Hand," and Kant's emphasis on an irrationalist form of custom, should be sufficiently clear.

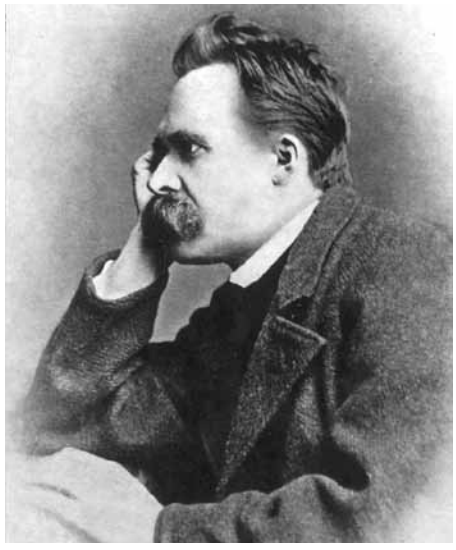
Through the position of influence in which he was sponsored at the University of Berlin, Savigny's doctrine emerged to become hegemonic in late-nineteenth-century and twentieth-century German aesthetics. This development in Germany, as it affected both doctrines of law and the fine arts, paralleled and converged upon hegemonic aesthetic dogmas in France, Britain, and elsewhere.

Through powerful Venetian influence over the powerful Acton family of Britain, a virulent Gnosticism was introduced to those islands, typified by the cult-novels of Edward Bulwer-Lytton and the preachings of Oxford Professor John Ruskin's Pre-Raphaelite Brotherhood. Out of this came the nineteenth-century theosophical-cult movement which spread throughout Europe and into the Americas. Ruskin, the Isis-worship of Madame Blavatsky, the explicit Satan (Lucifer-Dionysos) worship of Friedrich Nietzsche and Aleister Crowley, and the explicit Lucifer worship of Crowley's German social-democratic protégé, Rudolf Steiner, are examples of this. Wagner's "Parsifal" is an explicit adoration of the Cathar version of the Gnostic cult, the same variety of Gnosticism adopted by Houston Stewart Chamberlain, Nazi doctrinaire Alfred Rosenberg, and, from Wagner's circles, as the anti-Judeo-Christian state religion of the Nazi insiders. A kindred, neo-Cartesian positivism erupted in nineteenth-century France, giving rise to French fascism and twentieth-century Franco-Hispanic synarchism.

The overlap of the theosophical variety of Gnostic cults with Romanticism, and with later modernism, is not coincidence. René Descartes' mechanistic world-view exemplifies the epistemological roots of the connection. By declaring the physical world to be axiomatically mechanistic, the neo-Aristotelean Descartes relegated God and the creative faculties of the human mind to a place outside the universe, the mystical domain of a *Deus ex Machina*. In respect to Judeo-Christian theology, the Cartesian and neo-cartesian

dogmas deny the existence of the Judeo-Christian God, and thus implicitly define God as the Syrian Magi and their Gnostic offshoots do. Descartes thus, similarly, implies the wicked doctrines of Kant's *Critique of Judgment*, and thus the dogmas of Hegel and Savigny. The "mind set" of the theosophist and musical irrationalist, are one and the same; there is no coincidence in the occurrence of the two disorders in the same personalities.

Richard Wagner



Friedrich Nietzsche

In the same vein, Scottish Pietist Kant was essentially a Cartesian. This shows most clearly in Kant's distancing himself from Hume's radical turn. Both Hume and Kant defined themselves essentially as anti-Leibnizians. Hume thus continued the anti-Leibniz campaign launched by the supporters of the Duke of Marlborough, in the effort to prevent Queen Anne's appointing Leibniz the Prime Minister of England; this campaign is best known through the Leibniz-Clarke-Newton correspondence. Although post-1660 British empiricism in matters of the physical sciences, was a parody of Descartes, the eighteenth-century British empiricists were radicals, relative to the neo-Aristotelean formalism of Descartes and his followers on the continent. British empiricism adapted itself to the radical, Swiss form of Calvinist doctrine, which Presbyterians today often term "ultra-Calvinism;" whereas Descartes' training and beliefs were doctrinally Jesuitical. Kant's neo-Aristotelean formalism was essentially neo-Cartesian, as Kant showed most dramatically in distancing himself from Hume's radical turn.

By contrast, Bach, Mozart, Beethoven, et al., as well as Gotthold Ephraim Lessing, Moses Mendelssohn, Schiller, Gauss, and Wilhelm von Humboldt, were within the tradition of Augustine, Cusa, Kepler, and Leibniz.

Modernist cults within the arts are divided broadly among three currents: (1) The anti-Augustinian, Venice-centered faction of oriental Gregorian chant and Magi-Gnostic symbolism; (2) The strict formalists, such as the strict twelve-toners; and (3) The absolute hedonists, such as the jazz and rock cults. In studying modernist art-dogmas, we must take into account the significant differences among the three types, as we must recognize the secondary differences between Hume and Kant; but, we must also recognize, at the same time, that the three prototypes of modernism are but different varieties of the same species, as Dave Goldman has outlined this common origin for modernism in music.

