A Romantic life dedicated to Science: André-Marie Ampère's Autobiography

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A ROMANTIC LIFE DEDICATED TO SCIENCE: ANDRÉ-MARIE AMPÈRE'S AUTOBIOGRAPHY

Abstract: *This article explores André-Marie Ampère's autobiography in order to analyse the dynamics of science in early 19th century French institutions. According to recent works that have emphasised the value of biographies in the history of science, this study examines Ampère's public self-representation to show the cultural transformations of a life dedicated to science in post-revolutionary French society. With this aim, I have interpreted this manuscript as an outstanding example of the scientific rhetoric flourishing in early 19th century French Romanticism, which celebrated the life and works of men of science by means of biographies. Following this approach, Ampère's account has been analysed in relation to certain commonplaces shared with other autobiographies of that time, such as his traumatic experience linked to the French Revolution. Finally, this article discusses Ampère's autobiography as revealing an emerging model of scientific personae, i.e. a new collective way of thinking, feeling and perceiving, which announced the category of the modern scientist.*

Keywords: *André-Marie Ampère; autobiography as cultural history; romanticism and science; melancholy; terror in Lyon; post-revolutionary French society*

Romantický život zasvěcený vědě: autobiografie André-Marie Ampèra

Abstrakt: *Tento článek se zabývá autobiografií André-Marie Ampèra s cílem analyzovat dynamiku vědy ve francouzských institucích raného 19. století. V souladu s posledními pracemi, jež zdůrazňují hodnotu biografií pro dějiny vědy, tato studie zkoumá Ampèrovu veřejnou sebeprezentaci, aby ukázala kulturní transformace života zasvěceného vědě v porevoluční francouzské společnosti. Za tímto účelem jsem analyzovala tento rukopis jako výtečný příklad vědecké rétoriky vzkvétající ve francouzském romantismu na počátku 19. století, jež oslavovala život a dílo mužů vědy prostřednictvím životopisů. Podle tohoto postupu byl Ampèrův záznam analyzován ve vztahu k určitým obvyklostem, jež sdílel s jinými soudobými autobiografiemi, jako byla traumatická zkušenost spojená s francouzskou revolucí. V závěru tento článek pojednává Ampèrovu autobiografii jako text, jenž odhaluje rodící se model vědecké osobnosti, tj. nový kolektivní způsob myšlení, cítění a vnímání, který předznamenává kategorii moderního vědce.*

Klíčová slova: *André-Marie Ampère; autobiografie jako kulturní historie; romantismus a věda; melancholie; lyonský teror; porevoluční francouzská společnost*

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André-Marie Ampère's autobiography

This article aims to explore André-Marie Ampère's cultural representation by analysing his autobiography, a manuscript of sixteen pages dated in 1824, but with several corrections added up to 1828. This document should not only be considered as a subjective account, which describes Ampère's personal anecdotes about his education and his further life as a scientist, but also as a complex self-representation which mirrors certain cultural commonplaces with other scientific biographies of that time. As I shall show in following sections, Ampère's education in connection to nature inspired by Jean-Jacques Rousseau's work, his conception of knowledge moved by passions and his traumatic experience linked to the French Revolution were current images to portray a life dedicated to science following the impact of the biographical approach in early 19th century French Romanticism.

Although biographies have not been considered as relevant material to explain science as a collective enterprise, primarily because of their lack of historical objectivity, recent studies have pointed out how these narratives can reveal the interactions established between individual scientists and the social context in which they are inscribed. According to this interpretation suggested by Michael Shortland, Richard Yeo, Lorraine Daston and H. Otto Sibum, biographies can provide information about the cultural identity of the different *scientific personae*, these creatures of historical circumstance and how they have emerged in a particular historical moment. Therefore, this article focuses on examining Ampère's autobiography in order to shed light on the controversial cultural influences, which nourished his scientific life and his work in various fields such as poetry, botany, astronomy, mathematics, chemistry, natural history, philosophy and physics.[1]

I would like to thank Christine Blondel for supporting my research in the project "Ampère and the History of Electricity" during the years 2007–10 in the Centre de Recherche en Histoire des Sciences et des Techniques (La Villette, Paris). This article could be also considered a summary of an important part of my PhD thesis entitled, Electric and Magnetic in Romantic Europe (2006), UAM/EHESS, which was only possible with the help of my two PhdDsupervisors, Javier Ordóñez and Jean Dhombres. I want also to mention George Asch, who oriented my research on Ampère at La Societé des Amis d'André Marie Ampère (Poleymieux) during the years 2001–2002.

[1] Lorraine DASTON – Hans Otto SIBUM, "Scientific Personae and their Histories." *Science in Context*, vol. 16, 2003, no. 1/2, p. 1–8. Michael SHORTLAND – Richard YEO (eds.) *Telling Lives in Science. Essays on Scientific Biography*. Cambridge: Cambridge University Press 1996, p. 1–45.

André-Marie Ampère (1775–1836) was a versatile personality, who was moved by a desire for cultivating science as well as art. In his autobiography, he offered a representation of his intellectual path that did not correspond to the image of the *cold scientist* promoted by Positivism in the second part of the 19th century, but rather to the representation of a romantic philosopher of nature, who wanted to embrace all knowledge. In this way, he described his youth as a daydreamer, in the countryside of Lyon, he would become a mathematician for the sole purpose of supporting himself, when the National Government requisitioned the family properties after the French Revolution. Thus, he explained:

> The impossibility to set up an establishment, which had become his only goal in life without having what one could call a state, brought him back to exact sciences, which he no longer looked after from his seat in Lyon and which could alone offer him an independent existence from the revenues of a small estate which was all that was remained of his father's fortune.[2]

Ampère was appointed professor of mathematics and chemistry at *L'Ecole de Bourg en Bresse* in 1801, the following year in *Le Lycée de Lyon* and, in 1804 as *repétiteur* at *L'Ecole Polytechnique*. A decade later, he was elected member of *L'Académie des Sciences de Paris* in the mathematics section, although he was actually working on other projects in physics, chemistry and metaphysics. These personal works were not directly related to his public life in Parisian institutions and they were even completely contradictory to some of his numerous official positions, such as his post as *inspecteur général des études*. It was only at the age of fifty-five, at the end of his career, that Ampère was recognised as a physicist by *Le Collège royal de France*, when he presented his most relevant contribution, the science of forces exerted by electricity in movement, i.e. his electrodynamics.

