The Ampère-Fresnel revolution: 'on behalf of the future'

by Jacques Cheminade

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Our Schiller Institute research in Paris is a work in progress, undertaken as a continuation of the original work of Laurence Hecht, informed by the contributions of Dino de Paoli and Jonathan Tennenbaum, and guided by a challenging hypothesis by Lyndon LaRouche. From his understanding of a whole span of the history of science and ideas, it was clear to LaRouche that Ampère's contribution on electromagnetism—the concept of angular forces—and Fresnel's contribution on the theory of light—the transverse waves—had to come from the same cognitive source and be the product of a close collaboration. This was a "moment" in the revolutionary advancement of human knowledge that we had to explore; to improve our own minds in the course of following the process of discovery in the minds of two great discoverers.

We were running up against all the established knowledge of the 20th century, including of those interested in the ideas of Ampère and Fresnel. For example, the Society of the Friends of Ampère, in Paris, knew nothing about the possibility of an Ampère-Fresnel collaboration, and had never thought about it. Soon, unfortunately, it was clear that nobody, except us, had ever worked on the subject. You have to understand that for somebody buried in the universe of Kantian-Aristotelian categories, "optics" and "electromagnetism" are two different things. For them, the medium (water, air, some other fluid) determines and supersedes the work done; for them, action, transformation in the universe, is only a secondary predicate. Therefore, from their standpoint, the usual story is true: On one side, Ampère worked on electromagnetism; on the other side, Fresnel worked on optics; and, finally, Maxwell made a synthesis and came out with the electromagnetic theory of light!

There we were, in a Paris library, surrounded by busts of the 18th-century replicas of Roman ones, themselves replicas of the Greeks', knowing from our epistemological standpoint that we were faced with an outrageous fraud, and that our mandate was to expose it, going back to what originally had happened, as if we had to find the Greek original bust rather than its replicas. Our task was to show how the Ampère-Fresnel work is a "One," and from where that One comes.

Our starting point was that both could not, absolutely could not, have discovered what they discovered without challenging the wrong axioms of Cartesianism, Newtonianism, and Kantianism; and that, on the contrary, they had to be part of the opposite, Promethean tradition going from Plato to Leibniz. They had to be in the line leading from Plato and Leibniz to Weber, Gauss, Riemann, and Cantor—the torch now being passed into our own hands. This implied, on their part, the understanding of the isochronic principle, the capacity of man to be in simultaneity with eternity, past, present, and future in a single moment of creation. Concerning that, we had before our eyes a quote from Ampère on what he called the "heritage of Augustine," the "understanding that past, present, and future are contemporary from the standpoint of pure intelligence."

The political side to our work showed, moveover, that the Ampère-Fresnel revolution could not be a "French project" as such, but had to be linked to that "beacon of hope," the American Revolution. Such a positive horizon was necessary for such an endeavor.

Fresnel's background

Our first discovery was the name of Augustin Fresnel's uncle, Léonor Mérimée, head of the Ecole des Beaux Arts, the School of Fine Arts, in Paris, who had supported young Augustin in a decisive way. He was a close friend of the renowned François Arago, and he knew Ampère very well. When he introduced his nephew to Arago, in 1815, he gave him a protector without whom he could not have continued his work. From a closer look, it appears that Mérimée was also a Professor of Drawing at the Ecole Polytechnique, where he taught students about Leonardo da Vinci, and, in particular, the works of Leonardo on hydraulics—waves and vortices.

Let's now look at young Fresnel. After his studies at the Ecole Polytechnique (he had joined the Ecole in 1804), he was sent to the French provinces to build roads. He did it well, although he was not very interested in it. He was, in fact, interested in two domains: first, the observation of the stars and the nature of light, and second, hydraulic machines.

Arago, who was a strong character and in a senior position, helped and sponsored young Fresnel. Both had studied the interference of light and knew that Newton's corpuscular theory could not be true. Jonathan Tennenbaum has told you that part of the Ampère-Fresnel story.

Author Jacques Cheminade (right) tours a factory during his 1995 campaign for the French Presidency. The discoveries by Ampère and Fresnel, Cheminade told the Oberwesel conference, constituted "a moment in the revolutionary advancement of human knowledge that we had to explore; to improve our own minds in the course of following the process of discovery in the minds of two great discoverers."

