I. Leibniz

FOR THE LEIBNIZ YEAR 2016

Do You Know Gottfried Wilhelm Leibniz?

by Martin Kaiser

The origin of the most central, fundamental, and most memorable of those deeper roots of my presently knowledgeable outlook, is to be located in my reaction to a study, dating from my adolescence, on the subject of Gottfried Leibniz's concept of the Monadology.[1]

—Lyndon LaRouche

This is an edited translation of "Kennen Sie Gottfried Wilhelm Leibniz? Zum Leibnizjahr 2016," which appeared in Germany in Neue Solidarität, *March 2, 2016.*

Gottfried Wilhelm Leibniz, 1646-1716, in a portrait by Christoph Bernard Francke, about 1700.

March 2—This year's 300th anniversary of the death of Gottfried Wilhelm Leibniz provokes the question: What could be the reason for the change from the phases of growth and flourishing of societies, to their downfall? Although today's common sense assumes that societies come and go like seasons, Leibniz was not of this conviction. Growing up in the rubble of what was left of cities, villages, farms, and fields by the Thirty Years' War (1618-1648), where more than 30 percent of the European population was eliminated, he was not of today's liberal disposition, that fate decides where societies go and that one cannot do anything about it.

Since the trend of our society is set against its own survival, with possibly both a global financial crash and a world war bringing it to a sudden end, it is worthwhile to delve intensively into the life of Leibniz, if we want to escape from our fatal course. For Leibniz inspired so many contemporaries and successors to end the remnants of feudalism, initiate another Renaissance, and found a new form of society, that he can be considered, without exaggeration, the source of our idea of a moral state.

Why, for example, did a collapse of European civilization follow after the Italian Renaissance in the 15th Century? Wasn't it the hallmark of the Renaissance to view man as the crown of God's creation, so that science flourished as well as economic and artistic activity? Didn't poverty and ignorance recede, when the human being was seen as the living image of the highest creative principle? The citizens' participation in the state even awakened memories of the ancient Athenian democracy.

1. *EIR*, Feb. 22, 2008.

But no single achievement of this golden hour of mankind, between the Middle Ages and the religious wars in the 16th and 17th centuries with their barbarism, can adequately explain the principle of the Renaissance itself. Inspired by the Platonic idea of human reason, man again began to discover new laws of nature, art, and mind, in order to make them accessible to all mankind. Nicolas of Cusa and Leonardo da Vinci are still known for their pioneering roles, which have served mankind down to today.

The relationship between man and the Cosmos was revolutionized, and human beings no longer saw themselves—through their superstitions—as victims of blind forces of nature, but rather as agents of the creative principle.

Leibniz Challenges the Oligarchy

In Gottfried Wilhelm Leibniz (1646-1716), the oligarchical masters of Europe encountered an adversary who brought the ideas of the Renaissance to new heights, unlocked new powers of nature for mankind like a Prometheus, and thus ensured its survival. He intervened in all social spheres to develop his vision of a general harmony, a *Harmonia Universalis*. No sharper opposition can be conceived than that between Leibniz and his contemporary Thomas Hobbes (1588-1679), who created for the British Empire then arising in the footsteps of Rome, the ideology by which "every man is a wolf to every other."

In contrast to this, Leibniz saw in the creative potentials of every human being—his or her inventive spirit in skilled crafts, science, the arts, or mining—the mainspring of the good state, and thereby became the founder of the science of economics. In his early work, *Society and Science* (1671), the 25-year-old Leibniz drafted a program which we today would perhaps regard as contemporary, and which later led to his efforts to found scientific academies. He wrote:

> Monopoly is avoided, since this society always wants to pay [only] the fair price,— or even more cheaply in many cases, by causing manufactured goods to be produced locally [rather than imported]. It will especially preclude the formation of a monopoly of merchants ... along with excessive accumulation of wealth by the merchants or excessive poverty of the artisans—which is particularly the case in Holland, where the merchants are riding high, whereas the artisans are kept in continual poverty and toil ... And why, indeed, should so many people be poor and miserable for the benefit of such a small handful? After all, is not the entire purpose of society to release the artisan from his misery?... The society's highest rule shall be to foster true love and tolerance among its members, and not to express anything irritating, scornful, or insulting to others.[2]