[2] André-Marie AMPERE, "Note sur la vie et les travaux de A. M. Ampère." In: *Ampère's Papers*, *Archives de l'Académie des sciences*. Carton 23, Chapitre 20, Chemise 326. There is also an online version available at the CNRS project *Ampère and the History of Electricity* <http://www.ampere.cnrs.fr/ice/ice_book_detail-fr-text-ampere-ampere_text-8–3.html#>. Ampère wrote the first eight pages and a copyist wrote the following introducing two paragraphs that altered Ampère's first version. I transcribe the French original in order to give further information to the reader: "L'impossibilité de former un établissement qui devînt le seul but de sa vie, sans avoir ce qu'on appelle un état, le ramena aux sciences exactes, dont il ne s'était plus occupé depuis le siège de Lyon et qui pouvaient seules lui offrir des moyens d'existence indépendants des revenus du petit domaine qui était seul resté de la fortune de son père."

In particular, Ampère's electrodynamics has been interpreted from very different assumptions throughout the history of science proposing a contradictory representation of this French scientist. Some scholars have regarded him as "the Newton of electricity"[3] and others, as an outsider in the context of early 19th century French Physics represented by the so-called "Laplacian School".[4] In this respect, Christine Blondel has observed how Ampère's contribution entailed a double physical vision stimulating opposing social perceptions in different European scientific communities that have considered him, either "[...] as a strict upholder of Newtonian tradition, or sometimes as an opponent [...]".[5]

Broadly speaking, Ampère's ideas fitted neither with the official program established in Parisian scientific institutions led by Jean-Baptiste Biot (1774–1862) and Siméon-Denis Poisson (1781–1840), who maintained that electricity and magnetism were two unrelated phenomena, nor with other European scientists such as Michael Faraday (1791–1867), who considered Ampère's contribution as a "[...] highly complicated mathematical theory belonging to the same scope of those of Laplace or Poisson [...]".[6]

Although this article is not aimed at discussing the process of Ampère's discovery of electrodynamics, as this is a subject which has already been sufficiently well established[7], these opposite cultural representations of his main scientific work show to what extent Ampère has been considered a controversial personality in the early 19th century French panorama. Precisely, this article will explore Ampère's autobiography in order to understand his complex intellectual pathway within the broadest cultural movement of early 19th century European culture, i.e. Romanticism.[8]

[3] James C. MAXWELL, *A Treatise on Electricity and Magnetism*. Oxford, vol. 2, 1873, p. 175.
[4] Robert FOX, "The Rise and Fall of Laplacian Physics." *HSPS,* vol. 4, 1974, p. 92 and Kenneth L. CANEVA, "Ampère, the etherians, and the Oersted connexion." *BJHS*, vol. 13, 1980, no. 44, p. 121.
[5] Christine BLONDEL, "Vision physique 'éthérienne', mathématisation 'laplacienne': l'électrodynamique d'Ampère." *Revue d'Histoire des Sciences*, vol. XLII, 1989, p. 124.
[6] *Ibid*., p. 124.
[7] Christine BLONDEL, *Ampère et la création de l'électrodynamique*. Paris: Bibliothèque nationale 1982, p. 12. See also L. Pearce WILLIAMS, "What were Ampere's Earliest Discoveries in Electrodynamics?" *Isis*, vol. 74, 1983, p. 492–508. Christine BLONDEL, "Ampère and the Programming of Research." *Isis*, vol. 76, 1985, p. 559–561 and Fiedrich STEINLE, *Explorative Experimente. Ampère, Faraday und die Ursprünge der Elektrodynamik*. München: Franz Steiner Verlag 2005.
[8] James R. HOFFMAN, *André-Marie Ampère: Enlightenment and Electrodynamics*. Cambridge University Press 1996, p. 3. Dolores Martín Moruno, *Sueños eléctricos y magnéticos de la Europa romántica. El debate sobre la Naturaleza durante las últimas décadas del siglo dieciocho*

In contrast to J. R. Hofmann's scientific biography of Ampère, which explained his work in relation to the Enlightenment movement because of his affinities with Diderot and D'Alembert *Encyclopaedia*, this study focuses in a different way to examine Ampère's affinities with Romanticism, a decisive historical moment that has also been called a Second scientific revolution, "in which was formed the federation of disciplines that we call science".[9]

With this aim in mind, Ampère's autobiography should not be considered as describing his real, but rather a possible life in early 19th century French science, which embodied the changes that occurred in the representation of scientists between the French Revolution and Napoleon Bonaparte's Empire: from the *savant*, somebody who cultivated science with a certain lack of interest, to the modern scientist, who is prepared in an educational system in order to work as a civil servant within an institutional program.[10] Indeed, Romanticism was a "center-of-gravity [...] in the history of science, in which new words like "scientist" (der *Naturwissenschaftler*, *le scientifique*) were coined for a group that laid claim to ever greater cultural recognition".[11] This change of terms was not innocent and announced the emergence of a modern model of *scientific personae*. In France, these transformations were introduced with the outcome of the Revolution, when the public representation of scientists became politically engaged and active in society through personalities such as Lazare Carnot (1753–1823) and Gaspard Monge (1746–1818).

The Revolution deeply changed the whole of French society and in particular the life of scientists, who were accused of being a privileged instrument of the Ancient Regime by the most radical faction, the Jacobins. In their defence, the upcoming generation of scientists developed a new rhetoric in order to justify their role in society. It was not just a coincidence that this new rhetoric was based on the biographical approach, which became

y las primeras del diecinueve/Rêves électriques et magnétiques de l'Europe romantique. Le débat établie sur la Nature pendant les derniers décennies du dix-huitième siècle et les premières du dix-neuvième. UAM/EHESS, Tesis doctoral/Thèse doctorale. Madrid – Paris 2006. A brief introduction of this thesis is avaliable in Dolores Martin, "Le jeune Ampère et le Romantisme," [online]. *Ampère et l'histoire de l'électricité*. Paris: CNRS/CRHST 2008. Available at: <http://www.ampere.cnrs.fr/docs-etudes/etudes/jeuneampere/index.php>.

[9] Andrew CUNNINGHAM – Nicholas JARDINE (eds.), *Romanticism and the Sciences*. Cambridge University Press 1990, p. 1–8.

[10] See also Jean DHOMBRES – Nicole DHOMBRES, *Naissance d'un nouveau pouvoir: sciences et savants en France* 1793–1824. Paris: Payot 1989, p. 14.

[11] DASTON – SIBUM, "Scientific Personae and their Histories," p. 3.

the official way to celebrate the most outstanding contributions in science in contrast to the old way of commemoration known as *l'éloge funèbre*.