But, let's go back to the Mérimée family. Léonor's sister, Augustine Mérimée, was Fresnel's mother, and her father, Fresnel's grandfather, François Mérimée, was a lawyer in Rouen, and was picked up by the Marshal Duke de Broglie as manager of his chateau at Chambrais, near Caen. Chambrais, de Broglie's estate, was later called Broglie. If we then look into Fresnel's father, Jacques Fresnel, we find that he was an architect, called to the Broglie estate in 1784 to carry out repairs. So, in a word, the Fresnels were, on both sides of the family tree, sponsored by the de Broglies, who helped the three sons of Jacques enter the Ecole Polytechnique—Louis in 1803, Augustin in 1804, and Léonor in 1808.

Why is that important? Well, let me tell you something about the two brothers, Field Marshal Duke Victor-Louis de Broglie, the direct protector of the Fresnels, and Count Charles de Broglie. They were two short men, almost dwarfs, but their mental and political activity compensated for their physical limitations. Unusually close to each other for those times—because they were born ten months apart—they were the leaders of the "American Party" in France. Without Charles de Broglie, in particular, the American Revolution could not have been won.

Charles was one of the founders and a key sponsor of the French King's Secret Services, which was launched in 1746 to bypass the state bureaucracy—something you always have to do in France if you want to achieve anything. The de Broglies' entire life was devoted to one project: the defeat and invasion of England. Their first plan dates back to 1765-66, and was a very detailed and very competent one, including a social mapping of the British population.

To give you an insight into the way they thought, let me give you a quote from their agent Vergennes, later to become French Foreign Minister and a key supporter of the American Revolution. Count Charles de Vergennes, otherwise a very cautious man, writes: "Great Britain is a nation that despises the most sacred rights of all other nations, it is the hereditary enemy of France, we have to destroy it or be destroyed."

Charles de Broglie was the first man in France, as early as 1770-72, to have seen a revolution coming from America. He immediately realized that it provided the best way to defeat Great Britain once and for all, and he decided right away to create an American Party in France. He was its mastermind, while his brother, Victor-Louis, was the military figure in the combination. Their agents, besides Vergennes, included, among others, Pierre Augustin Beaumarchais in London and young Gilbert de Lafayette, whom they helped escape from his family, and sponsored and financed. Charles was also very close to Benjamin Franklin.

For the de Broglies, you have to know that the motto of the family was "Pour l'Avenir" ("On Behalf of the Future"). The timid but very interesting Louis de Broglie, the 20th-century scientist, was their descendant, a great admirer of Fresnel and an organizer of the 1927 celebrations at the Sorbonne for the hundredth anniversary of Fresnel's death. The unfortunate Solvay Conference came from Brussels to pay a tribute of vice to the virtue of Augustin Fresnel.

How do we explain the de Broglie phenomenon? Much more work needs to be done on this, but it is nonetheless clear that the tradition of Leibniz and his French co-thinkers was maintained through military-engineering networks, in con-

nection with the Oratorian teaching order. The cases of Gaspard Monge and Lazare Carnot, and of their mathematics teachers, are evidence of this.

How Ampère thought

Back to Ampère now, a man of the "second generation" of the Polytechnique group. I have had access to his original papers, and, together with my friend Pierre Bonnefoy, we hastily checked through about one-third of them. The key point about Ampère is that in an absolutely aversive period—

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of Napoleon and then the Restoration—he maintained a joyful impulse to go "beyond the limits," to explore the unknown in all domains. Conscious of how difficult it was to work in those times, and facing his own personal mental blocks, he looked into his own mind, into his creative processes, to find a method for knowledge.

