II. The Mendelssohn Bach Project

THE GENERATION OF 'POET-MATHEMATICIANS'

The Case of Niels Abel

by David Shavin

July 16—China has put on the table the beautiful—and very 'American'—mission of wiping out poverty by the year 2030.

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."

Niels Abel

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.[1]

This type of thinking is that of the 'poet-mathematician'. It was also expressed in Plato's **Republic** *as a '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' challenge. In the United States Edgar Alan Poe popularized the 'poet-mathematician' in the 1840's with his 'Dupin' character, who was based on one of those youth.*

This report will develop the case of Niels Abel, one of Gauss' youth generation.

Introduction

First, pick any number, that is, a positive, integral number. Let's try, for example, 23. Multiply it by 9. We'll get 207. Then, add up all the digits in the product, 2 + 0 + 7. You'll always get 9, regardless of what number you start with.[2] This is not magic. It has to do with a type of brainwashing you went through in first grade. It is not difficult to discover why this works nor how you were brainwashed; but, for maximum therapeutic benefit, we'll leave this exercise to the reader. This simple example is only a drop in Karl Friedrich Gauss' ocean, but it introduces an overlooked capacity. The human

1. See LaRouche's Four Laws: http://www.larouchepub.com/lar/2016/4329_revisit_4_laws.html. In particular, "The creation of credit… must be assured … to create a general economic recovery of the nation, per capita, and for rate of net effects in productivity …. This means intrinsically, a thoroughly scientific, rather than a merely mathematical one, and by the related increase of the effective energy-flux density per capita, and for the human population when considered as each and all as a whole. The ceaseless increase of the physical-productivity of employment …" is key. "Man is mankind's only true measure of the history of our Solar system, and what reposes within it."

2. In the cases where you get a sum larger than 10, repeat the adding of digits—e.g., 11 multiplied by 9 yields 99; and adding 9 + 9 yields 18, not 9. Here, adding the 1+ 8 will, once again, yield 9.

mind, forms patterns and organizes the world of which it is itself an integral part; though marvelous, it is not magical.

Next, a simple poetic snapshot: "*From fairest creatures, we desire increase . . . .*"

Which is the verb? Does beauty impel us to desire increase, or does it increase our desire?

Did Shakespeare's beautiful command of language change us, and, make us, as personalities, more than we were? Or did it make us fall in love with the bard, increasing our thirst for his poetic power?

Clearly, Shakespeare crafted an opening theme to his "Sonnets" where both 'desire' and 'increase' function as verbs, exploiting a world where the (subjective) beauty and (objective) truth share a fruitful interplay. If the world is constructed in such a rich fashion, it behooves us to raise our thought-processes and language up to the level of what we're investigating—rather than reducing it to what appears easiest to deal with.

The poet has an ability to seize upon, and play upon, powerful capacities of the mind, dramatically expanding the power of the culture's overall mental activity.

Lyndon LaRouche's passion for, and rigorous development of, the mind's unique and necessary capacity for transforming the world, is at the core of his rejection of formalist mathematics and his insistence upon the role of what is called here the 'poet-mathematician'.[3] The term, 'poet-mathematician', itself, is a healthy juxtaposition. The jarring aspect of setting 'poet' in combination with 'mathematician' aids in opening up critical areas of investigation. It would help to approximate the subject with another juxtaposition: The world objectively requires national banking, non-magical national banking; and only a fool would attempt to carry out national banking without the capacities of the poet-mathematician.


painted by Christian Albrecht Jensen

Johann Carl Friedrich Gauss (1777-1855)

I. Measuring World-Changing Power

In 1801, the young genius, Carl Friedrich Gauss, published a stunningly powerful poetic work in a most austere form, entitled *Disquisitiones Arithmeticae*. He boldly announced, from the mountaintop, the laws and powers of mind behind the properties of number. The harmonic interplay of the exponents, bases and residue, developed in Gauss' *Disquisitiones Arithmeticae*, bore many fruits and a vast amount of implications. But one fundamental, and identifiable, and rather general principle concerns us here: The conjoined measurement of both

a) the internally-generated power to grow, captured in the exponentials, and

b) the externally-generated 'accretion'-type of growth, or, actually, the magnitude of the resultant activity after a cycle of production.