All varieties of modernism in art concur in the most essential principle. That there is no rational principle which art shares in common with the physical sciences, and that either all art, or even only one particular artform, is governed by an arbitrary aesthetical principle peculiar to the passing opinion of some contemporary consensus. In music, for example, the radically hedonistic varieties of modernism, insist that shifting popular taste among audiences, is determining. Among the "elitists," the radical formalists, it is the current fads among the professional musicians which are esteemed as setting the standard.

For the case of Germany, the similarities and differences between the dogmas of Hegel and Savigny, are most relevant.

As Mrs. Joan Robinson aptly described the quack economist, Professor Milton Friedman, Hegel insisted upon a *post hoc ergo propter hoc* theory of history in general, and the history of philosophy in particular. For Hegel, what happened in history, is what should have happened; for him, a science of history consists of accepting the successive stages of political history as empirical demonstration of the will of the *Weltgeist*. For him, the history of philosophy is a matter of accounting

Portrait by Jakob Schlesinger, 1831

G.W.F. Hegel

Friedrich Carl von Savigny

for the world-view coinciding with each of the successive cultural stages of political history. Whatever theory of political history and of reigning philosophies is apparently consistent with *post hoc ergo propter hoc* dogma, is the proper universal theory.

Thus, Hegel pronounced the establishment of Spartan and Roman slave-society, as a necessary stage of progress in the political condition and philosophy of mankind in general. It was necessary for Hegel to lie wildly about history to paint this picture, but scholarly integrity was always an impediment to Hegel's reputation as a universal philosopher. So, every stage of political history, up through the Prussian state of 1818 as represented by State Philosopher Hegel, was a necessary stage of history, as ordered by the World-Spirit. The Prussian monarch, a notoriously weak, vacillating, and superficial intellect, relative to his great forebears, was declared by Hegel to be the highest agency of the will of the World-Spirit, and the Prussian civilian bureaucracy to be his high-priesthood, more or less as imperial Roman dogma pronounced the emperor to be a god.

Savigny narrowed Hegel's dogma somewhat; Savigny preferred a racialist version of Hegel's dogmatics. Each nation-race, according to Savigny, had its own special *Weltgeist*, the *Volksgeist* (the collective will of the people). In Savigny's dogma, the judges must accept the perceived collective will of the people, during that passing moment of history, as authority not subject to rational examination. Hit1er's doctrine of law and history, exactly.

Savigny's dogma is consistent with Roman law. Roman law was based chiefly upon the principles of Aristotle's *Nichomachean Ethics* and *Politics*, two of the most evil books ever written. The social, political, and theological dogma of imperial Rome was based on a special, oriental kind of racialism otherwise called "blood and soil" dogmas.

It has been the doctrine of empires, since Babylon and the Persian empire, that each people acquired its character from its racial ancestry and the particular patch of real estate associated with its habitation. The Chaldean priests, and their successor-form, the Syrian Magi, codified for each conquered people one and only one approved religion and law peculiar to people of that blood and soil. That codification was controlled by the priesthood of the ruling power, so codified as to make religion itself an instrument of willing subjugation of the conquered to the will of the conqueror. The Roman imperial pantheon, at Rome and at Constantinople, exemplifies the imposition and administration of this principle.

The only question of importance, for those who adopt the tradition of Roman law, is which race shall be the ruling race, to which all others are subjugated? Such empires are intended to be what some today term "world government," "global society," and so forth. The present, accelerating effort, to establish the International Monetary Fund as an institution of "world government," is consistent with Roman and Savigny's dogmas. Rather that submitting the subjugated nations to the status of puree-and-simple colonies, each nation is permitted to have its own approved varieties of local laws, religion, and customs; in effect, each such nation becomes a local satrapy under the imperial overlordship of agreements between the two superpower-alliances. The only restriction on local self-government of nations, that the particular form of religion and law they adopt, must be that approved by the ruling, "international authorities."

It is consistent with this imperial dogma, that today the proponents of an imperialist form of "global society" support the proliferation of those forms of "integrist" religious-cultural movements, by aid of which to fragment many existing nation-states into collections of "integrist" microstates. This is the current policy of

major sections of the Liberal Establishments of North America and Western Europe; it is also the "ethnic" policy of the Soviet empire. The only contention between these imperialistic "global society" advocates of the western Establishment and Moscow, is whether the Establishment and Moscow shall rule the world as equal partners, as the Establishment proposes, or whether Moscow shall emerge soon as the only dominant power within a world-empire which is essentially a "third Roman empire."

Savigny's revival of Roman law, denies any principle of law universal to mankind. That is, in direct opposition to the U.S. Declaration of Independence, for example, Savigny et al. deny an oppressed people the right to appeal to universal principles of law in behalf of justice among nations. It is a hateful attack upon the essence of Judeo-Christian civilization, most emphatically: it denies that all persons are created politically equal under the law. In hateful rejection of Roman law and Savigny, we hold that all persons are equal before the law, by virtue of that divine spark of reason which sets mankind above the beasts: an equality which is blind to distinctions of race, nationality, or local real-estate. We hold that all nations are subject to this principle of universal natural law, and regard any state or other potency which violates natural law on this point, to be an abomination. For us, only under conditions of what St. Augustine defines as "justifiable warfare," can some, relatively few, temporary exceptions to the application of this principle of natural law be tolerated.