Like Fresnel, Ampère was absolutely disgusted by Napoleon, and like Fresnel and Lafayette—and also, in a sense, Carnot—he was a constitutional monarchist, not because he liked the monarchs or the monarchy, but by default. He had seen how the Jacobins behaved in his own city of Lyons, in 1793, and how his father was murdered after a travesty of justice. His initial efforts were to sort out what was evil in the brute force of a man like Napoleon, and how it could be that most scientists of his time, despite their nominal commitment to truth, submitted to the dictator. What was their failure of principle? Then, he looked into his own mind and into the minds of the great men of the past that were reflected in him, to compare and understand the difference, and hence the nature of the flaw. With this approach, he tried to master the principle of cognition that leads to true discoveries, and not to tricks invented to gain social positions, as his colleagues were mostly doing.

Let me read you a letter to one of his friends, an unknown friend, where Ampère explains his purpose:

"You wish, dear friend, for me to outline for you the main results of work I carried out during a part of my life, whose aim was to examine our mental faculties, the precise determination of their numerous products, as well as some research on the relationship existing between some of the aspects they present to internal observation and some of the external aspects of their organization."

Then, in a letter to his son, Jean-Jacques Ampère, he includes a poem in Latin explaining, at the end of his life, the meaning of his work on the classification of sciences: "To know the world, you must observe matter and life: first measure and motion, then, the bodies, all types of living beings and how they go about their lives. Then study that which deals with the soul and with nations. Learn the operations of the mind, the art of modifying thoughts, the character and history of peoples and how they are governed."

Interestingly, he starts by observation and measure, the first, deductive level of knowledge, and then mentions "the operations of the mind, the art of modifying thoughts"—change, hypothesis, the higher order of mentation beyond deduction and induction, outside the Newtonian-Cartesian cage. Finally, he points at "the history of peoples and how they are governed," social responsibility. The concept here is what LaRouche developed this morning: the highest notion of the state as a servant of the mental and physical well-being of all the people, not the mere enforcer of "rule." [LaRouche's speech appeared in *EIR,* Aug. 6.]

This was a poem. A poem? Yes, Ampère, like Carnot, greatly enjoyed writing poetry—not of the best quality, but extremely interesting in its inspiration. It is through poetry, he says, that he realized that time and space cannot be *a priori* forms of sense perception, as Immanuel Kant pretended.

His "great project," many times started, but never completed, was to write an epic poem on Columbus, who he saw as a model of stubbornness and will. He saw in Colombus a tragic hero with a magnificent, grand design: "to evangelize the unknown," but betrayed by earthly powers.

A friend of Ampère notes that Ampère himself was, in his scientific work, like a "Columbus or a Kepler": "He was going toward the West, and as Schiller said, the land that he was looking for would have risen from the depth of the waters, even if it had not otherwise existed, because nature is in a perfect affinity with genius."

We have now sailed well beyond Newton, Descartes, and Kant. Ampère's discoveries testify to that, of course, as Tennenbaum showed. But, what about the tradition of Leibniz? The "proof" had not yet appeared, but our research could not miss it. It had to be there, by necessity of composition.

Let's look at young Ampère, at about 12 years old, coming with his father to see Abbott Daburon, a remarkable scientist and professor in his native city of Lyons. Ampère has already, by himself, worked on the "problem of the quadrature of the circle,"[1] and was interested, as a result, in the difference between the domain of circular rotation and the domain of the

1. As Lyndon LaRouche has often emphasized, it was Cardinal Nicolaus of Cusa who, in the 15th century, proved that "quadrature of the circle" is impossible, since circularity and linearity are incommensurable. See article by LaRouche in this issue, including footnote 14 on p. 9.

straight line and the linear polygons. Soon, at age 15, he would refute an error of Euler's on logarithmic calculation, raising the issue of negative logarithms.

Welcoming the young man, Daburon said: Now, you need to study the works of Bernoulli and Huygens, and therefore you have to know Latin, because they are not available in French." Ampère's father immediately answered, "No problem, I will teach him Latin." But then, Daburon added, "But, he has also to learn the calculus." To that his father said, "Just teach him that." Leibniz's calculus, Bernoulli, and Huygens, starting at 12 years old.

Maine de Biran and the 'psychology of cognition'

But, the usual story is that Ampère was a Newtonian in his scientific work, and resorted to Kantian categories in his theory of cognition. Again, we knew this *could not* be true, because of the very nature of Ampère's discoveries. But, we had to find out what had happened.