That is: Not to measure exponential and arithmetic growth separately, but to take a measure of their interplay, a more complex and inter-connected process.

Gauss' arithmetic-geometric mean is one simple case of this type of interplay. The arithmetic mean (AM) is what most people understand as the 'average' of two numbers. Half-way between 2 and 8 is 5. The geometric mean (GM) involves the internally-generated 'exponential' growth. In growing from 2 to 8, the 'half-way' point is 4; that is, 2 doubles to 4, and repeating this 'doubling'-growth, doubles to 8. One can determine this geometric 'half-way' point by multiplying the beginning and end points of the growth (2x8=16), and then figuring out the magnitude that acts upon itself to

3. See, e.g., LaRouche's "Poetry Must Begin to Supercede Mathematics in Physics."

portrait by Auguste Eugene Leray

Sophie Germain

Johann Peter Gustav Lejeune Dirichlet

Évariste Galois

Bernhard Riemann

obtain the same result (that is, what is usually called, taking the square-root of 16 yields 4). A geometric 'root' really is something that grows differently than, e.g., arithmetically stacking bricks in a pile. Gauss develops the arithmetic-geometric mean, whereby one successively takes the arithmetic and geometric means of the former arithmetic and geometric means. (That is, e.g., going from 2 to 8, the GM is 4, the AM is 5; then, next stage, between 4 and 5, the GM is the root of 20, and the AM is the slightly larger 4.5. The two limits converge towards each other with some rapidity to form the arithmetic-geometric mean.

Is this a silly game, designed to keep math majors busy? What physical significance would an arithmetic-geometric mean have? Put a bit too simply, the geometric is where one measures the power of a process (e.g., whether it grows 'fully acting upon itself,' squaring itself); and the arithmetic, where there is some significance to quantifying how much has been produced at the end of a production cycle. We have power being measured relative to a specific moment in the production process. If it is a physical process worth encouraging, it will be fruitful in some fashion. That fruitfulness has physically changed the world. That physical process, after one cycle of production, is now acting upon a different magnitude. The dynamics of bodies moving in elliptical orbits, or the dynamics of an integrated manufacturing facility, require physically-driven measurements—frequently at variance with the 'back-engineering', or ass-backwards engineering involved in someone calculating 'how much profit will my money make?'.

Here, power acts, producing a different world than before, changing what that power can accomplish in the next production cycle. Here, a language has to be developed to capture the historically-specific actions of power, or '*dunamis*'.[4] Lawfully, and somewhat ironically, the individuals who most seriously, most passionately, took up this mission, have proven to be, as rather unique individuals, the most fascinating exemplars, in their own personalities, of the higher-ordered mathematics. The historically-specific realities of their lives, rise to a level beyond mere biographical side-notes, a level helpful in delineating how they were able to develop such a rigorous and higher-ordered language, appropriate for mapping how the mind intervenes upon the outside world.

The most serious students of Gauss' *Disquisitiones Arithmeticae*, his 'poet-mathematicians', were Sophie Germain, LeJeune Dirichlet,[5] Niels Abel, Evariste Galois, and Bernhard Riemann. Common to all five is that their actual activities and methods of thinking, always combined two critical components:

1) a non-'mathematical', musical and/or poetic core; and

2) an identifiable, historically-specific moral core—where it is clear that the strength and power in their conceptions and dealings with matters of 'discreteness'/'continuity', revolve around each individual's courageous decision to deal with nothing short

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4. Power/'dunamis' is developed by Bruce Director in "Riemann for Anti-Dummies: Part 33" : Hyperbolic Functions—A Fugue Across 25 Centuries; see also: "Riemann for Anti-Dummies: Part 66"

5. The case of Dirichlet involves the author's development of the role of the German-Jewish Mendelssohn family. See: Philosophical Vignettes from the Political Life of Moses Mendelssohn, *Fidelio*, Vol. 8, No. 2, Summer, 1999, and for the Dirichlet case: "Rebecca Dirichlet's Development Of the Complex Domain, *EIR*, June 11, 2010.

