POET-MATHEMATICIAN SERIES, PART III

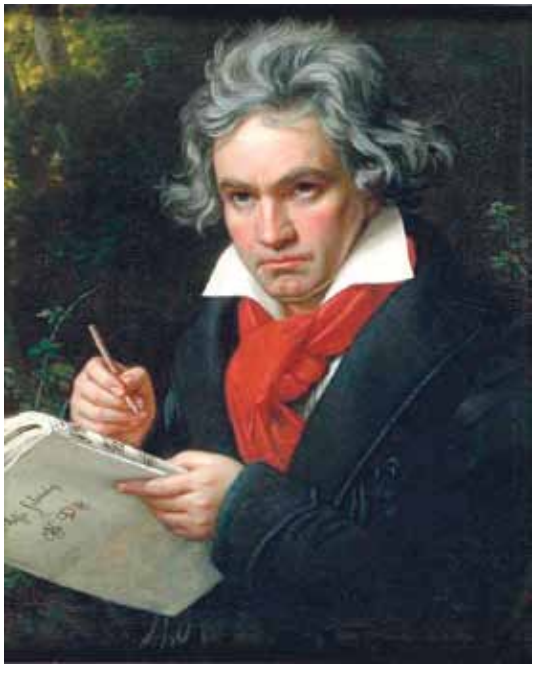
Beethoven's Fifth Symphony and Bernhard Riemann: How Minds Think

by David Shavin

China has put on the table the beautiful—and very "American"—mission of wiping out poverty by the year 2020. The type of thinking required today to finally wipe out poverty, disease and hunger will involve a level of creativity once described by Lyndon LaRouche as being able to "play ping-pong with the stars."

The beautiful composition of a new alliance of nations—pushing the frontiers of plasma physics, fusion technologies, and materials processing, as the surplus is deployed to craft massive infrastructure projects throughout the developing world—requires a level of thinking and emotional development that will make future generations stand in awe. This type of thinking is that of the "poet-mathematician." It was also expressed in Plato's Republic *as that of the "philosopher-king"—the almost impossible, but completely necessary development of leaders, who pursue the most difficult paradoxes in astronomy and music, so as to harmonize their souls with the complexities of the development of human communities.*

After the American Revolution, a youthful genius, Karl Gauss, in what was apparently an obscure mathematical text, went boldly where most others feared to tread. An identifiable, small core of youth, took up Gauss's challenge while he was alive. They were Sophie Germain, Lejeune Dirichlet, Niels Abel, Evariste Galois and Bernhard Riemann.



Ludwig van Beethoven (1770-1827)

Nov. 12—This third article continues with the story of another of the primary students of Gauss's *Disquisitiones Arithmeticae*, Bernhard Riemann.

In Part I, we investigated the powerful inversion method of Niels Abel and the role of August Crelle's music salon in Abel's development.

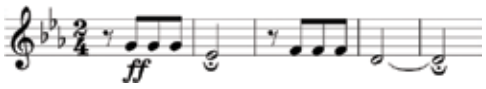
In Part II, we found the dissymmetries of the Platonic dodecahedron to be central for Evariste Galois' genius—a subject championed by Edgar Allan Poe, with the invention of his unique thinker, C. Auguste Dupin.

In both cases, the singing quality behind what is considered "rigor" in mathematics, and the rigorous causality communicated in the free exercise of classical musical compositions, found a rich interplay. Now, we dig deeper into this subject, with Beethoven's bold scientific treatise, his Fifth Symphony, and its proper scientific development in Riemann's treatment of the subservience of measure-relations to a broader, topological character.

To begin, consider, if you will, an exhilarating and gripping musical theme. It is sixteen notes long . . . and, by the way, the first twelve notes are all the same note.

How is that possible? The answer involves a re-evaluation of how you hear, how you talk, and how your mind is operating.

I. Beethoven's Unique Transformation



The most famous four notes in classical music, completely taken for granted by almost everyone, make up the signature of Beethoven's Fifth Symphony—the three short 1/8-notes on G, followed by a sustained E♭. Indeed, there are three of one thing and one of another, and this we may identify as a proportionality, 3:1. But, as we shall hear, of even greater weight is that one "thing" has a short quality and the other "thing," long. The germ of an idea, of a certain shape suggested by "short-short-short, long," we may tag as the "prosodic" idea, "sss-l."