This political side of Savigny's promotion of Roman law, aids us in seeing more clearly what is at stake in the application of these same, irrationalist principles to art in general, and music in particular. Hegel was partly correct, in assuming that there is a coherence between the form of society's political institutions and the dominant philosophy of the people under such forms of government. That point is by no means original to Hegel; relative to those who explored this matter earlier, Hegel's interpretation of it is fraud-ridden and largely false. The moral values expressed by the popular art and related features of culture of a people, do have a determining influence on the evolution of political institutions. Poetry, gone from bad to non-existent during the past century or more, and the moral decay of music, through Romanticism and later modernism, like popular television and other entertainments today, are expressions of, and forces for a kind of moral-decay of the political will, which must tend to bring nations into ruin. Modernism in art, traceably originating in ancient political evils, is a device which tends to express its embedded nature in decay of the moral quality of the political will, and of political institutions.

Schiller, Humboldt & Gauss

In his rebuttal of Kant's *Critique of Judgment*, his *Letters on the Aesthetical Education of Man*, Friedrich Schiller demonstrated that creativity is governed by knowable, rational principles. Schiller's *Letters* greatly influenced the entire work of those Prussian republican reformers, who, like Schiller himself, were part of the faction supporting the American Revolution in Germany. Out of this came directly, Wilhelm von Humboldt's sweeping reform of secondary education dedicated to the fullest and broadest possible development of the creative potentials of each young person prior to that person's undertaking specialized training at the university-level. The emphasis on teaching of synthetic geometry in secondary schools, as pioneered directly by Johann Friedrich Herbart and Jacob Steiner under the sponsorship of Humboldt was partly indebted to the work of France's Gaspard Monge and Lazare Carnot, but was a direct outgrowth of the influence of Schiller's *Letters on Aesthetical Education*. Out of this emphasis on synthetic geometry, came the greatest school of science in modern times, the Göttingen circle around Carl Gauss. Through the provocative inquiries by Herbart, and the instruction of Jacob Steiner, came Gauss's great collaborators and successors, most notably Bernhard Riemann in Germany, and Riemann's Italian collaborators, Enrico Betti and Eugenio Beltrami. The revolution in synthetic geometry, the establishment of the theory of functions in the complex domain, accomplished by Gauss and his collaborators, enables us today to restate the fundamental questions of Schiller's thesis in the most rigorous terms of scientific fundamentals.

My own contribution to this feature of music, occurred as a by-product of my earlier successes in economic science. In economics, I am to be classed generally as what is sometimes called a "neo-mercantilist," a follower of Leibniz, Alexander Hamilton, the Careys, and Friedrich List, an exponent of what Hamilton named "the American System of political-economy." However, within that larger framework, I have added an extremely important, fundamental discovery, on which I first struck during 1951-1952, the discovery of how the cause-effect relationship between advances in technology and increased productivity may be measured. The

Friedrich Schiller

Wilhelm von Humboldt

Portrait by Christian Albrecht Jensen

Carl Friedrich Gauss

elaboration of this discovery has depended chiefly on the contributions to physics of Professor Bernhard Riemann. My familiarity with the work of Riemann, arising in economic science and related matters of technology, enabled me to specify a fresh proof of the fundamental principles of well-tempered polyphony.

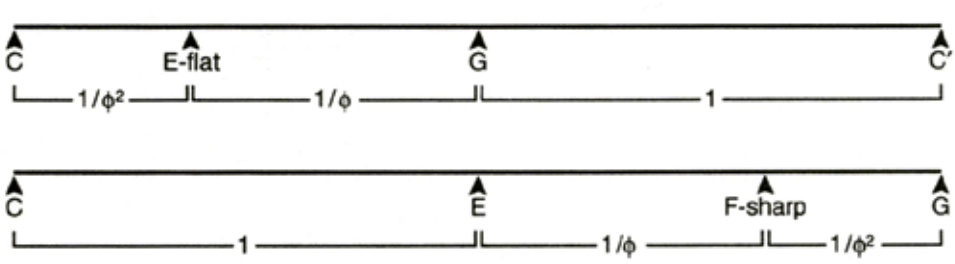
Briefly, the elaboration of my musical discovery came about in the following way. My associates and I had adopted an active program of music for our own needs and gratification, during 1973. Two brief items of mine, written during the Summer of 1977, on the Finale of Beethoven's *Ninth Symphony*, and on the singing of Florestan's prison-cell soliloquy in Beethoven's *Fidelio*, had prompted some of my associates, to launch a musical-theory research project. During 1981, the work of the musical-theoretical task-force is a new turn, almost as if by accident.