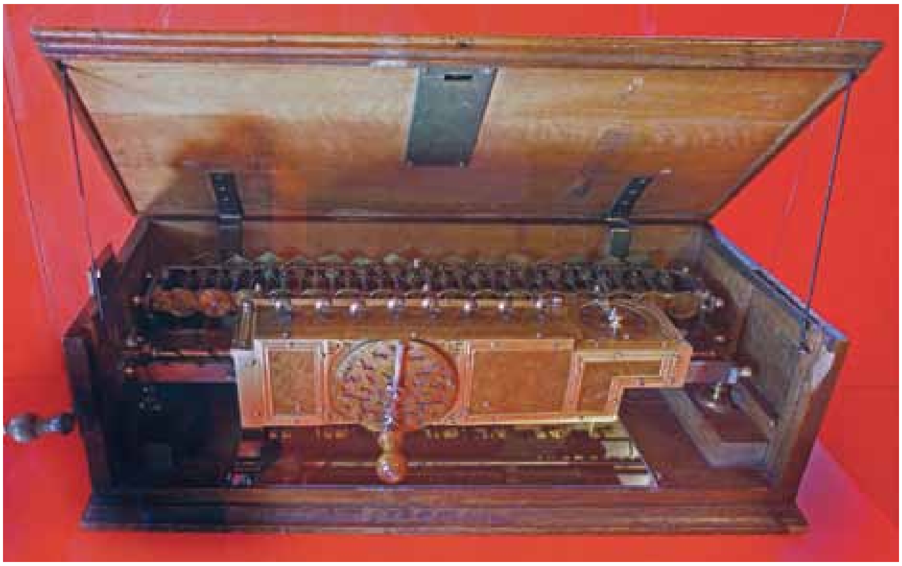
For Leibniz, this was consonant with the best ordering of Creation, and that for him was the reason, based in natural law, that the state should strive for this end. For according to the arbitrary will of the absolutist rulers, the result of government was in one case collapse and misery, in another progress, as it served the growth of their power and ambition. But they hardly saw themselves as in service of a universal development. Leibniz' principle was "to work for the public welfare, without being concerned whether anyone thanks me for it." As the grounds for it, he added, "I believe that man thus imitates God, who takes care for the well-being of the universe whether human beings recognize this or not."

Theory and Practice

Leibniz was never at home in the ivory tower of theory. In accordance with his fundamental conviction that the world is the best of all possible worlds because it is capable of being further perfected, he himself wanted to work for the benefit of society. He writes: "The art of practice is such that one brings chance itself under the yoke of science. The more one does this, the more does theory conform to practice."

Although one can scarcely summarize all of Leibniz' inventions and fields of activity, one instance will be helpful: When the first German scientific periodical appeared in Leipzig in 1682, it was thanks to Leibniz' contributions that within a short time, it did not fear comparison with the publications of the British Royal Society and the corresponding journal in France. A paper he wrote on quadrature of the circle appeared in the first issue; there followed contributions on optics,

2. Adapted from *The Political Economy of the American Revolution*, Nancy Spannaus and Christopher White, eds., 2nd edition, *EIR*, 1996, pp. 224-27.



Museum Schloss Herrenhausen

The calculating machine for the four basic mathematical operations developed by Leibniz.

chemistry, discount calculations, and many others on mathematics and physics, including the first publication of the infinitesimal calculus he had already developed in Paris, and expositions on the force/mass relationship.

Among the universal principles and their mathematical tools—with which Leibniz endowed mankind with far greater power over the hidden, *invisible* powers of nature—were the principle of Least Action, which Max Planck also used for his discoveries; the principle of Dynamics, called *vis viva* or living force; and the infinitesimal calculus. Also worthy of mention is the discovery of the dual counting system of binomial numbers, which opened the way to the development of computers. Leibniz himself invented a calculating machine for the four basic mathematical operations.

All this flowed into his plan to found academies of science in many countries. Such academies did indeed exist in France and England, supporting the scientists of those countries, but since Germany was splintered into a hundred fiefdoms and scarcely possessed its own language, Leibniz had to turn to the greatest royal houses. He viewed the purpose of the academies as—

> unifying theory and practice, and not only art and science, but also country and people, agriculture, manufactures, and commerce; in one word, to improve the food supply, and beyond that, to make discoveries which spread the fulsome praise and honor of God, whose wonders would become better known than heretofore.

Leibniz found the final cause for applied science not in material things, but in metaphysics, that is, in the laws of a universal harmony which orders the material world and which the human mind can discover and make useful through hypotheses. "True faith is not only a matter of speaking, indeed not only a matter of thinking, but rather of conceiving in practice—that is, to act as if it were true." Thus science for him is serving God; as God, one understands the principle that constantly works toward its own higher development.