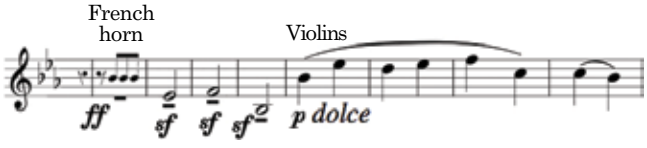
A third factor, the tonal motion, which goes, in C minor, from the fifth to the minor third, usually is given the primary status. While certainly not unimportant, it is actually subsidiary to the prosodic shape. But, for the record, do note that this shaped idea, sss-l, is then repeated a scale-step lower, on new tones, the F and D. Over the next fifty-five or so measures, a closely-related but different idea—the proportional, or metrical, idea of 3:1—is given full play. But then Beethoven shows how his mind works. The key relationship of the two, the prosodic and the metrical, or this interplay of

(a) the mind's power of causally acting upon a prosodic idea, a shape—actually a "gestalt"—with

(b) the mind's power of measuring and handling proportionalities,

breaks onto the scene. (Listen to http://www.youtube.com/watch?v=xmwHOhSYJI4, including measures 59-65, 00:49-00:55.)

First, the French horns "stretch out" (or "augment") the original prosodic idea. The two-measure sss-l becomes an eight-measure sss-l. Here, each "short" part goes from a quarter-measure to a full measure, while the "long" part goes from one measure to four. (The tonal expanse, compared to the opening idea, also undergoes a stretching.) The space carved out by the French horns' augmentation has prepared a surprisingly "new" idea:



the violins play (00:53-00:55) a four-measure phrase that is peculiarly phrased as "three and one"—but now the "three" is attached with the "long," not with the original three short notes, and the "one" is attached with the "short." Pedants may label this the "second theme," but that obscures the underlying connection. Rather, the ear and the mind are thrown off guard, and are thrilled that Beethoven has apparently pulled apart the prosodic and metrical aspects, and then re-attached them—sort of a grand "inversion," an "inversion" not of a few notes, but of two different powers of the mind.

This bears a bit closer inspection. Yes, it is also the case that we are now in the key of E♭, and it is also related to the opening idea as sort of a tonal inversion of the original. But, as Brahms would (and did) say, in a similar situation: "Any donkey can hear that." The tonal relations are not driving what Beethoven is getting at. Rather, of more importance here (and what donkeys indeed have trouble with), the eight quarter-notes of the so-called "second theme" played by the violins are phrased in two groups: first a group of six and then a group of two. Beethoven bows (groups) them that way. This is the same 3:1 proportionality. So, now the "3" goes with the "long" and the "1" goes with the "short." The phrasing actually violates nature—and wonderfully so! More than a few orchestras balk at this hurdle, and phrase, as if on automatic pilot, the first four notes against the next four notes.[1] Beethoven's phrasing is, indeed, unnatural by almost any measure; however, he is much more interested in inverting the prosodic and the metrical capacities of the mind! While neither one is seen, both are experienced as felt realities in Beethoven's transformation. And the mind says, "That Beethoven fellow is speaking my language. Play on!"

Beethoven's 'Habilitation Paper'

Beethoven crafted a means of displaying to the human mind, the higher capacity of that same human mind, both (a) to think in gestalts, and (b) to measure, to create proportionalities. This is not simply to have gestalts, and then also to be able to carry out scalar measurements; but rather to design the type of measuring process based upon the evaluation of the characteristic of the gestalt. Hence, Bernhard Riemann.

1. Most conductors will at least dutifully abide by Beethoven's given bowing, though to little conviction or purpose. They will simply fail to bring out Beethoven's phrase, by flinching on, or swallowing, the last two notes. Herbert van Karajan provides one useful example. See 00:44-00:47 https://www.youtube.com/watch?v=XipZen3zlC8

Prior to Riemann, Beethoven's subject was treated by Plato, in terms of the combined, but separable, "integrative" and "critical" capacities of the mind. Notably, Gottfried Leibniz addressed this in terms of the role of the characteristic in his "analysis situs" approach, whereby Plato's "integrative" and "critical" are developed as integration and differentiation. (What is called "calculus" is a secondary offshoot of Leibniz's much more general and extensive integration and differentiation method. However, reducing Leibniz's method is, indeed, the necessary first step to even attempt to create a "priority dispute" with Isaac Newton.) For Beethoven, and the others, man's capacity to carry out measure in and upon the world (to establish metrical relations) is different from, and premised upon, his ("gestalt") capacity, to take in to oneself the whole shape of the idea, or integral unity, of the problem that he faces. At its core, this is the human condition—to be a mortal singularity with the capacity to act upon the whole world and upon all time.