C. Schulin

Potsdamer Bahnhof in Berlin.

of the totality of the universe.

That is, they themselves, personally, are located as an exemplar of discreteness in the continuity of the processes of the universe.

Here, we shall examine the case of Gauss' Norwegian protégé, Niels Abel—and, in particular, his wonderfully strange year on the way to Paris, when Abel's unique aesthetic education empowered him to push forward the measurement of the mind's activity upon the world.

August Leopold Crelle

II. Abel's Wonderfully Strange Year

Niels Abel was a talented Norwegian youth who, at eighteen, had already devoured Gauss' *Disquisitiones Arithmeticae*. He had set himself the task of developing Gauss' treatment of the elliptical transcendentals and such curves as the *lemniscates*. However, it wasn't until he turned twenty-three that he was able to travel to Paris, via Berlin, Leipzig, Prague and Vienna, to test himself at the centers of learning and study. Though largely overlooked by historians and biographers, Abel's aesthetic education is in full view. One particular core of his aesthetic education had to do with the development of his power of inversion, which he would later apply to his so-called mathematical work. As Abel put it: "One learns many strange Things on such a Tour, Things of which I can find more use than if I were purely studying Mathematics."

Berlin and the Composer-Mathematician

First, in Berlin, in the fall of 1825, he met August Crelle, a man primarily known today, if at all, only for the mathematical periodical he founded, "Crelle's Journal." Crelle greatly valued Abel's talent and honesty from their first meeting: Crelle discussed one of his own mathematical papers—and, evidently, Abel was able to quickly explain where Crelle had fallen short. Abel was pleasantly shocked in finding that Crelle's Monday night gatherings were not mathematics seminars, but rather *musikabends*! Abel begins his description of Crelle's gathering: "There is at his place some kind of meeting where music is mainly discussed, of which unfortunately I do not understand much." Up to that point, Abel's passion for the theater had been more advanced than for the concert stage.

Crelle's primary job was to develop transportation for the Prussian state, whereby he would create the first Prussian railroad, that from Berlin to Potsdam. But he also composed music, including settings of Johann Wolfgang von Goethe and Friedrich Schiller.[6] He had authored a work on music in

6. Crelle's *Zehn Gesänge am Fortepiano* (op. 3) seem to be from the period of the Liberation War (1813/14). The ten settings, in order, are: C. A. Tiedge's *Abendfeier*; Goethe's *Der untreue Knabe*; *Liebe*; Bechtolsheim's *Die Blume aus Norden*; Goethe's *Der Fischer*; *Mein Edmund*; A. H. Niemeyer's *Dreistimmiger Kanon*; Friedrich von Matthisson's *Elysium*; Friedrich von Hardenberg's *Sängers Klage*; and Goethe's *Rastlose Liebe*. He also set Goethe's *Neue Liebe, neues Leben* and Hardenberg's *Zulima*.

Felix Mendelssohn

Sara Levy

1823, and on December 5, 1824, he gave a memorial lecture, on the occasion of the anniversary of Mozart's death. For this occasion, he arranged for a performance of Mozart's *Requiem* which included the fifteen year-old Felix Mendelssohn, who served as the orchestra. Crelle also had longstanding connections and activities with the Berlin *Singakademie,* including its director, Carl Friedrich Zelter, and its chief supporter, Sara Levy. (Zelter was Mendelssohn's teacher and Sara Levy was the aunt of Mendelssohn's mother.)