This vision of a fatherland, and Europe, blooming from the rubble of the Thirty Years' War, led him to many royal courts.

While at home in Hannover he served its prince as a confidential adviser and was the confidant of Princess Sophie. Leibniz spent three years, until 1711, in the service of the later queen, Sophie Charlotte of Prussia. He met with Austrian Emperor Leopold for the first time in Vienna in 1700, and from 1712 on had free access to the court there. In 1711 he met Tsar Peter the Great of Russia and proposed to the Tsar his program for comprehensive support of science. He made military-technical proposals, and got a promise from Peter for field measurements in the Russian Empire on the declination of the magnetic field, that is, how far it varies from true north. His influence extended to the court of the Emperor of China, in that the missionaries who were studying astronomy and other sciences with the Chinese Emperor received suggestions from Leibniz. Thus, for example, he proposed they make the Emperor a gift of Leibniz' calculating machine. After many unsuccessful efforts, he succeeded in founding the Academies of Berlin and St. Petersburg, which gave great stimulus to the development of these countries.

Dead or Living Matter?

Leibniz' "theory and practice" opened up great progress for mankind. For example, until that time mankind had only known of dead matter, which the study of "mechanics" sought to render useful. Since Archimedes, men had employed the lever, the inclined plane, and the winch, together with the wedge and the screw, to this end. Only the effect of the opposition of bodies was investigated, but not the impulse which triggered their motion. Laws were deduced from the observed behavior of bodies, strictly according to the empiricist method, which denied any knowledge other than that from the senses, and which persists today in the reverence for Aristotle, Isaac Newton, John Locke, René Descartes, and their successors.

But can the impulse, the reason for the observed motion, be detected by the senses at all? Above all René Descartes, who is still held to be a scientist, stands for the unreasoning nature of this thinking, describing bodies only by their mass and weight. For this he used the term "quantity of motion," meaning mass times velocity.

It follows from this that a ball with a mass of 1,000 kg and a velocity of 1 km/hr (quantity of motion 1,000), has the same impact as a ball weighing 1 kg and traveling at 1,000 km/hr (quantity of motion also 1,000). But the large ball of 1,000 kg and 1 km/hr velocity will be stopped by a wall which a cannonball of 1 kg at 1,000 km/hr can destroy. The same quantities of motion thus give different results in reality.

Leibniz, by contrast, compared the so-called kinetic energy possessed by a body weighing 1 kg which falls 4 meters, with the work by which a body weighing 4 kg is raised to a height of 1 meter. He used Galileo's laws of free fall for this purpose, and discovered the special proportionality between the distance fallen and the time required. He named this the "living force," the *vis viva* of the falling body. The velocity must be squared: This "living force" is equal to mass times velocity *squared*, and not simply mass times velocity, as Descartes and his school claimed.

Leibniz thus discovered new laws of motion, which he named the science of dynamics. It is concerned with invisible causes, which can nonetheless be proven experimentally, while mechanics had investigated only the visible effects for more than 2,000 years. His thinking turned toward the future result of work; it was necessary to measure the future *vis viva* of the motion. But this can only be done by the mind, so that Leibniz rightly called this force metaphysical, because it rules the visible from the invisible realm, and can be discovered and made useful only through the hypotheses of reason.

This had a great influence on the invention of the steam engine. His earlier acquaintance Denis Papin occupied himself intensively and successfully with this invention. In building the first precursor of the steam engine, Leibniz supported him in the attempt to concentrate the force of the steam. For in this way, the *vis viva* was able to unleash force, because the small steam particles produced more force as their velocity increased.

The competing English model, on the other hand, used only the counter-pressure of the atmosphere to run pumps with steam—for example, for pumping water out of mines. It would never have led to steamships or steam-powered vehicles, because the force was insufficient. Newton's Royal Society suppressed Papin and his invention, and thus set back the building of steamships and the industrial revolution powered by steam for a century.[3]

In his paper, *Specimen Dynamicum*, Leibniz brings his superior method to bear:

> Beyond the pure mathematical principles which belong to sense perceptions, one must also accept the metaphysical principles which are grasped only in thought . . . It is of no consequence whether we designate this principle as form or power.

Can the Spirit of the Renaissance Be Revived Today?

Leibniz was intensely fascinated with the discovery of how creativity acts in living things and in the Cosmos, and how human beings can willfully control it. Human creativity was, for him, a natural law like gravitation or the principle of life. He astonished his age by spreading the idea of "Monads," initially described as "having no parts." For the quality of the One is a decisive characteristic of all creative discovery in Classical art and natural science.