At that time, I was boiling with frustration. At the close of 1970s I had specified the constraints needed to create a computerized forecasting system. Work on the implementation of that design, had prompted a larger number of people to undertake study of Riemannian physics' relevant aspects. For most students, that study had been a failure; the cause of this failure was the blunder of some professionally physicists and students, in attempting to approach Riemannian physics from the starting-point of conventionally taught university calculus texts. From that standpoint, no comprehension of the fundamental work of Gauss, Dirichlet, Weierstrass, and Riemann is possible. Thus, the students understood the most crucial features of my mathematical-economics methods much less after taking that course, than before it. In aid of overcoming this problem, I sponsored a seminar-series on the relevant features of Leibniz's, Gauss's, and Riemann's work, held at a convenient location near Frankfurt, Germany. It was in that setting, that I introduced my thesis on Riemannian demonstration of the fundamental principle of polyphony.

Essentially, the harmonics of the well-tempered scale, and of the rudimentary polyphony based directly upon that scale, are all defined rigorously in terms of an elementary geometrical construction; the projections of conical self-similar spirals. A single such spiral projected upon the circular base of the cone, produces a plane spiral circumscribed within that circle. A radius drawn within that circle, is divided into line-segments whose ratio is the Golden Section. If the circle is divided into twelve equal sectors, the radii divide the length of the spiral-arm into segments whose ratios are congruent with the Golden Section; the division into twelve sectors is required from the standpoint of Leonhard Euler's and later treatment of the so-called "five Platonic solids" in topology: the topological significance of the twelve sides of the unique dodecahedron constructed by means of the Golden Section. The ratio of the lengths of the spiral arms is the well-tempered scale, precisely.

I proposed that we include an elaboration of the fundamental principles of polyphony, on this basis, to become part of the curriculum in mathematical eco-

nomics. Dr. Jonathan Tennenbaum and Ralf Schauerhammer, two of my colleagues, undertook the details of the construction, and presented the elaborations derived to two successive international conferences My pedagogical ruse succeeded more or less as I had intended; there was a substantial improvement in understanding the principles of my mathematical economics, and it became much easier to present the physics of coherent electrodynamic radiation to audiences educated in that approach to mathematical economics and music.



The frequency values of these two basic series of musical tones are ordered according to the Golden Section.

It is the bare features of that method, which I include in this introduction.

For purposes of comprehension, the following summary of synthetic geometry, from Cusa through Riemann, must be supplied.

Modern science began approximately 1438, with Nicolaus of Cusa's discovery of a physical principle usually associated today with either Leibniz's Principle of Least Action, or the isoperimetric theorem of topology. In his 1440 *De Docta Ignorantia*, Cusa named this "the Maximum Minimum Principle." In the language of Euclidean geometry, this states that the only self-evident form of physical action in the universe, is circular action, and not points acting along a straight line. The influence of that discovery, is key to the history of modern physical science. Leonardo da Vinci, Kepler, Leibniz, the Gauss's circle, among others, based their discoveries on this approach; Descartes, Newton, Laplace, Cauchy, Clausius, Kelvin, Maxwell, Helmholtz, Boltzmann, et al., represent those who attempted to deny the Principle of Least Action This discovery is also the key for defining the principle of beauty in aesthetics, our immediate topic here.

This discovery, and related elaboration of the principles of scientific method, by Cusa, guided the collaborators Luca Pacioli and Leonardo da Vinci to effect numerous major discoveries in mathematics and the physical sciences. The most elementary of these discoveries, and the most relevant to the questions of aesthetics, Pacioli reconstructed the proof referenced by Plato's *Timaeus*, that in visible space, only five kinds of regular polyhedrons can be constructed (the regular tetrahedron, cube, octahedron, dodecahedron, and icosahedron), of which five, only the dodecahedron is unique (the other four are derived from the dodecahedron). Since the construction of the dodecahedron depends upon first constructing the Golden Section of the circle, it is clear that the Golden Section expresses a limit of constructability in visible space. This discovery led to a number of remarkable results.

Pacioli and Leonardo proved, that all living processes are distinct from non-living processes in the respect, that the morphology of growth of living processes is harmonically ordered in a way coherent with the Golden Section. Between the extremes of astrophysics and microphysics, that discovery holds true experimentally today: any process which lies between the extremes of astrophysics and microphysics, and which as harmonic characteristics congruent with the Golden Section, is either itself a living process, or is a special sort of non-living artefact produced by action of a living process. Beautiful works of art are such artefacts.

The aesthetical principles of composition employed by Leonardo and his classical followers, up until the rise of German Romanticism, were based on this significance of the Golden Section's subsumed harmonies.

This was not entirely original. The design of the Acropolis, both its individual structures and the construction as a whole, is based on an harmonic ordering of those proportions which correspond to the harmonic proportions found in the human body, and in animals. Since as early as classical Greece, beauty is that which celebrates the principle of life. The classical Greeks also knew, as Plato's dialogues reference this, that the interval of a fifth, as precisely determined by the Golden Section, is the cornerstone of beautiful musical composition, and that the other elementary intervals are determined by geometrical constructions congruent with the construction of that Golden Section.

On this basis, Kepler constructed the hypothesis upon which the founding of a comprehensive mathematical physics is based to this day. If the universe is the work of a living God, then the most fundamental laws of the universe, as encountered in elementary features of astrophysics, must have the characteristics of a living process's artefact. Within the limits of precision of his mathematics, Kepler's three laws of astrophysics are the foundation of physics today. Kepler's only explicit error, was to tolerate the Ptolemaic system of harmony; otherwise, the limits of his work were those he specified himself. He prescribed the need to develop a rigorous notion of elliptic functions, a task completed by Gauss and Riemann during the nineteenth-century. He specified the requirements of a differential calculus, a task completed in essentials by Leibniz, as reflected in a 1676 paper which was the first report of discovery of the differential calculus.