It is not known specifically what Crelle's Monday evening music seminars studied; however a decent hypothesis may be ventured. At this very time of Abel's visit (1825), a special work had been dedicated to Crelle: a piano-arrangement of Mozart's (K. 546) *Adagio and Fugue* quartet-study of Bach's "Musical Offering."[7] It is not a big stretch to assume that this work played a central role in Crelle's seminar that year. The arranger, J. P. Schmidt, the same Winter that Abel was in Berlin, published Beethoven's Op. 29 String Quintet, arranged for four hands[8] and dedicated to the teenagers, Fanny and Felix Mendelssohn—drawing the circle even tighter. (Perhaps, the only question left seems to be whether Fanny and Felix performed this work at Crelle's, at their great-aunt's—Sara Levy's—or at both locations!) That Felix, within months, produced his own first string quintet, again points to the likelihood that these specific works were indeed part and parcel of the social discussions of these circles.

Abel may not have understood much about musical discussions when he first arrived, but Crelle certainly seems to have had other plans for him. He introduced Abel to the Mendelssohns' circle by getting him invited to Sara Levy's Saturday evening *musikabends*. Crelle had known Levy over the previous two decades from the Berlin *Singakademie*. Briefly, regarding Sara: she was a student of Bach's eldest son, Wilhelm Friedrich; she was the prime source for Bach manuscripts; and was the piano soloist performing from her Bach manuscripts with the *Singakademie*. Finally, it was her manuscript copy of J. S. Bach's "St. Matthew's Passion," given to her great-nephew, Felix, that occasioned the historic 1829 Bach Renaissance[9]—which played such an important role for Felix Mendelssohn's soon-to-be brother-in-law, LeJeune Dirichlet.

So, Abel's weekly schedule in Berlin is known to have included: Monday night *musikabend*s at Crelle's; discussions on Gauss on Friday mid-day walks with Crelle and Jakob Steiner; and Saturday evening *musikabend*s at Sara Levy's. In all, during his famous 'trip to Paris', Abel would actually spend fully one-half of his time in Berlin with Crelle and Sarah Levy. Crelle's famous journal itself is a residue of Abel's stopover in Berlin, as it was founded in the wake of Abel's visit, and its initial issues were centered upon Abel's works. (Later, Crelle tried to get Abel to become the editor of the journal.) Before leaving Berlin for Paris, one of Crelle's mathematicians, Professor Dirksen, provided Abel with a letter of recommendation, introducing him

7. *Adagio and Fugue*, K. 546, arranged, *La Fugue quatuor de W.A. Mozart arrangée pour le Piano=Forte à quatre mains et dédiée à Monsieur Crelle par son ami J.P. Schmidt*. Trautwein: Berlin, [1825].

8. Beethoven's String Quintet, Op. 29, arranged, *Rondeau, tiré du Grand Quintuor, Oeuvre 29, Arrangé pour le Pianoforte à quatre mains et dedié à Mdmlle Fanny & Msr. Felix Mendelssohn-Bartholdy par J.P. Schmidt*.

9. "Rebecca Dirichlet's Development Of the Complex Domain," *EIR*, June 11, 2010, pp 31-32.

to Alexander von Humboldt. Of some note, Crelle and Dirksen were well aware that Humboldt was recruiting talented geniuses to help build up Berlin.

Exhibit in the Freiberg Mining Museum.

Bach, Freiburg and Crystallography

Next, on Feb. 22, 1826, Abel goes for a month's-long stay in Leipzig and Freiburg, where he works, primarily, with the Naumanns—sons of the Dresden composer, Johann Gottlieb Naumann. The father had studied Bach's "Preludes and Fugues" with one of Bach's Leipzig students, Gottfried August Homilius. Naumann had composed for Benjamin Franklin's Glass-harmonica (1786), and had been involved with Schiller's friend, Christian Gottfried Körner, in the drive for a national theater.