Bernhard Riemann (1826-1866)

Riemann's treatment of metrical possibilities, as stemming from the topological characteristic, liberated human culture from the shackles of Euclidean formalism. This is not simply to adopt "alternative-reality," non-Euclidean geometries, leaving the underlying hypotheses governing the new geometries still in control, and the mind still shackled. Riemann's very general and very powerful method developed a new language for the human species, to better mine the wealth of the powers of the mind.

II. Did Riemann Study Beethoven's Fifth Symphony?

There is no "smoking pistol" evidence that Riemann studied Beethoven's Fifth Symphony. Let us consider the matter. What is known, and it is rather indisputable, is that Riemann's closest collaborator, the man who both taught him and who worked through some of the most intimate intellectual developments with him, was Lejeune Dirichlet.[2] And Dirichlet, as Rebecca Mendelssohn's husband and Felix Mendelssohn's brother-in-law, was steeped in classical culture and classical music. Also, Rebecca Dirichlet ran a music salon in Göttingen from 1855-1858, though it is not known which sessions Riemann attended.

But what is not so well known, and certainly not properly appreciated, is:

(a) Riemann himself played the piano.[3]

(b) In 1846, the year prior to Riemann's coming to Berlin to study under him, Dirichlet almost undoubtedly attended Felix Mendelssohn's carefully considered performance of Beethoven's Fifth Symphony. In the days and weeks after the performance, Dirichlet and Mendelssohn had, at least, a couple of dinner evenings together.

Over and above such biographical details, the coherence of Riemann's and Beethoven's methods of development of the human mind would hold. However, it is not a useless exercise to attempt a reconstruction of some of Riemann's development, before returning to the two final examples from Beethoven's Fifth.

Dirichlet and Mendelssohn on Beethoven's Fifth

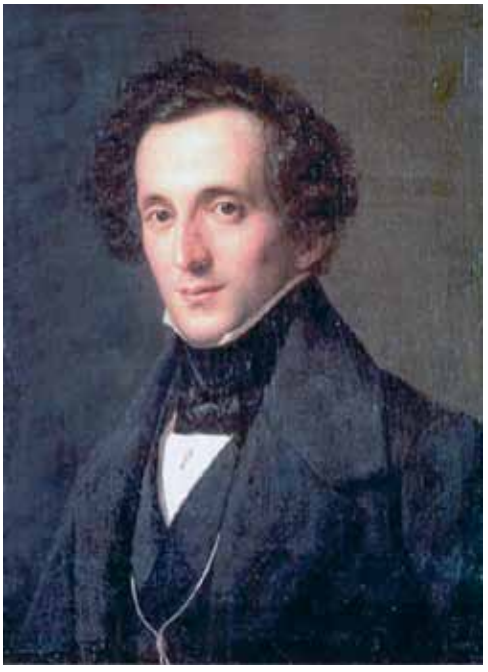
What did Riemann's teacher know of Beethoven's Fifth? Mendelssohn conducted Beethoven's Fifth at Aachen on June 1, 1846. His close study of the score and careful preparation of the performance is evi-

2. Riemann's friend, Richard Dedekind, described the relationship: "From the very beginning he [Dirichlet] felt the liveliest personal attraction toward Riemann."

3. Riemann's wife, Elise, mentions that the two of them played upon a church organ while on one of their trips in Italy. This casual mention by Elise is found in "Notes from Mrs. Professor Riemann on the last years of the life of her husband," an unpublished translation by Oyang Teng and Aaron Halevy.

denced, for example, by his discovery of an error in the printed score. Four decades earlier, Beethoven himself had complained about the mistake to the publisher, but it had never been corrected.[4]

Beethoven had been Mendelssohn's living hero from his teenage years. Along with Fanny, his older sister, Felix viewed Beethoven's late piano sonatas and late string quartets as a personal challenge that they had to master. As in the case of Gauss's *Disquisitiones Arithmeticae*, only a handful of individuals recognized and took up the challenge of Beethoven's late masterpieces. However, when Beethoven died, Felix had just turned eighteen. His death occasioned Mendelssohn's first (Op. 13) string quartet, an intensely personal work, composed around Felix's pledge to continue Beethoven's work. Further, the young Felix's study of Beethoven definitely included the Fifth Symphony. At the age of 21, Felix chose the opening movement of Beethoven's Fifth to play at the keyboard for Goethe, thinking the elderly poet needed to digest what Beethoven had accomplished.[5]