Yet Leibniz stressed (in *Monadology* §10): "I consider it as a given that . . . the created Monads underlie

3. http://schillerinstitute.org/ educ/pedagogy/steam_engine.html

change, and that this change is continually occurring in every Monad.... The activity of their inner principle can be designated as striving."

Unity thus encompasses a continuous process, as a poem consists in strophes of different thoughts, whose unity is able to form the creative thought. The same occurs in Classical musical composition, where themes and variations aspire to a unity, as also in discovery in the natural sciences, in which the discovery process passes through many contradictions and paradoxes to the new unity or discovery.

According to Leibniz, Monads express through perception or cognition the entire universe from their viewpoint. Thus he compares Monads to the manifold perspectives under which a city can be seen from different standpoints. The *Metaphysical Disquisitions* says in §14 that Monads are the individual perspectives of the divine view of the world.

Lyndon LaRouche writes of this:

> Thus, true science is not the mere observation and description of our experience of nature. Science properly comprehended, is also a centrally underlying principle of the cognitive powers which distinguish the creative scientific and artistic potential of the human mind from what might be described, loosely speaking, as the 'mental life' of the beasts. It is the crucial expression of that which distinguishes an actually human soul from the kind of mere opinion which is found among the beasts which we may have adopted as household pets. Thus, as I shall show in this reflection on my own experience, Leibniz did not exaggerate, either in placing the importance which he did on the role of the conception of the Monadology, or in denouncing the incompetence of the method of Sophistry employed by Descartes and by such followers of Descartes as the so-called Newtonians.[4]

But this idea threatened to bring down the entire system of tyranny which had destroyed the Italian Renaissance. Such systems are supported by priests and philosophers who tell the masses of people that the human being is only an intelligent animal, and fundamentally unable to know the secrets of the universe.

For this purpose the English monarchy called upon the Master of the Royal Mint, Isaac Newton; John Locke, the Secretary of the Board of Trade and Plantations; the philosopher David Hume; and the economist of the East India Company, Adam Smith. Their common foundation, their axiom, asserts that man knows only through the senses of hearing, sight, touch, smell, and taste, and that scientific knowledge is deduced from the combination of these sense perceptions. They admitted no causes in nature which could not be "taken hold of," and Isaac Newton, the icon of today's natural scientists, was supposed to have solved the problem of the attraction of masses by an apple falling on his head.

According to Adam Smith, the idol of today's economists, the individual does not need to concern himself at all with the consequences of his actions, a point which our economists today take very seriously. He writes in *The Theory of Moral Sentiments*:

> Nature has directed us to the greater part of these by original and immediate instincts. Hunger, thirst, the passion which unites the two sexes, and the dread of pain, prompt us to apply those means for their own sakes, and without any consideration of their tendency to those beneficent ends which the great Director of nature intended to produce by them.

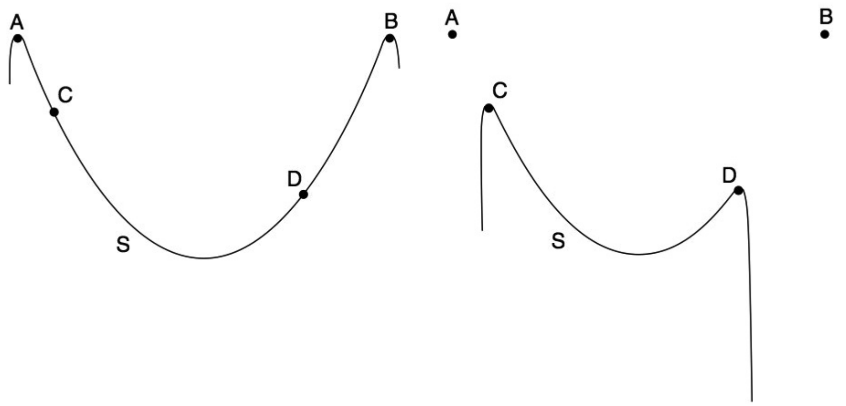
If the goal of the oligarchy and its Inquisition has been to raise beast-like subjects, the exclusive teaching of this ideology in universities and schools has today done the job completely. The spirit, the discerning soul, no longer has any place, and is even vilified, so that scarcely any revolutionary new knowledge is discovered—such as the planetary laws of Kepler, the Monads, or Einstein's Theory of Relativity—since now one is only permitted to draw deductions from given data. The creative idea is explained away as a phantasm in today's prevailing worldview. Men become mechanical, robot-like beings who run here and there, driven by their libidos, but whose drives can just as easily destroy them. They are not able to create a better future through the exercise of their reason.