In 1835, François Arago, who was *Secrétaire perpétuel de L'Académie des Sciences,* inaugurated this new way to celebrate French science by creating *Les Comptes rendus de l'Académie des sciences,* in which biographical notes were published. As Arago claimed on the occasion of Ampère's commemoration in 1839, it was necessary to go beyond the limits of the tradition by proposing a biography around which Ampère's work through his life was articulated. This approach emphasised Ampère's scientific contribution by means of values such as *individuality*, which were ultimately justified by the intimate relationship established between the biographer and the personality described. In relation to his college Ampère, Arago said:

> This new approach had already received on many occasions his enthusiastic approbation, the idea of giving up had never even occurred to me, and furthermore, with a bit of advance consideration when Mr Ampere was taken from us, I should been concerned that it wouldn't be possible for me to examine his work to perform an analysis of a true encyclopedia without crossing the boarders of our habitual praise. I will admit to an intimate relationship, a relationship without clouds that lasted for thirty years also contributed in the laying out of this biography and reminded me of the importance of certain details that a detached person may have left out.[12]

This type of public commemoration was celebrated in *L'Académie des Sciences* and its purpose was to reconstruct the social identity of the scientific community and, thereby, its memory after the Revolution.[13] According to Dorinda Outram's work on early 19th century scientific biographies, Ampère's manuscript seems to be destined to furnish material to celebrate

[12] François ARAGO, "Ampère: biographie lue par extraits en séance publique de l'académie des sciences, le 21 août 1839." In: *Oeuvres de François Arago; publ. d'après son ordre sous la dir. de J.-A. Barral. Notices biographiques*. Barral, J. A. (ed.). Tome 2. Paris: Gide 1854, p. 4. "Cette voie nouvelle a déjà reçu plusieurs fois votre bienveillante approbation. L'idée d'y renoncer ne s'était pas même présentée à mon esprit; et cependant, avec un peu de prévoyance, quand M. Ampère nous fut enlevé, j'aurais dû songer qu'il ne me serait pas possible d'examiner ses travaux, de faire l'analyse d'une véritable encyclopédie, sans sortir des bornes habituelles de nos Éloges. Je l'avouerai, une liaison intime, une liaison sans nuages de plus de trente années, a pu aussi contribuer à étendre cette biographie, à me faire attacher de l'importance à certains détails qu'un indifférent aurait délaissés."

[13] Dorinda OUTRAM, "The Language of Natural Power: The Eloges of Georges Cuvier and the Public Language of Nineteenth Century Science." *History of Science*, vol. 16, 1978, no. 3, p. 153–178.

his scientific career posthumously. Like other autobiographical notes written by popular French scientists belonging to *L'Institut de France* and *L'Académie des Sciences*, Ampère's account was probably made as a sketch for his future biography. This hypothesis explains why it was written just before his nomination to the *Collège de France*, on the 11th July 1824, when he was recognised as one of the most glorious French physicists due to his work concerning electrodynamics and why it was never published during Ampère's life.

From this point of view, Ampère's autobiography was not an exception, but rather a product of an institutional rhetoric, which was aimed at bringing legitimacy to a scientific life dedicated to science in post-revolutionary French society. Consequently, Ampère's narration should not be considered as a private document, but also as having a strong public dimension and showing certain cultural elements that were common in other French autobiographies of that time, such as those of Bernard de Lacépède (1756–1825) and Georges Cuvier (1769–1832).

Amongst these elements, the idea of French Revolution as a rupture in the lifetime was a commonplace in all the biographies belonging to this generation of scientists. In particular, this can be perceived in the case of Ampère who associated the revolution as the breaking point in his personal story, symbolising not only a crisis, but also a traumatic experience shared by the whole Romantic generation belonging to certain provincial circles such as Lyon. Moreover, the revolutionary process seems to mark the shift between Ampère's youth as an autodidact in the countryside of Lyon and his further career as a modern scientist, working in the most powerful scientific community in Europe of that time.

As I shall demonstrate in the following section, Ampère consciously used in his autobiography an emergent rhetoric of early 19th century French literature, when he portrayed his youth as that of a genius flourishing in connection with nature. Deeply inspired by Jean-Jacques Rousseau's ideas on naturalism, which are at the roots of the Romantic Movement in France, Ampère described the revelation of his scientific vocation not as a result of a deliberate meditation, but rather by making an appeal to his sentiments and passions.[14]

[14] In relation to the emphasis of emotions during European Romanticism, which is also called an "affective revolution", see Peter BURKE, "Is There a Cultural History of Emotions?" In: GOUK, P. – HILLS, H. (eds.), *Representing Emotions. New Connections in the Histories of Art, Music and Medicine.* Aldershot: Ashgate 2005, p. 41.

The young Ampère as a romantic genius

Ampère's autobiography is a manuscript written in the third person, i.e., "[...] when an author pretends to speak about himself by inventing a fictive narrator to present the author's point of view or tell his life story [...]".[15] In this way, Ampère constructed a fictional character that introduced not only his own public representation in the scientific community, but moreover a life in science in early 19th century French society. Thus, Ampère started with the recreation of his youth as if he was a Romantic genius cultivating exceptional virtues in literature, history, mathematics and physics.

Ampère established his origins in Lyon, where he was born on the 20th of January 1775. Ampère's mother, Jeanne-Antoinette Désutières–Sarcey (1749–1809), is only mentioned at the beginning of the text, although his father is presented as the moral figure in the education of the young man. Jean-Jacques Ampère (1773–1793) was a silk merchant, a profession that was an old tradition in Lyon and, also a cultivated man who was interested in Latin and French literature and several branches of science.

> His father, who had never ceased to cultivate himself in Latin and French literature as well as many branches of science would bring him up by himself in countryside neighboring the town where he was born[16]

Although Ampère did not give any more information about the academic background of his father, we know that he studied law and had a special interest in Denis Diderot and Jean le Rond D'Alambert's *L'Encyclopédie ou le systeme figuré de toutes les connaissances humaines* (1751–1780), holding an exemplar of this vast work in his private library. Ampère's father was certainly a cultured man, but this was not exceptional in the context of the Enlightenment society, which promoted a certain taste for the entertainment of the bourgeoisie through activities such as readings novels.

Jean-Jacques had a preference for reading the works of his namesake, Jean-Jacques Rousseau (1712–1778) and was particularly impressed by *L'Emile ou de l'éducation* (1762). Rousseau's work offered a natural background to the wave of autobiographical and subjective literature which characterised

[15] Philippe LEJEUNE – Edward TOMARKEN. "Autobiography in the Third Persons." *New Literary History*, *Self-confrontation and Social Vision*, vol. 9, 1977, no. 1, p. 27.

[16] AMPERE, "Note sur la vie et les travaux de A. M. Ampère." The French original is as follows: "Son père qui n'avait jamais cessé de cultiver la littérature latine et française, ainsi que plusieurs branches des sciences, l'éleva lui-même dans une campagne voisine de la ville où il était né."

France in the first half of the 19th century. Following this approach, André-Marie Ampère explained how his father raised him according to Rousseau's ideas in a village close to the Saone valley, Poleymieux-au-Mont D'Or, where his family moved in 1793. It was the ideal place for the intellectual growth of the young Ampère, who described himself as learning poems by heart, while he walked around the woods, enjoying the greenery and falling into reveries.