Felix Mendelssohn (1809-1847)

In 1846, while Mendelssohn was in Aachen as part of the South Rhine Music Festival, his brother-in-law, Dirichlet, traveled there from Berlin. He and his wife, Rebecca Mendelssohn Dirichlet, stayed in the neighboring town, Düren—the town where he had grown up. Mendelssohn conducted, along with the Fifth Symphony, his "Elijah" oratorio, and Haydn's "Creation,"[6] and Mendelssohn's close friend, the famous soprano, Jenny Lind, performed and sang some of Felix's songs. Felix's sister and Dirichlet would not have missed the Festival. Then, the week after the performance of the Fifth Symphony, they dined together with Felix in Düren.[7] There is no known record as to what they discussed, but the opportunity and the likelihood of a discussion of the scientific core of Beethoven's Fifth is right there. Further, a few weeks later, back in Berlin, the Mendelssohns followed up with a second dinner with the Dirichlets.[8] There is nothing particularly surprising in the fact that Riemann's primary teacher was imbued with the cultural life of the Mendelssohn household. However, it is notable that he would have found Mendelssohn's approach to Beethoven's Fifth remarkable for the deeper implications for science and the mind—and all this, in the period when Riemann walks into his life.

Dirichlet's Student, Riemann, and His Scientific Transformation

Riemann, then twenty, began his studies with Dirichlet in Berlin in 1847, and returned to Göttingen in 1849. Riemann's close friend, Richard Dedekind, described Dirichlet's teaching method as having the ability to make "a new human being" of his students.[9]

4. Beethoven had two bars of music meant for a possible expanded version of the third movement, the Scherzo; but the printer included them in the non-expanded version. Beethoven wrote his publisher, August 21, 1810, to correct the matter—but it wasn't. Felix recognized the two measures were inappropriate.

5. Evidently, Goethe was both stunned and not prepared to digest what Felix was presenting: "It is tremendous but quite mad. The whole house might collapse… That does not move one at all, it only causes astonishment." Goethe's relationship with Beethoven, and with the young Mendelssohn, is fascinating, but another story entirely.

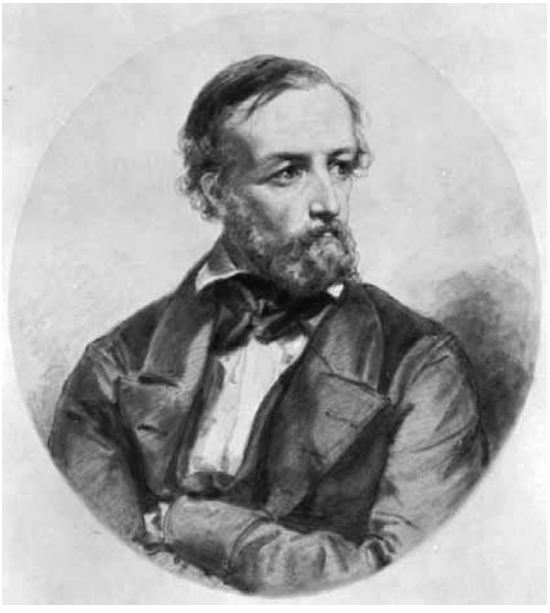
6. Curiously, Haydn's *Creation* is one of the few works that we know Riemann heard. Five years before Mendelssohn's conducting of the *Creation*, Riemann, as a fourteen-year-old, went to a performance in Hanover, along with the Kessner family.

7. They dined together at the household of Joseph and Elvira Wergifosse. Elvira sang in the Festival chorus; Joseph was a manufacturer and political activist, which included his role as a delegate to the Rhenish Diet in 1844.

8. Mendelssohn was in the midst of a related project, his setting of a part of Friedrich Schiller's "The Artist," which was premiered, a few days after the Düren dinner, in Cologne by a chorus of two thousand! The text was "Der Menschheit Würde ist in Eure Hand gegeben." This is a longer story, but any attempt to reconstruct what their discussions would have been about, rather than detracting from them, would more likely increase the likelihood of the Fifth Symphony having been part of the dialogue.