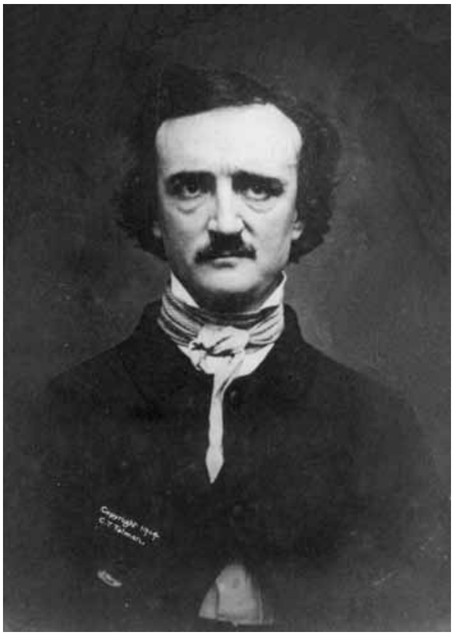
Abel, along with his Norwegian traveling companion, Baltazar Mathias Keilhau, first met, in Leipzig, with the composer's son, K. F. Naumann.[10] This Naumann had recently visited Norway's mountains to study crystals, and had just finished translating Keilhau's geology work from Norwegian into German. Within months of their meeting, Naumann would become the professor of crystallography at Freiburg, studying the exceptions to perfect symmetry in crystals (e.g., distortion of axes, twinning, and chirality or 'handedness'). Naumann called them *enantio-morphisms*. After two days in Leipzig, they—Abel and Kielhau—are off to Freiburg, where K. F.'s brother, August Naumann, taught mathematics. Abel meets August at a mineralogy seminar, and spends significant time with him over the next month. The Leipzig/Freiburg discussions might have touched upon mathematics, but evidently only as an adjunct to the paradigmatic cases of the crystalline exceptions to perfect symmetry—a key feature of Abel's mathematical developments. Abel writes of August: "a really gifted fellow" and "a very agreeable man and we associated harmoniously . . . ."

The trips to Leipzig and Freiburg were, somehow, not part of the official agenda. Abel had been expected to bee-line toward Paris, where the mathematical elite were said to reside. Abel's teacher at Christiania University, Christopher Hansteen—himself an important part of Gauss' geo-magnetic project—commented upon Abel's 'diversion' away from Paris: "...[W]hy that young god Thor, searching for his hammer, wants to swing to Leipzig and surroundings I do not know . . . . [Regardless, he] always arrives where he is supposed to, even if he does not move straight to it." Abel's response to Hansteen is telling: "...[T]here will be no lack of ideas for several years. I shall probably gather more on my travels, for just at present there are many thoughts circulating in my head." With Bach-ian inversions and transformations, Mozart's study of Bach, and the implications of the dissymmetry of physical transformations of nature, there should be little wonder! While Abel's powerful methods of

a) inversion—of reversing investigations, from 'what we may infer from the facts' to 'what must be the case for functions to work at all'—and

b) isolating the non-symmetric characteristics of a system, might have been suggested earlier by some of the procedures of Abel's earlier teacher, Bernt Holmboe, and his university professor Hansteen, it was given courage and shape in Berlin, Leipzig, and Freiburg.

10. The composer-father had actually given "K. F." four names, notably including "Amadeus"—this five years after Mozart's death.



Library of Congress

Edgar Allan Poe

Frédéric Thjéodore Lix

C. Auguste Dupin, from an illustration for The Purloined Letter *by Edgar Allan Poe.*

The 23-year-old Abel now describes to Hansteen his newly-formulated plan to put analysis on a rigorous basis, from the top down: "Everywhere [in advanced analysis, especially the tradition of Euler] one finds this miserable way of concluding from the special to the general, and it is extremely peculiar that such a procedure has led to so few of the so-called paradoxes. [For Abel, the so-called paradoxes are to be sought!] It is really interesting to seek the cause. To my mind it lies in the fact that in analysis, one is largely occupied with functions which can be expressed by powers. As soon as other functions enter—this, however, is not often the case—then it does not work any more and a number of connected, incorrect theorems arise from the false conclusions. . . . It works out satisfactorily as long as one proceeds generally. . . ." This is a pretty strong echo of Leibniz's "analysis situs" approach (also characterized by LaRouche as a "top-down" approach—to be preferred to that of the "bottoms-up").