Ampère represented himself living in Poleymieux au Mont D'Or, which he described as a mythic place, where he spent the best years of his life. Inspired by this Romantic image, Ampère understood nature as the place where we mirror the emotions of the self, "[...] rather than the inflated and artificial [...]".[17] Furthermore, the natural scenario was understood as a pastoral virtue, which reflected the purity of men dedicated to science by means of their unsociability.

In this way, Ampère emphasised this aspect in the conformation of his character and explained how his friends used to compare him with La Fontaine. Like the great poet, Ampère revealed great talents, but always associated with his absent-minded character. As Arago pointed out, this way of life spent in the loneliness of the countryside, i.e. far from the rules of society, would explain Ampère's absent-minded character as well as his natural ability for abstraction.[18]

> It was perhaps this sort of life which deprived him for such a long time of contact with the type of men that make up our society, which one must attribute to the distractions which Mr. Ampere was occasionally subject and which his friends *le bon La Fontaine* helped him surmount. Like an inimitable fabulist, he joined his huge talents to simplicity and sometimes complete forgetfulness of what was happening around him.[19]

Thus, Ampère represented his early life through the motive of the dreary walker, who discovered his scientific vocation, freely, while he was absorbed in the aesthetical contemplation of nature. In doing so, Ampère was emulating the style of Rousseau's *Les rêveries du promeneur solitaire* (1782) and, in particular, when he explained that he took a singular pleasure in

[17] Keith OATLEY, *Emotions: A Brief History*. Oxford: Blackwell 2004, p. 47.
[18] ARAGO, "Ampère," p. 93.
[19] "C'est peut-être à ce genre de vie si longtemps privé de toute communication avec les hommes dont se compose notre société, qu'on doit attribuer les distractions auxquelles M Ampère a paru quelquefois sujet et qui l'ont fait surnommer par ses amis le bon La Fontaine. Comme l'inimitable fabuliste, il joint à de grands talents une simplicité et parfois un oubli total de ce qui se passe autour de lui." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 8.

learning by heart Racine and Voltaire's tragedies and reciting them while he was walking in the woods of Poleymieux.[20]

In this genre of autobiographies, the metaphor of life as a pathway became a commonplace to illustrate the scientific training as an inner journey. This image "[...] also allowed the linkage of the life and work to go on being made at another level not by cutting out the life, but by seeing it as a web of movement, curiosity and introspection, which came together in a scientific vocation [...]".[21] The idea of serving in a scientific vocation was understood in this context by analogy to a religious conversion according to the style of Rousseau's autobiography (1782) that was also profoundly inspired by St. Augustine's *Confessions*. In this literary approach, the vocational aspect played an essential role to indicate, moreover, a profound epistemological revolution, which emphasised the self as the central axis in the process of knowledge, including one's sentiments and passions.[22]

In this way, Ampère's education was not represented by rationalist values following the spirit of the Enlightenment movement, but rather by means of developing positive sentiments towards certain intellectual concerns, i.e. what Rousseau called "negative education".[23] According to this, Ampère portrayed himself as a child who had discovered his own natural virtues, without any kind of sanctions from the part of his father. This liberal characteristic of Ampère's learning showed the roots of his scientific vocation as a passion, which led him to discover his personality through the suffering and joys of life.

Ampère's first steps in science were symbolised through the association of the illustrations included in Georges-Louis Leclerc de Buffon's *L'Histoire Naturelle des Oiseaux* (1766) to the words appearing in the text. In a similar way, Georges Cuvier's childhood was recreated in copying the pictures of Buffon's works (1749–1788) and colouring them, according to the captions.[24]

[20] "Il prenait un singulier plaisir à apprendre des scènes entières des tragédies de Racine et de Voltaire et à les réciter en se promenant seul." *Ibid*., p. 3.

[21] Dorinda OUTRAM, "Life- Paths: Autobiography, Science and French Revolution." In: SHORTLAND, M. – YEO, R. (eds.). *Telling Lives in Science. Essays on Scientific Biography*. Cambridge: Cambridge University Press 1996, p. 89.

[22] See also Charles TAYLOR, *The Sources of the Self. The Making of the Modern Identity*. Cambridge University Press 1992, p. 369.

[23] Jean-Jacques ROUSSEAU, *Emile ou De l'éducation*, London: Gustave Rudler Collection, t. I, 1780, p. 244.

[24] See also Dorinda OUTRAM, *Science, Vocation and Authority in Post- Revolutionary France: Georges Cuvier*. Manchester University Press 1984, p. 19.

As we can appreciate, the natural history was the opportunity to learn to read fluently for Ampère.

> The liberty with which he was allowed to study only when it pleased him to do so, was the reason that even though he had been supported for a long time, he couldn't yet read, and it was through his exertions to understand *l'Histoire des oiseaux*, that he finally learnt to read fluently.[25]

Furthermore, Ampère told of his early years emulating his father and cultivating his taste for literary works. He read the modern tragedies that composed the family library, such as those of Jean Racine (1639–1669) and François Marie Arouet (1694–1778), commonly known as Voltaire and, furthermore, the classical poetry of Virgil. It was literature that aroused Ampère's early interest in history and moreover, in politics. In this way, his reference to the War of American Independence (1775–1783) is essential to understanding his later convictions towards the French Revolution and his affinities with the Romantic Movement emerging in Lyon.

As it is well known, the French Government played an important role in this war, supporting the revolutionary cause and providing weapons and volunteer troops to fight for American independence. The French political engagement in this conflict was not only due to the old rivalries against England, but also to the rise of Enlightenment philosophy in France, a movement whose central vindication was freedom. In the same way that North Americans did not want the imposition of English colonial powers, the French population would rise up against the tyranny of the monarchy.[26]

Thus, the young Ampère explained his political sentiments comparing the battles of old Empires such as the Greek Empire and the Roman Empire, to his father's ideas about the independence of North America.

> The feelings that these readings developed within him exulted in hearing accounts of the events of the war that England and France waged at the period on the subject of the Independence of the United States.[27]

[25] "La liberté qu'on lui laissait de n'étudier que quand il lui plaisait de le faire fut cause que, quoiqu'il sût épeler depuis longtemps, il ne lisait point encore, et c'est en s'exerçant seul à comprendre *l'Histoire des oiseaux* qu'il apprit enfin à lire couramment." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 2.

[26] For the connections between the American Revolution and the French Revolution see Hannah ARENDT, *On Revolution*. New York: Penguin 2006, p. 39.