9. See the July 1856 letter located in *Eine Würdigung zu seinem 150 Geburtstag*, Braunschweig: 1981.

Amongst other matters, Dirichlet guided Riemann to the works of Gauss and Abel, securing access for Riemann to Gauss's papers in the Berlin library, and bringing unpublished works of Abel to Riemann's attention. Riemann gave special credit to Dirichlet for spending many hours with him, especially during Dirichlet's 1852 visit to Göttingen. There they worked through what would become Riemann's famous 1854 "Habilitation" presentation, "On the Hypotheses Which Form the Basis of Geometry." There we meet with Riemann's bold overturning of the fixed boundaries of over two millennia of Euclidean assumptions, hidden behind Euclid's axioms:



Lejeune Dirichlet (1805-1859)

> It is known that geometry assumes, as things given, both the notion of space and the first principles of constructions in space. She gives definitions of them which are merely nominal, while the true determinations appear in the form of axioms. The relation of these assumptions remains consequently in darkness; we neither perceive whether and how far their connection is necessary, nor *a priori*, whether it is possible. From Euclid to Legendre … this darkness was cleared up neither by mathematicians nor by such philosophers as concerned themselves with it.[10]

With this breath-taking opening, Riemann identifies the simple truth: human culture had spent over two millennia in needless obscurity regarding such basics as "the notion of space and the first principles of construction in space." Riemann's challenging task poses that one first construct a "multiply-extended manifoldness," the which may admit of variously more or less appropriate forms of measurement, or metric relations. Such manifolds are characterized by basic considerations prior to measurement, for example, what continuous pathways exist and whether they are reversible. A high priority is put upon what the mind can determine and what yet remains undetermined (and so variable)—actually, quite the Socratic approach. A manifold may transform into another "entirely different" manifold, yet it does so in a definite way, one that may be unpacked. Figuring out the dynamical relations of these transformations of various dimensionalities is more than, for example, figuring out tricks for factoring 2nd-power equations into two 1st-power equations.

It was Gauss who, in 1849, had emphasized for Riemann that the "higher domain of the abstract theory of magnitudes" should be developed, dealing with "combinations among magnitudes linked by continuity." This investigation, prior to any determination of metrical relations, was called by Gauss's student, J. B. Listing, "Topologie." However, of note, Riemann still preferred to identify it by Leibniz's term, "*analysis situs*."

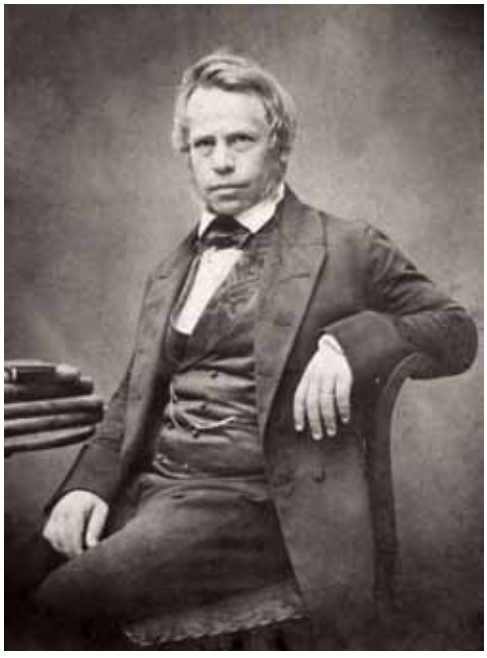
The extent of Riemann's Leibnizian core is not fully appreciated. For example, his first fourteen years with his family in the quiet countryside are usually overlooked. But his father fought in the Liberation Wars against Napoleon, and his beloved mother was the daughter and grand-daughter of Leibnizians. The grandfather, Georg Wilhelm Ebell, introduced Leibniz's proposal on fire-fighting into London, and the father, Georg August Ebell, was a longtime associate at Göttingen of Leibnizian Georg Lichtenberg. Lacking further knowledge of the warm familial ties of Riemann's childhood, one can still infer a solid moral underpinning, which was characteristic of Riemann's scientific passion. Whether the method is called "*analysis situs*" or "topological," Riemann brought Leibniz's methodology to a high pitch, as part of his passion for maturely dealing with the rich complexities of life.