Gauss proved conclusively, that Kepler's conception of the ordering of astrophysics was the only correct approach, and that the contrary approaches of such as Galileo and Newton, were absurd in principle, and useless in practice. Today, we know that a corrected version of Kepler's approach, applies to microphysics, as well as astrophysics.

On the basis of what we have just summarized, it is possible to construct the rudimentary features of polyphony, as well as a perfect calculation of the well-tempered scale. However, this is not yet the kind of conclusive proof we require to account for the physical principles underlying music, or to prove why the approach of Bach, Mozart, and Beethoven, is the durable standard for beauty in musical composition. This requires us to touch upon the bare elements of Gaussian physics.

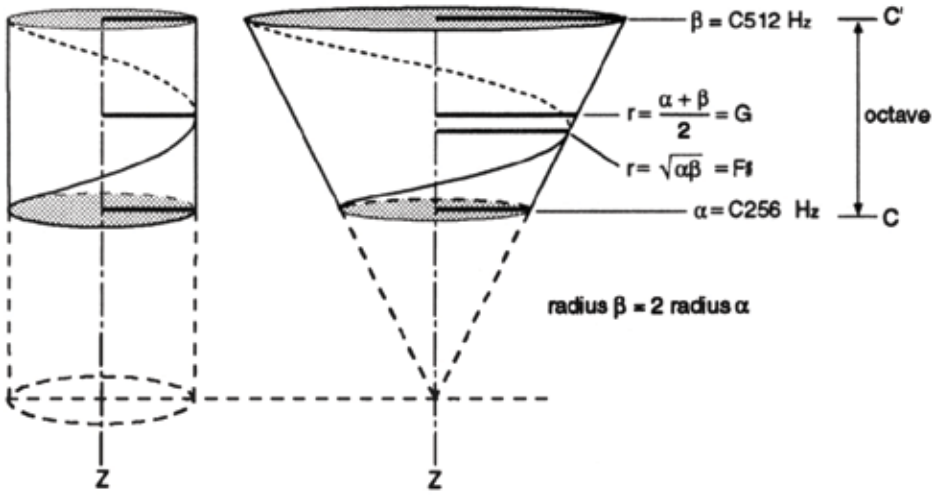
Cusa already proved that self-evident particles do not exist, and that action between particles does not proceed self-evidently in straight-line motion. Points and straight lines exist, of course; but both come into existence by construction, and thus do not exist "self-evidently." This is readily shown in constructive geometry; how is this also the case in physics? This question leads us through Leibniz's definition of the Principle of Least Action, into the discoveries of Gauss, Dirichlet, Weierstrass, and Riemann. It is within the work of Riemann, including his definition of what is called "the Riemann Surface," that the physical significance of creativity in musical composition is demonstrated.

The basis for Gaussian physics is simply this. Action in our universe does not occur in physical space, but rather in physical space-time. In elementary synthetic geometry, the secondary-school pupil is taught to master the rudiments of what we call a multiply-connected circular action. By "multiply connected," we mean simply that circular action is acting upon circular action at as much as every point, or the circular action is acting, similarly, potentially, upon every point of circular action upon circular action. This is the multiply-connected form of action in abstract physical space. What form does multiply-connected circular action assume in real space, in physical space-time?

Only two alternative forms are available. The simplest, is uniform circular action in the form of a uniform helix on a cylinder: implying multiply-connected helical action. The only alternative, is action in the form of a conical self-similar spiral. A hyperspherical universe, characterized by multiply-connected, conic self-similar-spiral action, is the physical universe of Gauss, Riemann, et al. The functions of a complex variable, in the mathematical physics of Gauss, Riemann, et al. are merely the algebraic form of description of loci in a purely geometric construction of the physical function to which the formulation refers. That construction is a synthetic geometry in which multiply-connected, conic self-similar-spiral action takes the place of multiply-connected circular action.

How can we prove that the Gauss-Riemann universe is the universe in which we live? Comparing Gauss-Riemann physics with that of Kepler, two points are outstanding.

Kepler already showed that the metrical properties of action in our universe are determined by the geometry of that universe. For example, Kepler's determination of the solar orbits, the only successful approach to estimation constructed thus far, ignores the masses and forces acting between masses, in determining the orbits. The orbits are determined by purely geometrical principles, defining the ordering and harmonic values for the orbits. Yet, from this, Kepler was the first to discover the principle of universal gravitation, and to supply the method for calculating the "force" of universal gravitation. The naive observer's problem here, is that the naive person thinks of space as "empty space," having no efficient effect on the processes which occur within, except the factor of straight-line distance. In reality, as Kepler was first to prove, our space has a "shap-



Simple spiral action in the complex domain (left) is cylindrical in form; at one-half rotation, the distance moved along the vertical z-axis is one half the distance moved along the z-axis by a full rotation. The radius at one-half rotation is the arithmtic mean (α+β)/2, which divides the octave at the fifth, or the movement from C to G. In self-similar spiral action (right), the radius at one-half rotation is the geometric mean $\sqrt{\alpha\beta}$, corresponding to the movement from C to F♯.

ing," such that all actions within physical space-time are governing primarily by that shaping of physical space-time. The question is, therefore, how do we prove that Gauss-Riemann space is the space in which we exist? The two tests are as follows.