[27] "Les sentiments que ces lectures développaient en lui s'exaltaient par ce qu'il entendait raconter des évènements de la guerre que l'Angleterre et la France se faisaient alors au sujet de

Jean Jacques was a sympathiser with the Enlightenment ideals and, thereby, he welcomed the French Revolution as a necessary break with the past. However, he did not support a radical interpretation of social change like the Jacobins, as he was closer to the more moderate liberal faction represented by the Girondins. This will explain Ampère's controversial feelings towards the French Revolution and, in particular, those concerning the Siege in Lyon.

Besides Ampère's interests in literature, he related how his passion for science was born at the age of thirteen, when he found Dominique-François Rivard's *Abrégé des éléments de mathématiques* (1772) and Jean-Mathuran Mazéas' *Éléments d'arithmétique, d'algèbre et de géométrie* (1777) in his father's library. Ampère's completed his study of arithmetic, algebra and geometry by apparently not following any rational order and having nobody to support him, not even his father who was most likely a literary man. In short, Ampère shaped his early life as if he was a kind of autodidact, who continued his mathematical training with the study of Jean-Baptiste de La Chapelle's *Traité sur les sections coniques* (1750) and Gillaume de L'Hôpital's *Traité analytique des sections coniques* (1776). When he finished these works, he explained how he imagined a new demonstration in conics.

> Not knowing anyone who had the least knowledge of mathematics, he devoted himself to writing a tract on the division of conics with the material he found in these works and demonstrations, which he imagined and believed to be new.[28]

This study was Ampere's first mathematical work, which was entitled *Sur la rectification d'un arc quelconque de cercle plus petit que la demi-circonférence* (1788). It was focused on the construction of a straight line with the same length as an arc. The commission established in *L'Académie de Lyon* evaluated Ampère's treatise as a product of brilliant and precocious mathematical skills and encouraged the young man to continue with his scientific research. However, when Ampère was reading the entry of the *d* in Diderot and D'Alembert's *Encyclopaedia*, he recognised that he had no understanding about infinitesimal calculus. This is why Ampère's father asked to a professor in Lyon to give some lessons to the young man. As Ampère

l'indépendance des Etats-Unis." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 3.

[28] "Ne connaissant personne qui eut la moindre de connaissance des mathématiques, il se mit a composer un traité des sections coniques avec les matériaux qu'il trouvait dans ces ouvrages et les démonstrations qu'il imaginait et croyait nouvelles." *Ibid*., p. 4.

recounted in his autobiography, the professor became astonished, when he realised the progress that the child had made by himself without any help from outside.

> His father, having at this time made a two month visit to Lyon, had the opportunity to see Mr. Daburon who was very involved in mathematics, [A. M. Ampere] would tell him of his embarrassment when he noticed that he had put "d's" without him knowing what they represented. Mr Daburon was struck by what the young Ampere had done without having other resources than the books he had read.[29]

It is certainly true that Ampère developed brilliant mathematical skills from his childhood. Nevertheless, we know that he was at school in Lyon before he arrived at Poleymieux and, that later on he had two different tutors to guide his scientific training. On one hand, he received lessons from Daburon, who was professor at *Le Collège de la Trinité* in Lyon and also *inspecteur général des études*. He accepted to orientate the young man's scientific training, and made several visits to Poleymieux becoming a friend of Ampère's family. These lessons were surely decisive in explaining Ampère's rapid improvements in mathematics.

> His father, full of gratitude, was linked in an intimate relationship with Mr. Daburon, who would sometimes come to stay a few days in the countryside where he had brought his son. Mr. Daburon directed the mathematic studies of the young Ampere and would inspire within him a new spirit of emulation, which made his progress more rapid.[30]

On the other hand, Jean-Jacques used to spend some months in Lyon every year and took the opportunity to bring his child to the city in order to allow him to take part in Joseph Mollet's lessons. At that time, Joseph Mollet was professor of Physics in the same *Collège de la Trinité* and he recommended that André-Marie read works such as, Rousseau's *Lettres*

[29] "Ayant à cette époque, pendant un séjour de quelques mois que son père fit à Lyon, eu l'occasion de voir M. Daburon [...] qui s'était beaucoup occupé de mathématiques, il lui raconta l'embarras où le mettaient les d qu'il trouvait dans ces articles sans qu'on y eut dit ce que cette lettre représentait. M. Daburon fut frappé de ce que le jeune Ampère avait fait sans autre secours que les livres qu'il avait étudiés." *Ibid*., p. 5.

[30] "Son père, pénétré de reconnaissance, se lia d'une intime amitié avec M. Daburon qui venait parfois passer quelques jours à la campagne où il avait ramené son fils. M. Daburon dirigea les études mathématiques du jeune Ampère et lui inspira une nouvelle émulation qui rendit ses progrès plus rapides." *Ibid*., p. 5.

sur la botanique (1771–1773). On returning to the family residence in the countryside, Ampère was portrayed as completely passionate for Rousseau's botany, while he continued to study calculus.

> On return to the countryside, he read some works on physics, and a while later, the reading of Rousseau's letters on Botany, inspired within him a strong ardor for the study of this science, he divided his time between his collection of plants and his sums.[31]

Although Daburon and Mollet were recognised as Ampère's tutors in his autobiography, they appear only as secondary characters in relation to the affirmation of Ampère's scientific vocation. Walking alone around the woods close to his house, he seemed to reproduce the movement of his own thinking, i.e what we call the process of introspection. Ampère's early life was shaped as that of a Romantic genius, who discovered his own voice in recognising his passion for science. However, he was not an autodidact in the literal sense of the term, but most likely a child belonging to the bourgeoisie, who received a private education in the retreat of the countryside.

The outbreak of the Siege of Lyon would disturb the harmonious characteristic of Ampère's early life, which is the longest and most detailed part of his autobiography. When the rebellion broke out in Lyon, the young man was completely absorbed reading and repeating the demonstrations of Joseph Lagrange's *La Mécanique Analytique* (1788) a work of special complexity, which deduced the whole mechanics of solids and fluids from the law of virtual work and became an essential reference in Ampère's further research on mathematics.

> He was cradled in the vain hope that his father would be given back to him, and the study of mathematics engrossed him more than ever, because one had procured for him, shortly before the siege of Lyon, the book *Mécanique Analytique*, the reading of which filled him with a new ardor. It was in re-doing the calculations and in devoting himself once more to this work, that the news of his father's fate was revealed to him.[32]

[31] "De retour à la campagne [il] lut quelques ouvrages de physique et, quelque temps après, la lecture des lettres de Rousseau sur la botanique lui ayant inspiré une grande ardeur pour l'étude de cette science, il partagea son temps entre les herborisations et les calculs." *Ibid*., p. 6.
[32] "On le berçait de la vaine espérance que son père allait lui être rendu, et l'étude des mathématiques l'occupait plus que jamais, parce qu'on avait eu soin de lui procurer, peu avant le siège de Lyon, la Mécanique Analytique, dont la lecture l'avait animé d'une nouvelle ardeur.