There are more than a hundred letters between Ampère and his very close friend, Maine de Biran (François Pierre Grontier), between about 1804 and 1819. Maine is supposed to be the founder of the "French introspective psychology" and "spiritualism," or other horrors of same genre. In reality, Maine's and Ampère's ambition was to create a new science, the "psychology of cognition."

Indeed, if you look at some of their correspondence, even if both try hard to understand Leibniz, and Leibniz is many times explicitly mentioned, they are quite confused. I cannot enter here into the details of the long efforts of both, but a few points should be made.

Both reject the materialism—knowledge only as information provided by sensory impressions—of Etienne Bonnot de Condillac and the so-called "ideologues." They oppose the piggish Antoine Destutt de Tracy, later to be sent to the United States to disorganize a weak Thomas Jefferson. Both, also, understand that Descartes and his followers cannot account for the "science of human knowledge," because they build an impenetrable wall between material (*res extensa*) and immaterial (*res cognitans*) substances, putting all things into an unbearable fatality, a passivity absolutely foreign to human cognition. Dualism leads to impotence, and, says Ampère, "Human freedom is, in the universe of Descartes, nothing but an arbitrary gift given by an arbitrary God."

More difficult for them is to deal with Kant, and very often they are trapped in his categories of *phenomena* and *noumena:* On one side, the phenomena knowable through one's consciousness; and, on the other side, the things-in-themselves, the realm of "ideas," the noumena beyond and behind the phenomena, that you cannot know through your consciousness. After Descartes, this is Kant's own insurmountable barrier against man's willful power of creation.

What Maine and Ampère—particularly Ampère—try to do, is to say that a relation between two phenomena allows one to understand the relations between two corresponding noumena. The human mind has, therefore, according to them, the power to understand the corresponding realm of noumena indirectly, through a connection of pairs of relations, an active connection based on one's reflection upon one's own activities. There is, according to Ampère, a "human drive" expressed in the unity of cognition and a result of the indivisibility of the soul, that permits us—contrary to what Kant pretends—to obtain a knowledge of the noumena through activity, effort, and willful change. The primary substance of the self being activity, the active absolute reflects itself in the active subject, which is thus capable of knowing. In other words, he tries to turn Kant around through a reinterpretation of Kantian categories, superimposing an approximation of the Leibnizian notion of substance as active force. He sees in it a "reconciliation of the possible and the real," superseding the dual matrix of materialism and spiritualism.

But Maine and Ampère are conscious that they have to go further. Maine writes to Ampère on Oct. 25, 1805, "I am forced to admit the existence of a hyperorganic force, a permanent substance of the soul." But, if the universal self is hyperorganic, how can we grasp it? Not with Kant! Kant prevents us from doing it. Then, on Jan. 20, 1806, Maine mentions Leibniz's monads and the Leibniz-Clarke correspondence.[2]

You have to understand that Maine and Ampère are surrounded by "ideologues" and "spiritualists" of all sorts in and around their Philosophical Society; most of the time they have to fight their own supposed friends, and even though Leibniz is for them the real issue, the debate around Kant and goes on and on, and in Kantian terminology. The problem is: Where does the active substance come from? Their interpretation of Leibniz is a concept of *vis viva* (life force), as self, and as the reality of an absolute form of existence. The real world is the locus of active centers of force—monads—and of the resistance that they encounter. Remember the quote given by Tennenbaum from Ampère, commenting on Fresnel's discovery, in his essay on the Philosophy of Sciences:

"We must admit an immaterial, motive substance everywhere where there is a spontaneous motion. We then discover that it is in this substance that thought is to be found, since words obey it. . . . The cause of all causes, the creative and all powerful substance is, on the contrary, only known to us indirectly, through its works."

In other words, only the Leibnizian concepts can ultimately account for the discovery of a fundamental principle of nature, like Fresnel's transverse waves.

Dumping Kant for Leibniz

At this point, after so many years of debate, you can imagine Maine and Ampère asking each other: Wouldn't we be better off by dumping Kant? The beautiful thing is that a

2. In his correspondence with Newton's front-man, Samuel Clark, Leibniz demolished the Newtonian philosophical system.

decision was taken, not as a neat mechanistic logical development, but through a demanding dialogue between them, as they strove to understand the principles of cognition.