Leibniz and the Fire of Discovery

Leibniz, by contrast, placed himself in the tradition of the great German astronomer Johannes Kepler (1571-1630) to defeat the barbarism of war and the stu-

4. *EIR*, Feb. 22, 2008.

FIGURE 1



If one "disturbs" the equilibrium of a chain at any point and lifts it, it will always attempt to re-form a catenary shape.

pefaction of mankind. Kepler had already overthrown the entirety of the astronomy of the previous centuries by assuming a physically active cause in the Solar system.

Until then the movements of our planets had been explained only by approximations of geometry. Since Euclid (Third Century BC), it had also been believed that the smallest effect in the universe is a short-range effect along a straight line between two points—an idea which has still not been dispelled today. Yet the planets in the heavens move along non-uniform courses. They therefore cannot be described by calculations based on the circle, the dominant method in astronomy prior to Kepler. Moreover, the planets also change their velocity in a non-uniform manner along their orbits.

Kepler was able to solve this riddle because he assumed the causality of a dynamic, changing universe, which mankind—as a harmonic part of the whole through his God-given reason—could learn to understand. Kepler, and after him Leibniz, not only contributed to mankind's store of scientific knowledge in this way, but also redefined the role of mankind in the universe: The quality of reason enables the human mind to conceive principles that cannot be grasped by the senses, and to prove these principles experimentally through hypotheses. By mastering these principles, mankind is able to ensure its survival.

The anti-mathematical, anti-geometric—because physical—characteristics of the planetary motions are also exhibited by the "natural" catenary curve (see **Figure 1**) which the greatest mathematician of that time, Johann Bernoulli (1667-1748), and Leibniz had used for their solution to these natural phenomena. All readers are invited to explore for themselves the uncanny behavior of the catenary curve, using a free-hanging chain whose ends are attached to a wall or any other vertical surface. For example, if one "disturbs" the equilibrium at any point and lifts the chain, it will always attempt to re-form a catenary shape.

Why is this form constantly reproduced, entirely naturally—even independently of the material? How is this equilibrium and equal tension produced? What invisible principle rules each individual link of the chain? Whoever seeks to answer these questions encounters the nonlinear, almost living effect which our universe everywhere produces, and which bears a great similarity to the irregular, but nonetheless ordered motion of the planets. The question is also posed by the motion of light through increasingly dense media: How does the light beam know to bend along this non-mathematical path—what does it know, that we do not?

Many researchers have tried mathematically to comprehend the incalculable behavior of the catenary curve, thinking, as did Galileo Galilei, that it behaved like the geometrical parabola, which can be calculated by a mathematical formula. But nature does not allow it. This, also, reveals a defect in the ideas of the empiricists. Their research assumes only sense experiences and the mathematical expressions derived from them—and not reason. It follows the motto: "First come mathematics and geometry, then reality." This error is greatly amplified today by the development of computers.

Leibniz clearly disavowed this when he wrote, in a 1678 letter:

> I rejoice in mathematics only insofar as I discover in it traces of the art of invention. I have cleared its hurdles by virtue of my love of metaphysics, for metaphysics is scarcely to be distinguished from the *art of invention* in general. For

FIGURE 2

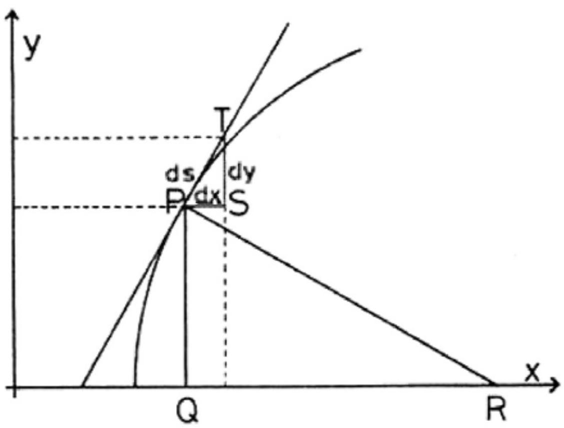


Illustration of differentials: The figure shows a circle to which a tangent is drawn at Point P. A right triangle is formed from QR, PR and PQ. The triangles PST and PQR are similar to one another; i.e., TS : SP = RQ : QP. Their ratio remains constant even when TS and SP go toward the infinitely small values dy and dx, and thus are thought of as infinitesimal quantities. But the ratio of the two segments dy and dx is precisely the sought-for slope of the tangent, and therefore a decisive quantity for the curve.

the idea of God includes absolute Being; i.e., also that which is in our thinking, from which everything that we think arises.