The destiny of Ampère's father, who was condemned to death by guillotine after the Siege of Lyon, marked the end of Ampère's childhood, which he spent cultivating all knowledge without any concerns. This historical event mirrored not only Ampère's personal crisis, because of which he fell into an acute depression, but also *le mal du siècle,* commonly known in Romantic culture as melancholy. This wave of melancholic feelings that affected early 19th century French society revealed more than a mere psychological trouble, this was a broader cultural reaction against the Enlightenment movement and the politics of terror carried out by the army of the National Convention against several towns, such as Lyon.

Revolution, melancholy, and poetry

The critical point in Ampère's autobiography was directly related to the rebellion declared in Lyon against the authority of the National Convention, coming from Paris during the summer of 1973. For Ampère, the Siege of Lyon was a cruel example of the politics of terror in French history, which was interpreted in a broader sense as a civil war that had provoked terrible and unexpected consequences. This interpretation of the revolutionary process as a civil war was explained, because Ampère's father became judge of the peace during the insurrection and condemned Joseph-Louis Chalier (1747–1793), a particularly exalted and fanatical leader, who was very close to Jean-Paul Marat (1743–1793).

Chalier incarnated the Jacobin enemy in Lyon, becoming an essential factor to understanding why the people took up arms to eliminate the municipal government imposed by Paris. The majority of the population in Lyon was under the influence of the Girondin and Royalist factions and, thereby, they did not accept radical changes, such as the confiscation of properties belonging to numerous citizens of the bourgeoisie. Therefore, when Jean-Jacques Ampère judged Chalier guilty, this placed him in the eye of the counter-revolutionary storm. The Parisian Government did not hesitate to take repressive measures by immediately sending the army of Alps, whose troops applied terror to the letter, by destroying the city and "executing around 209 people by the guillotine".[33]

Il en refaisait tous les calculs et se livrait encore à ce travail dans l'instant où le sort de son père lui fut révélé." *Ibid*., p. 7.

[33] Chantal THOMAS – David F. BELL, "Terror in Lyon." *SubStance*, vol. 27, 1998, no. 2, p. 34.

After three months of violent fighting in the streets of Lyon, the National Convention recovered the control of the city on the 9th October of 1793 and Ampère's father was one of the first personalities to be judged and executed as a traitor of the French Republic.

> Meanwhile, the political problems in France brought about events that were as disastrous as unexpected; civil war broke out and Lyon was put under siege by the Convention army. Mr. Ampere left his family in the countryside and made it his duty not to abandon his co-citizens. He refused to leave the besieged city, and when it fell, he was one of the first victims of the revolutionary tribunal.[34]

Ampère received the news of the death of his father when he was thirteen years old. This tragic event provoked a shock in his life, indicating also a most profound social fracture experienced amongst the survivors or descendents of the counter-revolutionaries engaged in the siege. In this way, Ampère's generation would receive the conservative ideology of their fathers, creating certain intellectual networks such as *L'école mystique,* as known as "the Catholic group".[35]

L'école mystique was joined by Ampère's most intimate friends, who revealed a vivid interest for the discussion of Immanuel Kant's work and other religious matters related to theosophical and mystical traditions. It was composed of young Lyonnais, such as Joseph-Marie Degérando (1772–1834) and Claude-Julien Bredin (1776–1854) who had fought during the insurrection, Pierre-Simon Ballanche (1776–1847) whose father was also condemned to death by guillotine and Camille Jordan (1771–1821), one of the instigators of the rebellion. Ampère's political affinities with this group were expressed by a common philosophy, inspired by a discontent towards a miscarried revolution that had justified violence as the driving force in the logic of the progress of liberty. In order to accomplish revolutionary change, the French Republic had sacrificed the life of numerous loyal citizens, such as Ampère's father. Thus, Romanticism in Lyon emerged as a social revolt vindicating the cultural heritage lost after the siege through the development of a certain

[34] "Cependant, les troubles politiques amenaient en France des évènements aussi désastreux qu'inattendus; la guerre civile éclata, et Lyon fut assiégé par l'armée de la Convention. M. Ampère laissa sa famille à la campagne et se fit un devoir de ne pas abandonner sesconcitoyens. Il refusa de sortir de la ville assiégée et lorsqu'elle succomba, il fut une de premières victimes du tribunal révolutionnaire." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 6.

[35] Joseph BUCHE, *L'école mystique de Lyon, 1776–1847.* Paris: Alcan 1935, p. 87.

speculative philosophy, which would deeply influence Ampère's vision of science.[36]

Like other scientists of his generation, Ampère perceived the French Revolution as a kind of trauma in his personal story. For example, Lacépède explained in his autobiographical note how after the death of his father in 1783, he suffered a nervous breakdown. Likewise, Ampère described how during a year he was caught by a vague melancholy, which was understood not only as a mental illness, but rather as a natural condition related to solitude and reflection typical of certain men of genius in literature, art and philosophy.[37]

> The young Ampere, stuck so cruelly in the object of his love and respect experienced such a commotion that it seemed that it had an influence on his intellectual faculties. His time drifted by in the countryside, where far from all worry, he spent entire days sadly contemplating in the woods, the hills and the sky; this vague melancholy without any determined thought, was perhaps for him a benefit of nature, which gave his life back to him momentarily taking away this harrowing memory.[38]

On one hand, Ampère's melancholic feelings represented his grief and the necessary mourning, after the loss of his biological father. On the other hand, this melancholic mood was understood as a distinctive mark of creativity in the character of the Romantic genius, which also emphasised his sensibility. Although Ampère explained that he was unable to concentrate in any subject of study, we know that his first reaction was to write poetry explicitly criticising the Jacobin politics based on the application of terror, as he did in *Contre Marat* and *Après septs ans entiers de fureur et de crime*.[39] Only a year later, Ampère would awaken from this dark episode reading

[36] MARTIN MORUNO, *Rêves électriques et magnétiques dans l'Europe romantique*, p. 248–62.
[37] See also ARISTOTLE, "Brilliance and Melancholy." In: RADDEN, J. (ed.), *The Nature of Melancholy: From Aristotle to Kristeva*. Oxford: Oxford University Press 2002, p. 55–61.
[38] "Le jeune Ampère, frappé aussi cruellement dans l'objet de son amour et de son respect en éprouva une telle commotion qu'elle parut avoir influé sur ses facultés intellectuelles. [...] Son temps s'écoulait dans la campagne où loin de tout souci il passait des journées entières à contempler tristement les bois, les collines et le ciel; cette mélancolie vague et sans idée déterminée fut peut-être pour lui un bienfait de la nature qui lui rendait sa vie en lui ôtant momentanément le déchirant souvenir." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 8.
[39] André-Marie AMPERE, "Contre Marat." In: *Ampère's papers. Archives de l'Académie des Sciences*. Carton XIX, chemise 298, folio 81. André-Marie AMPÈRE, *Après sept ans entiers de fureur et de crime*. Carton XIX, chemise 298, folio 237. See also Dolores MARTIN MORUNO,

Rousseau's work on botany and, overall, falling in love with Julie Carron who would become his first wife.