Riemann's Violinist and His Work on the Ear

Riemann's other main connection to Mendelssohn addresses, in a somewhat different fashion, Riemann's

10. Find Riemann's dissertation at http://archive.larouchepac.com/node/12479.

passion for the issues of thinking, hearing and music. One of Riemann's last projects, one that he chose even as he knew he was dying, was in response to a reductionist account of music and of hearing produced by Hermann Helmholtz. Riemann objected to the trivializing of the power of the ear and of music, insisting that any analysis of such a fascinating part of nature had to rise up to the level of the experience. The same methodology he employed in investigating dynamics in the infinitesimally small, needed to be brought to bear to account for the incredible powers of discrimination of the hearing process.[11]



Jacob Henle (1809-1885)

Riemann's collaborator on his paper on the workings of the ear was Göttingen's professor of physiology, Jacob Henle. An associate of Mendelssohn, he had even considered a pursuit of marriage with Felix's older sister, Fanny—that is, before he discovered she was already engaged. A few items, arranged chronologically from Henle's life, give an idea of Riemann's colleague on his last project. Henle studied violin under Beethoven's colleague, Rudolph Kreutzer.[12] He organized a musical salon in Göttingen, called the "Friday Night Club," several years before Rebecca Dirichlet arrived in Göttingen. Performers included the violinist Joseph Joachim. And of note, Riemann and/or his friend Dedekind drew Henle's attention to Gauss's *Disquisitiones Arithmeticae*, prior to the work on the ear.

Henle published Riemann's last work in the physiology journal that he had founded. Henle contrasted Riemann's approach to Helmholtz's fundamentalism: "Riemann thought that the mathematical problem to be solved was in fact a hydraulic one." Riemann focused upon the interface between the air fluid and the inner ear fluid, in addressing the qualitative event: "If we take "timbre" to mean the quality of sound … then this is evidently communicated by the apparatus with complete fidelity, so long as it transmits to the fluid of the inner ear the variation in air pressure at every moment at a constant ratio of amplification … Were the timbre curve noticeably altered, such sensitivity of hearing as indicated by, for example, the perception of slight differences of pronunciation, would seem to me scarcely conceivable…" For Riemann, the scientific investigation began with the miraculous fact that the dynamics of the quality of sound accomplished what it actually did. If the hydraulics of the inner ear could track variations in air pressure (from sound transmission) so rapidly and so accurately, then the mathematical language had to rise to the level of the rich phenomena. When Henle published Riemann's work, it was still unfinished, as Riemann had died before finishing it.

III. Twelve Boring Notes—or Riemann's Thought-Mass?

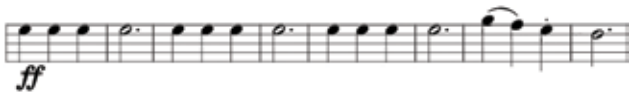
What to make of Beethoven reaching into his audience's mind, surgically detaching the metrical and prosodic (or topological) components, and re-attaching them in reverse order? Nowhere does Beethoven's grasp of such powerful matters show themselves in this work as in his gripping sixteen-note melody, where the first twelve notes are all the same note.

One may hear this at 00:30-00:36 of the third movement of https://www.youtube.com/watch?v=mCnfX9obJ3M. Okay, what is so gripping? It certainly was not the richness of tonal development. Sixteen notes, grouped in

11. Three examples: The hairs in the cochlea function on the order of a few atomic radii. At normal conversation levels, the oscillation of the basal membrane is no larger than an atomic radius. The amount of energy in a barely audible musical tone is about twice the energy of a single photon of light. No other human sense comes close to these levels. See Robert Gallagher's "Riemann and the Göttingen School of Physiology" in *Fusion* magazine, Volume 6, No. 3 (Sept/Oct 1984) http://wlym.com/archive/fusion/fusion/19840910- fusion.pdf

12. Henle, like Mendelssohn, was from a Jewish family, one that had converted so that they could pursue their professions. On a visit to Henle's home, Mendelssohn charmed Henle's sister with a private performance of his "Midsummer Night's Dream" overture. Mendelssohn and Henle socialized off-and-on, including in the period prior to Felix's performance of Beethoven's Fifth Symphony. Henle's scientific work greatly impressed Alexander Humboldt, and it was Humboldt who had personally intervened to free Henle, at a time when he had been given a six-year prison term for political activities.

four two-measure segments, each of four notes. We had that opening, four-note germ of an idea—but now, with the tonal motion (G-E♭) stripped out and only the single note, G, left. A veritable kaleidoscope of rich interconnections ensues.