The 'Melancholy Spectre' of Venice

Abel's visit to Venice provided him a *'Feindbild,'* an enemy-image, for his moral objection to 'mathematics-by-induction.' Abel's description: "There is a melancholy Spectre invading Venice. Everywhere one sees Signs of former Glory and contemporary Wretchedness. . . .Everything testifies to Decay." The state of mathematics, in not openly developing the implications of the *Disquisitiones*, was also one with "signs of former glory and contemporary wretchedness." This should not be discounted as simply a 'poetic truth.' The backward state of build-from-the-bottom mathematics (what Poe would call, in honor of Francis Bacon, 'Hoggism') was not merely wasteful; it never had to happen. Its very existence betrayed a systemic problem, not to be overlooked. For Abel, the very fact that there had been a Venice, a second incarnation of Rome, could not be accepted as a necessary feature of the world—without suffering the penalty of mental damage to one's own faculties! Even this part of his aesthetical education would prove of significant utility in his upcoming dealings with the mathematical reactionaries of Paris.

Otherwise of note, in between Freiburg and Venice, Abel saw an Italian opera in Dresden, and Schiller's "William Tell" in Prague. In Prague, he also sought out the heads of the astronomical observatory. (It might be imagined that Abel benefitted from discussions with those working at what was once Johann Kepler's observatory, but, unfortunately, this author has not been able to develop a case for reconstructing those discussions.) Then, after Venice, his last major stop before Paris was a six-week stay in Vienna, which included visits to theaters and discussions with Crelle's friend, J. J. Edler von Littrow, the director of the Vienna Observatory.[11] Littrow provided Abel with what would be a critical letter of introduction to the director of the Paris observatory, Alexis Bouvard.

Paris: Abel Links Up with Dirichlet, His Fellow 'Countryman' in the Land of the *Disquisitiones*

Bouvard introduced Abel to a key group of French republicans around Audebart, Baron de Férrusac. In 1823, Audebart had established what would later be called the *Bulletin General et Universel de Sciences et de l'Industrie,* which reported useful scientific advances to Parisians, especially those from outside of Paris. Audebart's journal was given a favorable review by one member of the French Academy, C. August Dupin—the actual scientist whose name Edgar Alan Poe would use for his fictional poet-mathematician! Audebart's editor, J. F. Saigey, employed Abel to write short synopses of articles from other science journals. Abel's first submissions included an account of his own proof on the impossibility of the quintic,[12] along with an account of his Norwegian article on the moon's gravitational effect on the pendulum.

Audebart's scientific library, maintained by Saigey, was the gathering place for the serious thinkers in Paris, for those who would not be hemmed in by Augustin-Louis Cauchy and by the Restorationist grip over the Academy. (From the 1815 Congress of Vienna until the 1830 July Revolution, France was administered under the restored monarchies of Louis XVI's two brothers, and Cauchy was their controller at the Academy.) It was there, at Saigey's library, that Abel met with Lejeune Dirichlet, who, at 21, was three years Abel's junior. It is certainly possible that Dirichlet had sought out Abel, due to his published account of the quintic. Abel writes (10/24/1826) of Dirichlet: "He is a very sharp Mathematician… [H]e has shown the impossibility of solving in whole Numbers the [quintic] equation $x^5 + y^5 = z^5$ and other neat Things." He made sure to record: "Herrn Le-jeune Dirichlet, a Prussian, who the other Day came to me and said he regarded me his Countryman." Dirichlet certainly was not confused: he knew he was talking with a Norwegian! While he might have been referring to Abel's time in Berlin and possibly even the Humboldt plan to recruit Abel to Berlin, it were very likely, knowing Dirichlet, that he bonded with Abel in the 'country of the *Disquisitiones.'*

Dealing with Demons—LaPlace and Cauchy

This July-October 1826 period in Paris saw Abel's perhaps most concentrated work, centered around his paper on transcendental functions. That work should be viewed as the fruit, in particular, of Berlin, Leipzig, and Freiburg. The introduction of his *Mémoire sur une propriété générale d'une classe trés étendue des functions transcendantes* was read by Joseph Fourier before the Academy on October 30, and then given to Augustin-Louis Cauchy to make a report. Abel had described his powerful 'inversion' plan of attack, as formulated back in Freiburg. His methods allowed for a breath-taking expansion of the human race's ability to deal with transcendental functions, where exponential and logarithmic functions did not lead up to, but rather were derived from the elliptic and higher transcendentals. Higher species of curves, of characteristic actions that accounted for all the important features of the visible curves, were made subject to human culture and deliberation. Cauchy promptly buried the report.