From the French Revolution to the Napoleonic Empire

Ampère's early life dedicated to knowledge without any practical purpose changed, radically with the aftermath of the siege. At that time, Ampère's family was affected by serious financial problems as a result of the requisition led by the National Government after the French Revolution. He needed to be economically independent and, therefore, he had to find a job to support his future family. Ampère explained how he left the countryside to return to his hometown, Lyon, and that he turned his efforts to learning chemistry and physics in order to work as a private professor. Three years later, he was appointed to an official post as professor of chemistry and mathematics in Bourg, after passing a routine inspection and without having too many difficulties to obtain his permit to teach.[40]

He ended, in 1789, his period in the countryside and went to teach mathematics in Lyon, and this work, naturally led him to devoting himself again to the study of science and to that of physics and chemistry. Having married in 1799, he was named Professor of Physics at the *Ecole Centrale* in the Ain region two years later.[41]

The *école* where Ampère worked was as example of the educational reforms promoted by the Government of the National Convention from 1795. This institution was the result of the reforms promoted by the political and philosophical movement called *les idéologues,* which was led by Desttut de Tracy (1754–1836) who tried to increase scientific and practical contents in the educational curricula. However, Ampère explained how the real situation was completely different in Bourg, where he repaired several of the laboratories instruments to create new ones, in order to explain new chemical and physical phenomena to his students.

Ampère: un poète romantique? [online]. Paris: CNRS/CRHST 2008. Available at: <http://www.ampere.cnrs.fr/manuscrits/index.php? lang=fr>.

[40] Louis De LAUNAY, *Le Grand Ampère*. Paris: Perrin 1925, p. 69.

[41] "Il quitta en 1797 le séjour de la campagne et vint enseigner les mathématiques à Lyon, et ce travail le conduisit naturellement à se livrer de nouveau à l'étude de cette science et à celle de la physique et de la chimie. S'étant marié en 1799, il fut nommé deux ans après professeur de physique à l'École centrale du département de l'Ain." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 8.

As he pointed out, this ability would be especially, useful in his later research on electrodynamics.

> He acquired, through this work, a singular aptitude for imagining new procedures to test nature and to construct new instruments, an aptitude which had been a great help to him in his works on dynamic properties that he discovered in galvanic conductors.[42]

Meanwhile, the health of Ampère's first wife, who lived in Lyon with Ampère's son, also called Jean-Jacques, began to grow weak. Ampère tried to return to his hometown by publishing *Les considérations sur la théorie mathématique du Jeu* (1802), and achieving a post at the *Lycée de Lyon*.[43] Ampère's appointment was clearly influenced by Joseph Delambre's support. Delambre (1749–1822) was not only a great astronomer and mathematician, but also became a powerful personality in Napoleon Bonaparte's Empire being elected as permanent secretary for the mathematical section of *L'Académie des Sciences* in 1802.

When Ampère lost his first wife in 1803, Delambre helped his *protégé* for a second time, supporting his candidature to *L'Ecole Polytecnique*. As Ampère explained, Delambre became a new father for him and introduced him to Parisian academic life. The recreation of an institutional father, who would guide the novice man of science, was also very common in scientific autobiographies of that time. This was normally related to the loss of the biological father as a consequence of the political struggles that occurred during the French Revolution.[44]

> Having been presented to *l'Académie des Sciences* by Mr. Delambre, the flattering report made of him by Mr. Lagrange and Biot at this Institute, persuaded Mr. Ampere to come to Paris where Delambre was for him a new father. He became, successively, an Analysis Tutor at the *Ecole Polytechnique*, member and

[42] "Il acquit par ce travail l'aptitude particulière à imaginer de nouveaux procédés pour interroger la nature et à construire de nouveaux instruments, aptitude qui lui a été depuis d'un grand secours dans ses travaux sur les propriétés dynamiques qu'il a découvertes dans les conducteurs voltaïques." *Ibid*., p. 9.
[43] André-Marie AMPÈRE, *Considérations sur la théorie mathématique du jeu*. Lyon: Périsse frères 1802.
[44] OUTRAM, "Life-Paths," p. 94.

> secretary of the *Bureau consultative des arts et manufactures*, General Inspector of Studies, and finally teacher at the *Ecole Polytechnique*.[45]

During his period in Paris, Ampère spent his time preparing his lessons imparted in *L'école Polytechnique* and travelling around France to fulfil his post as inspector. Furthermore, he made several contributions on the calculus of variation and on differential calculus, and he also proposed a simplified demonstration of the principle of virtual work.[46] As Ampère explained, he was elected member of the mathematical section of *L'Académie des Sciences* in 1814 due to these publications and coinciding with the Restoration of the Bourbons in France. However, Ampère portrayed himself as not being concerned by any mathematical research, but instead with chemistry, physics and overall, with philosophy.

> In 1814, Mr. Ampere, due to the various mathematical theses that he had published since he had resided in Paris, was chosen by the *Académie des Sciences* to replace Mr. Bossut. Mr. Ampere was particularly devoted to the study of physics, chemistry and above all speculative philosophy in its application to other sciences; he liked to see in this application, a source of new progress both for science and for philosophy itself.[47]

Diametrically opposite to the image of the scientist promoted by early 19th century French science, which had a certain distrust in philosophy, Ampère recognised that he was absorbed into a metaphysical discussion with François Maine de Biran from 1805 until 1819, on the justification of

[45] "Ayant été présenté par M. Delambre à l'Académie des sciences, le rapport très flatteur que MM. Lagrange et Biot en firent à cette compagnie détermina M. Ampère à venir à Paris, où M. Delambre fut pour lui un nouveau père. Il devint successivement répétiteur d'analyse à l'École polytechnique, membre et secrétaire du Bureau consultatif des arts et manufactures, inspecteur général des études, et enfin professeur à l'École polytechnique." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 10.

[46] André-Marie AMPERE, *Précis des leçons sur le calcul différentiel et le calcul intégral*, 1824. André-Marie Ampère, *Essai sur un nouveau mode d'exposition des principes du calcul différentiel, du calcul aux différences et de l'interpolation des suites, considérées comme dérivant d'une source commune, 1825–1826*. André-Marie AMPÈRE, *Exposition des principes du calcul des variations, 1825–1826*.