First, the characteristic feature of physical space-time, is that the primary metrical relations within the universe are harmonically congruent with the Golden Section. This, to make short of the point, suffices to prove conclusively, that we exist in a hyperspherical universe, in which the elementary form of action is conic self-similar-spiral action.

Second; the characteristic feature of all processes of the physical universe, is the generation of what we call "physical singularities." These singularities include such things as the action of a photon, or the existence and behavior of an electron. Since the universe is rich in such singularities, we know that the only competent mathematics to be used for stating universal laws, must be the kind of mathematics which requires, and accounts for the generation of such singularities. Only a Gauss-Riemann physics requires and accounts for the existence of such singularities; only a mathematics based upon a synthetical-geometrical construction of functions of a multiply-connected, conic self-similar-spiral action, requires and accounts for the way in which singularities are generated in our universe.

To press to our crucial point here, we must take notice of the reader with limited mathematical knowledge. We must demystify certain terms.

The universality of circular, helical, and self-similar-spiral action is expressed mathematically by complex numbers. For example, the light-beam which appears to be moving simply in a straight ray, is actually progressing in a helical fashion within that ray. If we take a side view of that ray, we see the familiar sine-wave movement, which is nothing but the projected image of a helix, side-view, on a flat surface. Divide the number of helical turns per second by the speed of light, and you have the wave-length of one cycle of rotation. The action performed by the photon of light is expressed in terms of a cycle, such that light of shorter wave-length is more powerful than light of longer wave-length. We describe the movement of the sine-wave by an elementary trigonometric statement; this statement is another form of stating a function of a complex variable. If we look at the helix, of which the sine-wave is a projected image, we see that it is uniform rotation of the progressing helical action which obliges us to describe this as a locus in terms of a complex function.

In Gauss-Riemann physics, the locus-descriptions are based upon conic self-similar-spiral action, rather than simply helical action. This physics becomes very interesting once we study the most simple cases of doubly-connected such action. Such doubly-connected action generates hyperbolic mathematical discontinuities, and this at a harmonically ordered rate. So, from the standpoint of algebra, we have a function which is defined as continuous, but which has an increasing density of regions of discontinuity throughout that continuity. This is the simplest form of what we call a non-linear function. Directly to the point, this is an illustration of what we ought to signify, whenever we speak of creativity in science, music, and so forth.

The structural features of a Classical musical composition, the bare harmonics aside, are copied directly from classical poetry. The time-signatures and other metrical features of the composition, are taken directly from classical poetry. The music is written in a sequence of lines, like lines of classical poetry. In Mozart and Beethoven, for example, the German strophic form is most used, or at least referenced. Any Mozart keyboard sonata, for example, shows that the statement of thematic material is usually in the couplet form associated with classical strophic forms, such that the paired lines in sequence, have the form of statement and apposition.

If, in this simplest case, I state a theme in the key signature of C-major, and state that as a harmonic progression in the tonic-fifth-fourth sequence, and then restate this in the slightly altered form of a tonic-fifth-sixth sequence, I have a doubly-connected action. In this case, I have defined a relationship between the original C-major and a now-added C-minor; I have also opened the way, harmonically, to move to each of the other twenty-two major and minor keys. In respect to a linear interpretation of the key-signature of C-major, I have created a discontinuity by implicitly superimposing the fifth-sixth progression upon the fifth-fourth, which I have done by stating the same thematic material in these two ways. To maintain harmonic continuity within the composition, I must incorporate the new keys invoked within the totality, such that, instead of a monotonous progression, linearly, through the original key-signature, the characteristic of the development of that theme throughout the composition, is recurring, "non-linear" movement across the totality of keys invoked.

In polyphony, distinct from the sequential music of single-singer poetry, there are two or more voices singing simultaneously. In the most rudimentary polyphony, the simple canon, a second voice is introduced at some determined place in the singing of the first. The accomplished composer uses this to add new dimensions of multiple-connectedness. This juxtaposition is the means employed to create new singularities many of which are "dissonances" relative to the range of keys already in progress.

In each case, the rules of polyphony from which the composition begins in its assigned key-signature, are never violated in any arbitrary way. Rather, multiple-connectedness is employed to generate singularities. This applies not only to harmonic development, but also to rhythmic development (herein lies the obvious bestiality and wickedness of the oriental cult of Gregorian chant). It is not necessary, or desirable, to go further into this side of the matter here. The point illustrated, is that Classical composition strictly binds the composer to the rules of well-tempered polyphony; he can never exert personal "freedom" against those rules by mere impulse. Yet, this mode of composition provides the greatest possible freedom for creativity within the scope of those rules.