On the Path to a Solution

Thus Leibniz took the opposite path: Where mathematics cannot deal with reality, it is the mathematics that must be further developed. This led him to the integral and differential calculus. With Leibnizian thinking we can recognize the true origin of the integral and the differential, which our formal education has locked away from us in most cases. The scientist Bernoulli, who collaborated with Leibniz on the solution of this problem, called the catenary curve the integral, the expression of an active principle, and the smallest changes of the links, the differential. Both are shadows of an invisible physical process, just as the planetary orbits or the path of light through a medium of varying density are only shadows of their invisible cause.

Between a curve being investigated and a tangent at one of its points, triangles are constructed which become ever smaller, so-called differentials, which approach the infinitely small (see **Figure 2**). The differential calculus, based on this construction, was expressed by Leibniz in a formula, so that one could for the first time calculate precisely with infinitely small, invisible quantities, as also with the infinite. Bernoulli praised the method of Leibniz because it provided solutions which up to that time were considered impossible.

Yet from the beginning, a conflict raged around the understanding of this discovery, comparable to that around the understanding of the Monads. Are Monads the expression of continual change, which reflects the development of the Cosmos, or are they fixed, if also infinitely small things? No explanation is needed to understand that all empiricists—who recognize only objects of sense and accept no causes beyond the sensual world—misunderstand the infinitely small as a fixed quantity, instead of recognizing it as the shadow of a development, and they teach this even today in all schools and universities. We owe to LaRouche, who reintroduced the physical understanding of Leibniz, Einstein, and Max Planck, our ability to understand the calculus as the expression of the change in that process whose shadows we find in the sought-for change of the curve.

Leibniz had to defend himself against this misunderstanding, and rejected it energetically: "The infinitely small and large can always be viewed as arbitrarily small or large, so that the expression always designates only a "complete species," but not an individual "final member." Note that "complete species" presumes a non-sensual knowledge and cannot be any "thing" of the senses, so that here we are again reminded of the idea of the Monads.

This discovery made possible the calculation of motions of all kinds for the first time, and thus enormously expanded the power of humankind over nature. In this way, Leibniz solved the challenge of the catenary curve and of curves of all types. His method enabled, for example, the 24-year-old Carl Friedrich Gauss to discover the orbit of the asteroid Ceres in 1801, based on only three observations—it was being vainly sought by many researchers. Today we can track the heavenly bodies and our rockets in space very exactly in this manner, as demonstrated by the landing of the Philae probe on Comet Churyumov-Gerasimenko: It had traveled more than 6.4 billion kilometers, *en route* for 10 years, looping around other heavenly bodies.

Thus mankind obtained an influence upon the future, which is itself no object of the senses, but is determined by invisible causes which can be known by means of reason. Leibniz sees the future as determined by the infinite capacity for improvement of the universe, and not by the pushing and pulling of the tiniest atoms on the shortest straight lines, as the materialist standpoint predominantly represents it down to the present day. So it is not by chance that he quotes Plato's Socrates verbatim on this question.

He writes in *On the Principle of Continuity*:

> Socrates commented admirably on this in Plato's dialogue *Phaedo*, when he took the field against the all too materialistic philosophers, who did recognize a principle of reason superior to that of matter, but did not avail themselves of it in the philosophical explication of the universe.

(The similarity to the teaching of our churches today is not accidental.)

> What it indicates is that the *mind* orders everything for the best and that *it* is the cause of all things, . . . whereas they would rather take hold of motion and collision of brute bodies [!], whereby they confuse the mere conditions and *instruments* with the true *cause*. (Emphasis added)

Leibniz writes further:

> This is—says Socrates—as if one wanted to give an account of the fact that I am sitting here in prison and expecting the fatal cup, instead of fleeing, as I easily could have done—and said that this is happening thus because I had bones, sinews, and muscles and these were extended in such a way that I had to sit down. But those bones and muscles were in truth not here . . . unless the mind had come to the decision that it were more worthy of Socrates to obey the law. This Platonic point deserves to be read in its entirety, because it contains fundamental and extraordinarily beautiful thoughts.

Leibniz unmistakably calls us to be ready to make even great sacrifices in the fight against the suppressors of truth and oppressors of mankind.