Beyond this philosophical debate, let me read you some unpublished notes from Ampère's manuscripts that will help clarify things:

"Pleasure and pain are sufficient to lead the faculties of beasts to their destination. Stronger faculties demand from us other motivations. . . . That strong, involuntary attention which excites within us the pleasure of perceiving new relations between our ideas. . . . The emotions aroused in the soul of those who conceive them before having executed them, by the representation, at an ulterior moment, of the masterpieces they meditate upon."

You can see that he is against both bestial British empiricist ideology, which equates men with animals, as well as against the Kantian conception of the separation of intellectual creation from the emotion attached to it. For Ampère, the human being is an active force, enjoying his capacity to create beautiful things, the gifts that he is willfully, actively making to future generations.

Next, let me show you, in other notes from his manuscripts, how Ampère rejects apodictic judgments (judgments based on mere deductive processes), and points to Descartes, Locke, Locke's followers, and Kant, as absolutely mistaken. Ampère writes:

"All those errors come from the confusion of the intuitive and of the conceptual, which is the source of the greatest errors in philosophy.

"The foundations of all hitherto admitted apodictic judgments are all false. One can enumerate four systems in these matters: Descartes' comprehension, Locke's conventional or non-conventional, the notion of identity of those metaphysicians who proclaimed themselves his disciples, even though on this point they were in total opposition to him, and finally the laws of the human mind which force one to believe in Reid or in Kant's categories."

Finally, as a result of the interventions by Ampère, Maine de Biran wrote an article on Leibniz in the 1819 *Biographie Universelle de Michaud,* a key reference work for French scholars. Maine attacks Kant on the issue that was stressed by Ampère: If you admit things in themselves and cut all links between emotion and your intellectual self, you necessarily become skeptical, condemned to doubt. Maine de Biran wrote: "How to reconcile fate and freedom, moral application and the dependency of finite beings? Kant thinks he can avoid this snag by only subjecting the phenomenal world to the law of causality (Leibniz's determinism), and freeing the soul from this principle, as a noumenon or thing in itself. He thus considers each action as belonging simultaneously to a double series: to the physical order where it is connected, by the common links of nature, to what goes before and what follows; and to the moral order in which a determination produces an effect, without it being necessary to explain this will and its result, to consider a previous state. In short, Kant's doctrine for reconciling evil and the supreme wisdom is to apply the maxim: 'In doubt, refrain from judging.' Whereas Leibniz takes the standpoint of the absoluteness of the Creator Himself, so that neither the *Theodicy,* nor the *Monadology,* can be understood without following the thread given by the author of this exposition."

Interestingly, Maine attacks Kant because Kant had attacked Leibniz in his bitter critique of all "Theodicies"—an attack aimed against Leibniz's *Theodicy*. Maine launches a devastating polemic against Voltaire's *Candide,* the most famous pamphlet ever written against Leibniz. Maine writes: "This piece is a mocking and superficial philosophy, preaching with ferocity the cult of material lusts, degrading the human species through an exaggerated picture of its miseries."

Let me now read you the concluding words of Maine's article. For him, Leibniz's unique contribution is to have understood that all simple monads have the capacity to conceive the universe in a way congruent with the divine knowledge: every person knowing from the highest standpoint what he is, as a force deliberately acting and operating:

"It is by always tending to take this sublime point of view that Leibniz often grasps, with extraordinary success, the most unexpected relations between the world of ideas and the world of facts in nature: It is by attempting to find out, through calculus, the means that lead the most directly to the end, that best economize matter, space, and time, that he succeeds in solving questions considered inaccessible for the human mind, or in proving truths previously conceived of but never proven. This is the source of the absolute confidence that always characterized this grand master. . . . From the standpoint of the immortal author of the *Monadology,* the science of principles is the same as that of forces; yet the science of forces includes everything that is or can be understood by the human mind, starting from oneself, a force directly given in the primitive act of conscience, up to the absolute force, such as it is, in itself, in the eyes of God; such as it can be in God Himself. The standpoint of the self is not the same as the standpoint of God, even though it leads there through an exact analysis and through the same principle of force that completely eluded Descartes and that Leibniz was the first to grasp in full depth. Like Descartes, it is true that Leibniz did not distinguish between these two standpoints or express the link between them, but Descartes had broken this link, whereas Leibniz provided the only means capable of reestablishing it. It is thus to his doctrine that subsequent progress of the true philosophy of the human mind will be connected."

