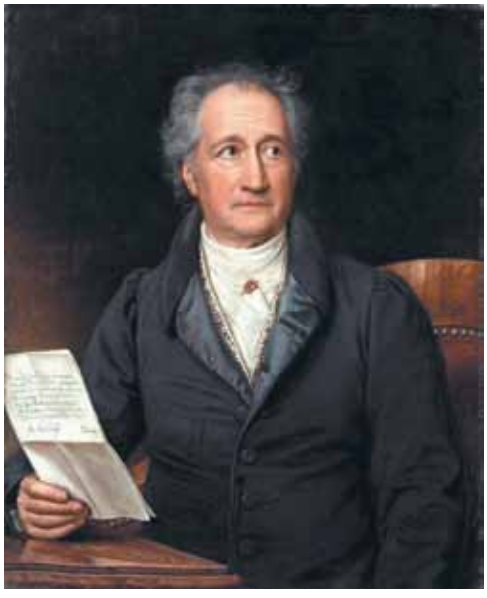
Letter to the Editors

Having recently read in the "Galactic Man" issue of *EIR*, your report on "Albert Einstein's God," I recalled some of what I had read of Einstein's writings on this very subject. I began to think more on what I knew of Einstein's great discoveries, and, within that context, Lyndon LaRouche's constant and necessary warnings, against mathematics as the foundation for physics. From my earliest memories, it is poetry which has been, as the German poet Heinrich Heine said, "a holy plaything to me." And physics? Something to be shunned at all costs. But, when I read one of the greatest early essays of the economist LaRouche, "Poetry Must Begin To Supersede Mathematics in Physics,"[1] I thought a possible new world of play had emerged. It is those memories that have compelled me to write you.



Johann Wolfgang von Goethe

In this essay, Mr. LaRouche boldly asserts:

> *Poetry, and forms of music, painting, and sculpture ordered according to Neoplatonic poetic principles, serve as part of the essential training of the mind to master preconscious processes. In turn, only those aspects of artistic effort that serve that notion of the poetic principle are to be regarded as art.*

I then began to struggle with some of the more popular writings of Einstein published for the informed layman, and then some of the works of the great 19th-Century German scientists such as Friedrich Gauss, Bernhard Riemann, and Georg Cantor. I searched for confirmation of their roots in poetry. And as I did, a slightly clearer idea began to emerge. But it was not until I read an essay by the great German poet Friedrich Schiller, "The Aesthetical Estimation of Magnitude,"[2] that a clear and wonderful picture emerged.

I will not attempt to provide a detailed history of the relationship between the breakthroughs of German science in the latter half of the 19th Century, and the works of German poets such as Schiller and Johann Wolfgang Goethe, etc. But I thought I might be able to provide a few relevant quotes and references that might encourage many of your readers to investigate these areas on their own. I do wish to give some indication of how poetry has been absolutely essential in developing these ideas.

'Einstein was a man of the book…'

These are words of German-born American physicist Gerald Holton, after exhaustively reviewing, in 2008, the contents of Einstein's personal library at Princeton:

> Throughout his life, Einstein was a man of the book, to a much higher degree than most other scientists. The remarkably diverse collection of volumes in his library grew constantly. If we look only at the German-language books published before 1910 that survived Einstein's Princeton household, the list includes much of the canon of the time: Boltzmann, Buchner, Friedrich Hebbel, the works of Heine in two editions, Helmholtz, von Humboldt, the many books of Kant, Gotthold Lessing, Mach, Nietzsche, and Schopenhauer. But what loom largest are the collected works of Johann von Goethe in a 36-volume edition and another of 12 volumes, plus two volumes on his Optics [*Zur Farbenlehre*, 1810—ed.], and the exchange of letters between Goethe and Friedrich Schiller.

As a young boy, educated in the tradition of German public school education, Einstein was building a foun-

1. *Fusion*, October 1978.

2. See translation on the Schiller website

Friedrich Schiller, 1791 portrait by Anton Graff

dation upon which the edifice of his genius could be raised. In *Dædalus, the Journal of the American Academy of Arts and Sciences*, in another essay on Einstein entitled, "The Roots of Science in the Cultural Soil," Holton elaborates on the foundations of Einstein's education:

> Other points pale in comparison to a central one: Einstein's lifelong interest in and devotion to the European literary and philosophical cultural tradition, and especially to German literary and philosophical *Kultur*. That allegiance, in which his science was clearly embedded, had been fostered early in his childhood. While the classics of music were offered in their home by his mother, Einstein's father would assemble the family in the evening around the lamplight to read aloud from works by such writers as Friedrich Schiller or Heinrich Heine. The family perceived itself as participating in the movement of general *Bildung* in this way, the uplifting of mind, character, and spirit that characterized the rising portion of the *Bürgertum* [middle class-ed.]. This was especially true for its Jewish segments. *Kultur* advocated and legitimized emancipation, and also provided a vehicle of social assimilation.

After providing a brief history of Einstein's youth and education, Holton concludes with the following summation:

> After all, during his scientifically most creative and intense period in Bern, Einstein formed with two young friends an academy for the self-study of scientific, philosophical, and literary classics. We have the list of the books they read and discussed at their meetings, which sometimes convened several times a week: Spinoza, Hume, Mach, Avenarius, Karl Pearson, Ampère, Helmholtz, Riemann, Dedekind, Clifford, Poincaré, John Stuart Mill, and Kirchhoff, as well as Sophocles and Racine, Cervantes and Dickens. They would not have wanted to be ignorant of the cultural milieu, even if they did not necessarily agree with all they read.