On one level, we have the four-note germ played three times in succession, as three of one "thing," followed by the one of another "thing"—here, four changing tones, or what we used to recognize as melodic material. With total efficiency of statement, with total command of the workings of the mind, we now get a multiplicity of both the "sss-l" prosody and the "3:1" metrical relation. Both the prosodic and the metrical are in play, but on more than one level. The first three two-measure segments can be heard as one long six-measure event, against the short, last two-measure segment. (In this incarnation, it reminds us of the second theme of the first movement, covered above.) But now, the last two-measure segment is distinguished by its "melodic" motion. It is the "change" from the "sameness" of the twelve repeated G's. So, now "sameness" is associated with the "long," in contrast to the opening four notes of the first movement, where the three same notes were the three short events.

Re-hearing the gripping sixteen notes, we can also hear the eight measures as a four-fold expansion of the original two-measure idea, and this suggests each of the three two-measure segments are also a "short" and the last two-measure segment is a "long"—or, if not actually "long," still as related to the original "long" by its characteristic changing notes. This last relationship we will examine a bit further when we take up the third and last example from the Fifth Symphony, regarding the matter of where language comes from, and why there are determinative shapes of ideas prior to their incarnation in actual words. The whole opening movement is replete with a wealth of variegated readings of the two fundamental relationships. The core issue here, with this 16-note version, is the wealth of riches that Beethoven mines, once he has so powerfully demarcated the prosodic and metrical qualities. So, it never was a matter of twelve of the same, boring notes.

Riemann was fascinated with the possibility of mining such riches. Reflect on Beethoven's gripping sixteen-note passage when considering Riemann's description of the dynamics of his "thought-masses": "As they are forming, the thought-masses blend; or are folded together, or connect to one another and also to older thought-masses, in a precisely determined manner. The character and strength of these connections depend upon causes which were only partially recognized by Herbart, but which I shall fill out in what follows. They rest primarily on the internal relationships among the thought-masses." Furthermore, he was confident regarding the healthy development of the personality based upon such dynamics: "The mind is a compact, multiply-connected thought-mass with internal connections of the most intimate kind. It grows continuously as new thought masses enter it, and this is the means by which it continues to develop." At this point, before proceeding, it might be best to put down this article and take eight minutes to listen to the first movement: https://www.youtube.com/watch?v=xmwHOhSYJI4. (The link is to a 1937 performance by Wilhelm Furtwängler; and he is, indeed, one of those rare conductors who phrases the second theme of the first movement correctly!)

The circumstances of Beethoven's decision to develop his Fifth Symphony are worth one quick snapshot. Beethoven began work on his Fifth Symphony in 1804, three years after Gauss had completed his *Disquisitiones Arithmeticae*. He had just finished his massive, and revolutionary, Third Symphony, called the *Eroica*, a work that was not easily received. (Though the Fourth Symphony was begun after he had begun work on the Fifth, it was published prior to the Fifth.) One notable figure, Prince Louis Ferdinand of Prussia, was captivated by the *Eroica*.[13] Evidently, he had "listened to it with tense attention which grew with every movement" and had demanded that the symphony be repeated. Louis Ferdinand came to Vienna to visit with Beethoven. Coincidentally—or perhaps not—the Prince was the cousin of Gauss's sponsor, Duke Carl of Brunswick.[14] The discussions with Beethoven in 1804 were most fruitful. Louis Ferdinand's championing of the *Eroica*

13. While Beethoven had no problem with great men making history, he was disgusted by Napoleon's proclaiming himself Emperor, and tore up his original dedication of the Third Symphony. The Prince shared Beethoven's view of Napoleon, loved the symphony, and mobilized Germany against the Emperor.

14. They were actually both grandsons of Leibniz's student, Sophie Dorothea, Queen of Prussia, and great-grandsons of Leibniz's patroness, Sophie. Tragically, they both died leading the fight against Napoleon's invasion in the Fall of 1806.

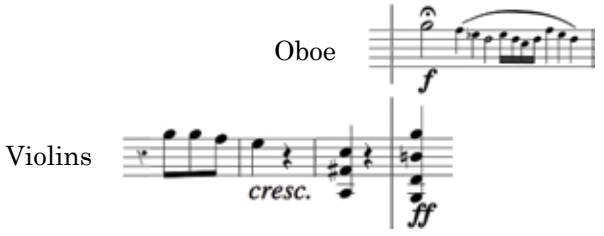
gave Beethoven's novel work a new life. Beethoven recognized the role of Louis Ferdinand in defending his *Eroica* and dedicated his C Minor Pianoforte Concerto to the Prince, a fine pianist.[15] And a re-enthused Beethoven began his C Minor Symphony project, the Fifth Symphony.