This power of Classical composition is rooted in the physics of the well-tempered scale. Every statement within those rules of harmony, is a conic function, such that multiply-connected statements generate the kinds of discontinuities associated with creative development of the composition.

Musical creativity thus pertains to the same faculties of reason which enable the scientist to discover valid new physical within the strict rigor of Gauss-Riemann physics. Classical music reflects and celebrates these creative powers of the mind is the purest, most immediate way, such that the physicist whose life is enriched by concentrated experience of such music is a better physicist, for that reason.

The Physiology & Psychology of Well-Tempering

Most simply, because we are living beings, our characteristic movements, including those involved in singing and hearing, require harmonic orderings congruent with the Golden Section. Modern research confirms, as Riemann argued, that these are the metrical characteristics of the physiology and processes of hearing. The method of singing, which the Italians named "bel canto" during the nineteenth century, is of the same relevance. In this method, which is known to have been practiced during the fifteenth century, the human head functions according to the same principles as a laser. The rough tone produced in the throat is projected against the tissues and cavities of the upper portion of the cavity, and something approximating a "lased" tone is projected, instead of the less coherent throat-tone. The same physics as in hearing apply.

Thus, the well-tempered scale is the only natural scale for the singing and hearing of living beings. Helmholtz's "natural scale" is better suited only to inanimate

objects, such as a concert of rocks (e.g., a "rock concert"). Similarly, Ptolemaic harmonics. There was never a time in the history of music, at which a composition intended to be performed in anything but a well-tempered scale, was truly musical.

Let us now summarize the case for the principle of creativity peculiar to Classical composition, as omitted from the Romantics and modernists. The quality of creativity associated with a strictly rational composition, is the most essential of the distinctions between mankind and the beasts. This fact is demonstrated most easily from the standpoint of economic science.

In the ethnologists' hypothetical, most primitive state of society, a "hunting and gathering society," an average of ten square kilometers of the Earth's land-area, approximately, is required to sustain an average individual. This indicates approximately ten million persons as the maximum population. Today, there are nearly five billion persons, and most of the increase has occurred since the Golden Renaissance. If we had been a species incapable of creative rationality, like the baboons, we should have remained at the "hunting and gathering" level forever, and the "radical ecologists" would never have come into existence to demand that we regress toward that "natural" condition best suited to small populations of baboons. This increase of population reflects the most essential superiority of man over the beasts; it reflects that quality of human reason which sets us above the beasts.

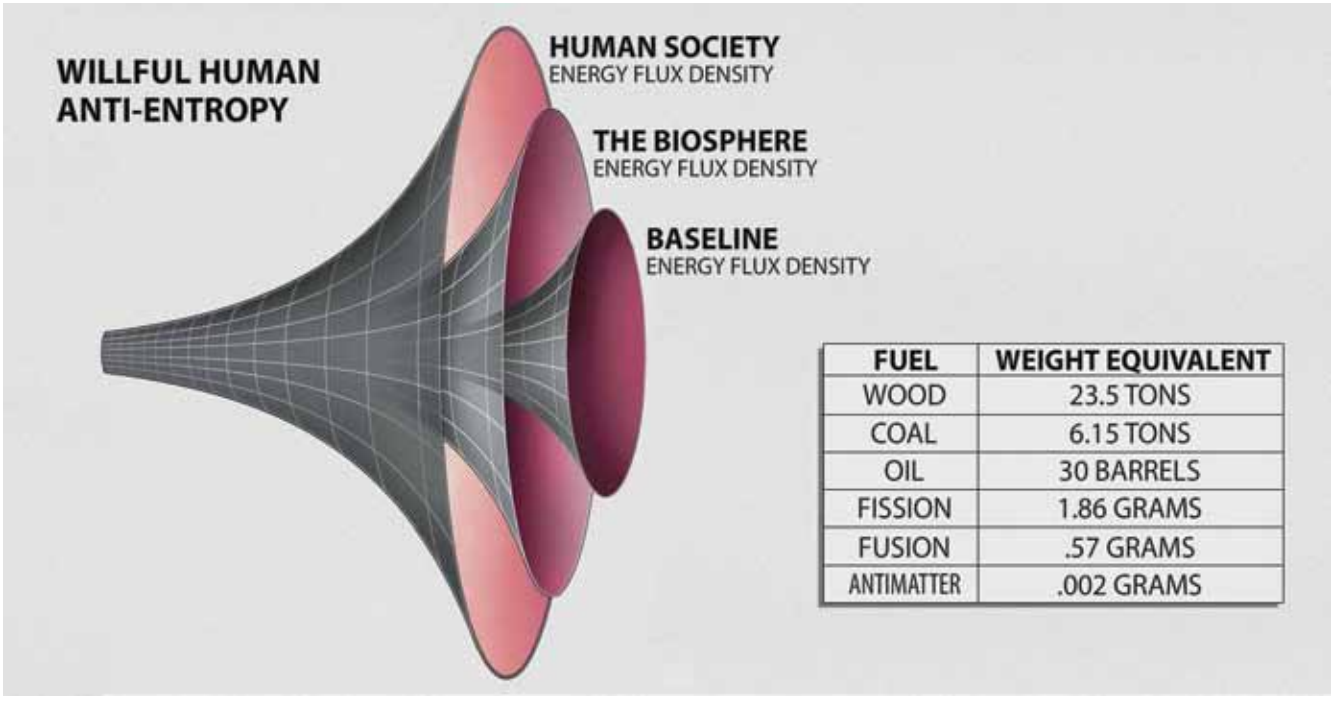
The means by which the quantity and quality of human life has been advanced to such effect, is of the form we call today "technological progress." Technological progress is divided into two distinct categories. The lesser quality of technological progress, is that accomplished by those kinds of useful inventions which involve no first application of a scientific principle; the second category, is the application of a new scientific principle. The first type of invention, is to be compared to the discovery of a new theorem in a deductive geometry, in which there is no act of discovery of a new axiom or postulate. The second, more profound type, is comparable to a revolution in the entirety of previously existing practice of geometry, through replacement of a faulty, axiomatic principle of the old geometry.