Relativity: The Special and General Theory

Relativity: The Special and General Theory, is Einstein's own popular translation of the physics that shaped our truths of space and time. From the beginning he challenges all the contemporary assumptions of mathematics and physics. He demonstrates that physics must be grounded not only in the science of Ampère, Helmholtz, and Riemann, but also in the *Kultur* of the classics created by men like Beethoven and Schiller.

In Einstein's works for the layman, we see echoes of Schiller's writings, especially the "Aesthetical Estimation of Magnitude," where Schiller provides the necessary aesthetic foundation for the later works of Riemann and, eventually, Einstein. But before we approach Schiller, we must look briefly at Riemann's "Habilitation Dissertation," an elaboration of one of the greatest analyses of the relation between mathematics and physics, establishing the axioms of new,

Bernhard Riemann

more appropriate geometry.[3]

Riemann begins his dissertation by establishing a foundation for the actual measurement of space and time. Though this introduction is straightforward, it is not an easy read. Yet, it is certainly comprehensible for the informed layman willing to take the time and effort to study it. Riemann introduces his dissertation with a simple statement:

> It is known that geometry assumes both the notion of space and the first principles of constructions in space, as given in advance. 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 perceive neither whether nor how far their connection is necessary, nor, *a priori*, whether it is possible.

Riemann continues,

> From Euclid to Legendre (to name the most famous of modern reforming geometers) this darkness was cleared up neither by mathematicians nor by such philosophers as concerned themselves with it.

Riemann is emphasizing that geometrical notions of space and time, though empirically measurable, are nonetheless notions, hypotheses, assumptions, and are not themselves necessarily true. What we believe to be the causes of what we see, smell, and touch, so to speak, do not directly represent the causality behind these events, and therefore are not necessarily true. This is part of the foundation for the German scientific breakthroughs of 19th Century. And that foundation was, in great part, begun by the poet Schiller.

This is also the point that Einstein emphasizes: Mathematics is not science. It is merely a complex ruler, a measuring rod that tells you little about the causes of that which you are attempting to measure. More than any other great scientist, except perhaps LaRouche, Einstein's ability to educate the informed layman is part of his genius. In an essay entitled "Geometry and Experience," Einstein emphasizes:

> At this point an enigma presents itself, which in all ages has agitated inquiring minds. How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality? Is human reason, then, without experience, merely by taking thought, able to fathom the properties of real things?
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> In my opinion, the answer to this question is, briefly, this: *As far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.* (emphasis added)

That is to say, mathematics tells us less and less about the nature of the physical world, to the extent to which we depend upon it to measure the physical world. Or to put it perhaps more simply: If it adds up perfectly, it tells us nothing about the nature of what we are counting.

'Aesthetical Estimation of Magnitude'

This notion as to an aethestic understanding of how we must investigate the relationship between Geometry and Experience, is admirably argued in Schiller's essay

3. This is a letter; it is meant to do nothing more or less than to interest the reader in investigating the connection among these three great geniuses of the 19th-Century renaissance of science.

of 1793. This is the same great poet that Einstein's father would read to him and his siblings almost every evening as children. And I would find it difficult to believe that Einstein was unaware of this essay. Its significance lies in its opposition to those who denied any connection between beauty and the human creativity necessary for scientific advancement.

In this essay, Schiller demonstrates the essential idea that science must be grounded in an aesthetic appreciation of the universe. Science is not objective, nor is beauty somehow merely subjective, a matter of taste. It was Schiller who created the conceptual basis for those advances made in physics by Bernhard Riemann and Albert Einstein.

Schiller begins by asserting:

> I can form four mental images, quite different from one another, of the quantity of an object. The tower which I see before me, is a magnitude.
>
> It is 200 ells high.
>
> It is high.
>
> It is a high (sublime) object.

It is here that Schiller introduces a new axiom, for the foundations of a new geometry. The question of understanding any feature of the universe had to include "An Aesthetic Estimation of Magnitude," whether in physics, chemistry, or any feature of the physical sciences.

He concludes his essay with that same sense of aesthetics:

> The highest mountain range is indeed small against the height of the firmament, but that is merely what the understanding teaches, not the eye, and it is not the heavens whose height makes the mountains low,—rather it is the mountains which, by their magnitude, show the elevation of the sky. It is, accordingly, not merely an *optically* correct, but also a *symbolically* true idea, when it is said, that Atlas holds up the heavens. Just as the heavens themselves literally seem to rest on Atlas, so our idea of the height of the heavens rests upon the height of Atlas. Thus the mountain, in the figurative sense, really holds up the heavens, because it holds the heavens aloft for our sensuous comprehension. Without the mountain, the heavens would fall, that is, they would sink before our eyes and be brought low (emphasis in original).

In this great, but little-read essay, Schiller is laying the foundation for what Einstein would later assert in his essay "The Religious Spirit of Science":

> You will hardly find one among the profounder sort of scientific minds, without a religious feeling of his own. But it is different from the religiosity of the naïve man—the scientist is possessed by the sense of universal causation. The future, to him, is every whit as necessary and determined as the past.... His religious feeling takes the form of a rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection. This feeling is the guiding principle of his life and work....

Yours,
Theodore J. Andromidas