Prior to October 30th, Abel had offered Cauchy time to examine the *Mémoire*. "I showed it to Mr Cauchy, but he scarcely deigned to glance at it." After the presentation of the paper to the Academy, *The Memoir on Transcendental Functions* disappeared, with no report being produced. Cauchy claimed that he simply lost the paper. Even for someone committed to suppressing scientific development and suppressing genius, it was a rather brutal and desperate action. Still, Abel might not have been completely surprised. In his preceding three months in Paris, Abel had already described the problem: "Cauchy is '*fou*' [mad] and there is Nothing to come out of him, although he is the mathematician for the present Time who knows how Mathematics ought to be treated. His Issues are excellent, but

11. For what it is worth, the "Littrow projection" is said to be the only conformal retro-azimuthal map projection. Curiously, Littrow's own 'academic advisor' back in Prague had been August Gottlieb Meissner, the professor of aesthetics and classical literature—who happens to be the source for the story that the Venetian agent, Casanova, had tried to intervene upon Mozart's "Don Giovanni" production back in 1787.

12. Algorithmic solutions had been found for 2nd, 3rd and 4th -power equations. (Algebra students typically learn the simplest one, the "quadratic equation.") Contrary to expectations from the 'bottoms-up' crowd, not only was no such algorithm discovered for 5th-power equations, but Abel, and Dirichlet, had addressed why such was the case, proving no such algorithm was possible.

Augustin-Louis Cauchy

Jean-Baptiste Paulin Guérin

Pierre Simon Marquis de Laplace (1745-1827)

he writes very obscurely. . . . Cauchy is tremendously Catholic and a bigot. A sorely strange Thing for a Mathematician." What is this "sorely strange Thing"? A mathematician capable enough to identify the leading mathematical issues, but who has chosen to obscure and smother them. Abel's analytical ability, in identifying the characteristic evil in the scientific community of 1826, clearly stemmed from his moral commitment to truth-seeking, and his moral repulsion for the 'Venetian decay' disease.

Further, Abel recorded his analysis as to why the disease would not be easily cured in Paris. He was convinced that the older generation around the Academy would not challenge Cauchy. The 74-year-old Adrien-Marie Legendre was an "exceedingly obliging Man but unhappily as old as a Stone." Sylvestre François Lacroix, though, biologically, only sixty, was "awfully skaldic [ancient, from the Middle Ages] and remarkably Old," while Simeon Denis Poisson was "somewhat captivated by himself." But Abel was especially exercised over the sophistical Pierre-Simon LaPlace: "He appears quick and small, but He has the same Shortcoming of which [the demon] Haltefanden accuses Zambullo;[13] that is to say, *'la mauvaise habitude de couper la langue de gens'*." ['He has the horrible habit of silencing people'.] Abel certainly recognized that LaPlace's deterministic axiomatics left him with the felt need to invoke a hypothesized 'superior intelligence,' LaPlace's Demon, which demon would pre-determine everything mechanistically—a ruse little different from the "Invisible Hand." Such sophistries were designed to cover over, rather than reveals—not unlike the obscurantism that Abel objected to in LaPlace's collaborator, Cauchy . . . an obscurantism which would now extend to simply burying Abel's masterpiece.