'Dialogue within one's self'

Despite Maine's and Ampère's flaws—considering that they knew only a small part of Leibniz's works—it is clear that they passed the torch on to future generations, the best

way they could do in the terrible times in which they lived. Even their difficulties, their struggles with the concepts, are interesting and moving. Lyndon LaRouche has often stressed that in research, one should never pick up facts, analogies, or mere connections as such, but identify with the mental processes enriching the human species and going through the difficulties of the discoverers—even their mistakes. Have your own mind awakened, and begin to look inside it. Enjoy the research and don't be so fixated on the solution. The solution is the process, it is the change for the better in your own mind. Let me quote here, LaRouche's recent paper, "Prometheus and Europe" [*EIR,* July 23, 1999], to go further into this concept:

"The process of individual discovery, and refinement of one's own knowledge of universal principles, takes the form of a dialogue within one's self. It is the experience of that self-critical process of change, the which is generated by such internal dialogues, which should lead one to a more refined sense of one's inner self. Such a dialogue on some specific paradox, may be recurring over days, weeks, or longer. On one occasion, it is with others. On another occasion, it is with oneself. Nonetheless, on every occasion, it is always, primarily, with oneself.

"It is one's insight into the process of change, associated with the outcome of repeated efforts to perfect such dialogues, through which one's private self-image is elevated. One may be transformed by such habits, away from the self-conceptions of a fixed thing, into a conception of oneself as a process of changing, a continuing process of becoming a better person. So, in Plato's *The Republic,* the leading figure, Socrates, argues for truthfulness and justice. It is in such experiences, and their outcome, that a truthful conception of the nature of both man and the universe is molded."

Think of the dialogue among Ampère, Fresnel, Maine, and also Arago, leading to the Fresnel-Ampère revolution, and then focus on your own capacity to reenact that revolution.

Now, let's go back to the Maine article on Leibniz. It is from 1819. Well, something else happened with Leibniz on that very year: the publication in France and in French of Leibniz's *Exposition de la Doctrine sur la Religion,* his 1680 *Systema Theologicum*. The original Leibniz manuscript had been stolen by the French occupation forces in Hanover, and then hidden in the Saint Louis des Français Church in Rome. Who dug it out? Well, Prince Antoine de Broglie, a descendant of the two brothers mentioned at the beginning of our story! So, there is, against all odds, a principle of continuity.

On the other side, too, by the way. As a byproduct of our research, we discovered that the first French translation of Newton's *Opticks* was dated from 1787, and was done by one Jean-Paul Marat, the very Jacobin killer later deployed on behalf of Jeremy Bentham, the very Marat that Ampère denounces in a retaliatory poem.

As a follow-up of the Maine work, when the new edition of the Michaud *Biographie Universelle* was undertaken in 1856, one Foucher de Careil was sent to Hanover, where he spent many months checking the Leibniz manuscripts, and then published in 1857 *New Letters and Unpublished Works of Leibniz*. He wrote an article in the *Biographie* replacing the one by Maine, but quoting him quite extensively.

Fresnel died at 39 years of age in 1827. During the last three years of his life he was so ill that he could not continue his research. He kept repeating, "How much I would have still to do." Ampère died in 1836, and when his friend Bredin came to him on his death bed to take care of him, he leaped out of bed, saying, "My health, my health, enough about my health! The only question worth debating between you and me should be that of eternal truths, of things and men who have been good or evil for humanity."

The torch has been passed to each of us. Ampère, Fresnel: Let us be inspired by them, let's know more about them. Our research has only started, and already we can see a great tragedy: what others, at best, have not done, or, at worst, have undone. Let's think about these men: Ampère, Fresnel, and let's think of the work of Laurence Hecht. Let's put them in out hearts and minds, "Pour l'Avenir," for the future, and let us improve our work.