Although fundamental scientific progress represents a qualitatively higher level of mental life, than ordinary useful inventions, both are distinct, but interrelated expressions of that potentiality of the human mind which places mankind qualitatively above the beasts. Those activities which are deserving of a rigorous usage of the term, "useful invention," are already a form of activity which depends upon the individual's development of rigorous approaches to rational thinking, rationality of the type required for mastery of Professor Jacob Steiner's text in synthetic geometry, for example. The higher level of creative reason, unknown to Immanuel Kant, is most usefully termed "Socratic method," the method by which the axiomatic assumptions of scientific principle are successfully challenged to the effect of prompting lesser or greater scientific revolutions. The individual's rise to the higher level of mental development, "Socratic reason," requires that individual's preceding development to the ordinary, lower level of rationality.

Let us consider reversing the ordering of these two levels. Let us assume that the higher level, cohering with Socratic reason, comes first. Since new human individuals are born predominantly infantile personalities, whose best development is, apparently, through the transition from infantile irrationalism, through formal rationality, to Socratic reason, it must seem to some, that irrationality comes first, and then rationality develops out of irrationality, and then Socratic reason develops as a higher stage of rationality. To some degree of approximation, this sequence appears to occur in the civilized development of the individual personality. Is it not a wildly fallacious assumption, to presume that the highest degree of rational behavior did not exist before mankind?

The progress of physics, from Cusa through the circles of Gauss, proves conclusively that the laws of the universe are of the form of Socratic reason applied to synthetic geometry, and that this ordering of the universe long predates the existence of mankind. The uniqueness of mankind is not that man actually invented the laws of the universe, but, rather, that mankind is the first species able, both to assimilate knowledge of those laws, and to employ that knowledge as guide to efficient changes in mankind's behavior.

Gnostic theology has been sufficiently persistent and influential, to introduce even into Christian churches, for example, the absurd, Chaldean, neo-Aristotelean dogma, that the physical universe was created in a "big bang," and that the universe as it now exists is the rubble from that explosion roaming within empty



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Successive power sources of mankind's economic activity measured in energy-flux density, as indicated by the comparative weights of fuel required to achieve an equivalent energy release. This is a qualitative, not simply quantitative effect. LaRouche indicates below: "The fundamental laws of the universe are best approximated today by ordered values for what is called in mathematics 'a Riemann-Surface function.' "

space. The popularization of this absurd cosmogony in modern times, owes much to a widespread, credulous confidence in Newtonian mechanics; Gnostic theology describes Creation as if it had been an act of Sir Isaac Newton.

This "big bang" doctrine, as it first appeared in Chaldean theology, was later copied from the Chaldeans by Aristotle, or propounded by such miseducated astrophysicists today, is based mathematically on the assumption that the fundamental laws of physics are of the form of linear algebraic statements. On the contrary, God had already mastered the physics of a "nonlinear" complex function, long before Aristotle existed; Gauss, Riemann, et al., have proven, that the fundamental laws of physics are not linear, but are, rather, "non-linear." Specifically, the fundamental laws of the universe are best approximated today by ordered values for what is called in mathematics "a Riemann-Surface function."

The form and metrical characteristics of our universe are constantly being changed, to the effect that the set of linear formulations approximating physical laws, is being changed in an ordered sequence of changes. None of these linear approximations actually corresponds to a fundamental, i.e., permanent law of physics. Rather, the fundamental laws of the universe determine the ordering principles governing the relativistic changes in linear approximations of physical laws.

What this signifies for physics, requires review of the work of Gauss, Dirichlet, Weierstrass, Riemann, and Cantor in some detail, a detailed discussion beyond the scope of our purpose here. Here, it is merely necessary that we identify the authority for the interpolated working-point, as we have just done briefly. The point is, that when we think of physics in terms of Socratic reasoning expressed as synthetic geometry, we have tuned our mental processes to receiving knowledge of the highest, preexisting laws of creation. The fact that we, by effecting scientific revolutions in this way, are able to introduce to the universe physical states which did not previously exist, merely demonstrates the nature, the power of that quality of knowledge which such modes of Socratic reasoning permit us to receive.

Over the centuries, the increase of human population would have been aborted at many points, but for the introduction. . . . [Here the ms. breaks off.]