Abel's ability to forge ahead, in the face of the reactionary social culture of Restorationist mathematics in Cauchy's Paris, had everything to do with his previous year in Berlin, Leipzig, Freiburg, Prague and Vienna—and, yes, even decadent Venice. Recall Abel's forecast: "One learns many strange Things on such a Tour, Things of which I can find more use than if I were purely studying Mathematics." The full facets of Abel's creative personality found lawful expression in Bach; in the powerful language of inversion; and of dissymmetric, characteristic processes in crystallography. The development of access to higher-order causal processes cannot but give form and shape to the previously hidden processes of the 'mathematician'. (And these hidden processes even apply to the first-grade mathematician, in his or her unthinking acceptance of the number 'ten'.)[14]

13. The two are characters from a topical fictional work by Lesage.

14. For the attentive, here is one explanation of the number puzzle from the top of the article, for the reader to compare with his or her own solution: The key is '9' as the last numeral of the 'base 10' system. Multiplying by nine creates a series: 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108, etc. Each addition of 9 lowers the digit column by 1 and increases the next column to the left by 1. This 'hidden' property is simply a function of the intervention made by your first-grade teacher, who halted the enumeration of numbers at 9, and then spent some weeks, drilling and grilling you on the importance of the columns and the place-holder role of zero. (It was very important to line up your columns when adding.) There is no problem in ordering numbers in groups of ten, with columns representing increased powers. The problem only arises when the mind is deceived as to how the action of shaping 'number-space' has implications.

III. Those Who Already Have the Death of Abel on Their Consciences

Abel received no response in Paris to his opus magnum, locked away in Cauchy's study. He wrote home about the ostracism: "On the whole, I do not like the French as well as the Germans; the French are extremely reserved toward strangers. It is very difficult to become closely associated with them, and I dare not hope for it. Everybody works for himself without concern for others. All want to instruct, and nobody wants to learn. The most absolute egotism reigns supreme." Years of intellectual fascism had taken its toll around the Academy. Then his "Countryman" Dirichlet left Paris; Alexander Humboldt had arranged a professorship in Germany for Dirichlet. From November, 1826 until January, 1827, Abel's last three months in Paris, he was increasingly isolated. It seems likely that this is the precise period when Abel contracted tuberculosis, which was then the equivalent of a death sentence. His actions indicate that his prime concern was to get home and to concentrate on his own work for whatever time he had left. Though he did take the next four months to revisit Berlin, attending the *musikabend*s at Crelle's and at Sara Levy's, he surprised Crelle by turning down his offer to become the editor of *Crelle's Journal*. When he left for home, he had less than two years remaining.

Crelle, probably in 1828, wrote Humboldt: "The gentlemen Dirichlet, Abel, Jacobi, and Steiner, who all, except Abel, already are in the service of the Prussian government, represent in reality a group of young mathematicians giving the greatest expectations for the advance of science. Perhaps they, in time, will become mathematicians of the very highest rank, for in spite of their youth, science already owes essential progress to them… Again the Prussian government is in a position to support talents so great that nature only rarely produces them. For this science will be in a debt of gratitude to your Excellency." Crelle and Humboldt still planned to get Abel a professorship in Berlin. In April, 1829, Crelle's letter arrived, with the news that Abel had received his appointment in Berlin. However, Neils Abel had died, only days earlier.

Karl Jacobi, Abel's closest mathematical collaborator in Berlin, who had walked with Crelle and Abel every Friday, would exert pressure upon the Paris Academy to produce Abel's "lost" manuscript. With intervention from the Norwegian consul in Paris, Cauchy eventually succeeded in locating Abel's manuscript—but not before he had succeeded, again, in "losing" the manuscript submitted to the Academy of the next-in-line of Gauss' geniuses, that of Evariste Galois. In December 1831, from a prison in Paris, the precocious genius, Galois wrote: "I must tell you how manuscripts go astray in the portfolios of the members of the Institute, although I cannot in truth conceive of such carelessness on the part of those who already have the death of Abel on their consciences."

Alexander von Humboldt

The case of Galois underlines and intensifies that of Abel. But in both cases, to repeat from above: "…their actual activities and methods of thinking always combined two critical components:

1. A non-'mathematical' musical and/or poetic core; and

2. An identifiable, historically-specific moral core—where it is clear that the strength and power in their conceptions and dealings with matters of 'discreteness'/'continuity,' revolve around the individual's courageous decision to deal with nothing short of the totality of the universe. That is, they themselves, personally, are located as an exemplar of discreteness in the continuity of the processes of the universe."