IV. The Formation of Ideas, and Singing

One of the provocative results of the 16-note example was the last point, that the last four notes, after twelve G's in a row, suggest that melody is born out of prosody. Once Beethoven had isolated two different, though related, powers of the mind, he made this higher-level interplay of prosody and metrics the basis of composition, and this is where the mind sings. The third example deals with this.

The most singular feature of the symphony, after the opening, motivic four notes, is perhaps the oboe "cadenza." Usually it is assumed that the genius Beethoven simply has eccentricities, such as having the orchestra come to a crashing halt, while the oboe inserts a mini-cadenza into the symphony—a bit of melodic relief after all the non-lyrical material. What could Beethoven possibly be doing?[16]

Early in the first movement (measures 19-21), the orchestra makes a crashing statement with three massive chords—but Beethoven has the first violins simply hold on to their G after everyone else has ended the chord. It is as if they had something to say, but had lost their train of thought. But after a timeless moment, they do stop, everyone looks the other way, and matters proceed. But at the parallel part in the recapitulation (measure 268, or 04:46-05:00 in the Furtwängler recording), emerging out of the crashing chord, a lone oboe transforms the explosive, rather percussive chord; it extends the note, and then softens and shapes the single note. A melodic suggestion emerges, G-F-E♭, F-E♭-D-E♭ F-E♭-D. Out of all the forceful developments, a butterfly surprisingly emerges . . . and then it is gone. The melodic notes? Why, they are the same as the forceful, opening "non-melody" of sss-l: G-E♭, F-D. Beethoven has, very late in the movement, provided us with the "sung" version, one that could have melted our hearts. But he provides it only long enough to suggest such simple beauties as an afterthought. Immediately, he pulls us back into his maelstrom of relentless developments.



But now think back to that held chord, with the G on top. At first, presented so forcefully by the full orchestra, it even takes a moment for the ear to hear it as a stable tone, before the massive chord fades away, and the sound of the lone oboe emerges. The percussive event takes on length and shape with the oboe, and, if done properly, a natural vibrato develops as the tone takes on life. The oboe's melody has begun while still on the held G—and only then unwrapping itself melodically into the other notes. The percussive singularity unfolds a flowing continuity. To state it a bit too succinctly, Beethoven is working where language itself takes shape—where continuous, melodic shapes, which we call "vowels," are bounded by discontinuous, percussive "stops," which we call consonants. Thus, Beethoven's simple directions, inside the geography of the brain: Just go to where the metrical arises out of the prosodic shape, the gestalt, and you'll find where melody and language are born!

It is not terribly easy to use words to describe how thought-masses work prior to language. However, the wilful act of refusing to stigmatize Beethoven as an eccentric, or to characterize him as the type of genius where one simply has to look the other way at certain embarrassing moments, is a beginning—where one can begin to hear what the man is thinking. Riemann was possessed by a similar passion to make the healthiest, happiest movements of his mind transparent, to actually give determination to his determinable thought-masses.

15. The compositions of Louis Ferdinand that this author has heard are quite good, better than that of any other nobility. Beethoven is said to have commented: "Now and then there are pretty bits in them." Thayer reports that Beethoven complimented the Prince: his playing "was not that of a king or prince but more like that of a thoroughly good pianoforte player."

16. Peter Schickele fashioned a hilarious "send-up" of Beethoven's "eccentricity." See http://www.youtube.com/watch?v=f0vHpeUO5mw, around 4:40—5:00.

V. Determination

The striking opening of Riemann's composition, clearing away a couple of millennia of lazy and wishful delusions, can be repeated in the experience of hearing Beethoven's Fifth, but without all the accumulated baggage; that is, hearing what the living Beethoven would have you discover about the powers of your own mind. This is not an esoteric subject for mathematicians and/or musicians. Indeed, a closely related experience is that of thinking through what the establishment of a nation as "a beacon of hope and temple of liberty" should have accomplished in the world, and how what has been determinable might now become determined. Indeed, the very ability to characterize the present moment in history, and to have that characterization be known to be on solid footing—more solid than the pretense of all the primitive, "Euclidean" methods of establishing supposed "solidity"—is a cultural and scientific gift from Beethoven and Riemann. The ability to craft appropriate measure-relations amongst the various cultures signing up for the "win-win" approach of Chinese President Xi Jinping, is a cultural and scientific gift from Helga and Lyndon LaRouche. Use such gifts wisely. Become determined to make what is determinable, determined.

Société Wilhelm Furtwängler

Wilhelm Furtwängler conducting in Paris in 1934.