[47] "En 1814, M. Ampère dut aux divers mémoires de mathématiques qu'il avait publiés depuis qu'il résidait à Paris, le choix que l'Académie des sciences fit de lui pour remplacer M. Bossut. M. Ampère se livra particulièrement à l'étude de la physique, de la chimie et surtout de la philosophie spéculative dans son application aux autres sciences; il aimait à voir dans cette application une source de nouveaux progrès et pour ces sciences et pour la philosophie ellememe." AMPERE, "Note sur la vie et les travaux de A. M. Ampère," p. 11.

the soul through self-sense.[48] Furthermore, Ampère revealed a most mysterious influence from other movements such as Gall and Lavater's phrenology and, notably, Franz Anton Mesmer's animal magnetism that promised a miraculous unification of all experimental phenomena by means of a magnetic fluid.[49] Although this latter doctrine had been condemned in 1784 as pseudo-scientific by the *Académie des Sciences*, Ampère was convinced of its influence on the behaviour of human being and he has, even, received a magnetic therapy at the hands of the Lyonnais physician Désiré Pététin.

However, the summer of 1820 would completely change the orientation of Ampère's research. Then, he received the news of Hans Christian Oersted's discovery and was immediately inspired by this idea about the connection of magnetic and electric forces. Although the majority of scientists belonging to the early 19th century Parisian scientific community, such as Pierre Louis Dulong, considered Oersted's discovery as another *rêverie allemande* characteristic of the German *Naturphilosophie*, Ampère would support Oersted's revolutionary hypothesis without resistance. This is why Ampère has been considered an enigmatic personality in the history of science and, in particular, in relation to early 19th French scientific community, because he defied the central dogma of "Laplacian physics", which established that electricity and magnetism were two independent phenomena that needed to be explained by means of two different imponderable fluids having no connection between them.[50]

As Pearce L. Williams has suggested, we can probably explain Ampère's seduction towards Oersted's hypothesis by means of his metaphysical background. Since his youth in Lyon, Ampère was deeply influenced by German philosophers such as Friedrich Wilhelm Joseph von Schelling who supported the connection of all forces in nature such as heat, light, chemical affinities, electricity and magnetism.[51] Therefore, we can finally appreciate Ampère's cultural affinities with the European Romantic movement in his

[48] Jean-Jacques AMPERE, "Résumé de l'ensemble des idées de mon père, ce qui lui appartient et ce qui appartient à Maine de Biran. Lettres à M. Maine de Biran. 1812." In: *Ampère's papers. Archives de l'Académie des Sciences de Paris.* Carton XVI, Chapitre 16, Chemise 264. See also Marco SEGALA, "Ampère filosofo." *Nuncius*, vol. 1997, p. 145–160.

[49] ARAGO "Ampère," p. 90. Although these points which are not mentioned directly in his autobiography, they appeared in F. Arago's biographical note.

[50] John L. HEILBRON, „Weighing Imponderables and Other Quantitative Science Around 1800." Supplement to *HSPBS*, vol. 24, 1996, no 1.

[51] Pearce L. WILLIAMS, *Michael Faraday: A Biography.* London: Basic Books 1965, p. 143. His last interview was published in J. Noble, "Ampère Letters Show Flowering of Young Genius." *New York Times*, November, 1986.

understanding of magnetic phenomena in electrical terms, an idea from which he deduced the whole of his science of electrodynamics.

A romantic life dedicated to science

Although the discovery of electrodynamics is described in Ampère's autobiography as the ultimate objective of his life making sense of his whole scientific career, we have seen throughout this article how Ampère's public representation did not always fit with his real interests. Furthermore, it was precisely in his private life where he seemed to develop his most important research, such as for example in philosophy and physics, giving a confusing idea to the public of what he considered the main points of his scientific activity. As I have shown throughout this article, Ampère's discrepancy between his private and public life was a result of the numerous social changes that occurred in French scientific institutions from the outbreak of the Revolution to the Restoration of the Bourbons, passing through Napoleon Bonaparte's First Empire.

This is why I have interpreted Ampere's public representation as revealing a shift from the old image of the *amateur* coming from the Ancient Regime to that of the professional scientist, who worked as a civil servant remunerated by the state. In this way, Ampère's scientific career embodies what L. Daston and O. Sibum has called the notion of *persona*, a concept that establishes an "intermediate between the individual biography and the social institution". Following this approach, the *scientific personae* are not individuals, nor are they stereotypes or social roles, but rather "categories of people, of collective ways of thinking, feeling, judging, perceiving, working".[52]

In this respect, Ampère was one of the last scientific personalities to achieve a post in the educational system, without having pursued official training in an institution in France. His early education was inspired on the model of the *amateur*, i.e. somebody who was devoted to science by passion, not because he exerted a profession.[53] As we have seen, Ampère's early life would play a decisive role in his further conception of scientific knowledge as a whole explaining how a man dedicated to teaching mathematics, became

[52] DASTON – SIBUM, "Scientific personae," p. 3.
[53] See Bernadette BENSAUDE-VINCENT – Bruno BERNARDI, *Rousseau et les sciences*. Paris: L'Harmattan, 2003, p. 11.

famous for his contribution in electrodynamics, while he was passionate for metaphysics.

Furthermore, his active participation in philosophical circles since his youth in Lyon, which were very influenced by German Idealism, was another reason to understand Ampère's romantic vision of science, in which all disciplines were connected. Indeed, his speculative vision of knowledge, in which was included sciences as well as arts, would be published posthumously in his last work, *Essai sur la Philosophie des Science où Exposition analytique d'une classification naturelle de toutes les connaissances humaines*.[54]

In conclusion, Ampère's autobiography shows the various social changes promoted by the Government of the National Convention from 1795, Napoleon's Empire and, finally, by Louis XVIII during the Restoration. These changes that gave way to the modern notion of the scientist in France, were intimately related to the rise of Romanticism in Europe, which involved a parallel revolution in the history of science. As Cunningham and Jardine have pointed out, this Second scientific revolution transformed not only the public representation of the scientific community in Western society changing completely the particular life of scientists, but also the organisation of scientific knowledge creating, even, new disciplines such as what we know today as biology.[55] In particular, Ampère's contribution in electrodynamics should be regarded as a central key in the foundation of modern physics.

Likewise François R. Châteaubriand explained in his popular autobiography, *Mémoires d'outre-tombe* (1848), Ampère's account represented metaphorically a journey from the ancient to the modern world, from the monuments of nature to the ruins of civilisation. As Chateaubriand wrote, the French Revolution had cut in a half the life of the Romantic generation.

> I found myself between two centuries like the confluence of two rivers, I dove into the troubled waters, and distanced myself with regret from the old bank where I was born, and swam with hope towards the unknown bank that would be reached by the new generations.[56]

Romanticism has been usually considered a very prolific culture in domains such as aesthetics but as a contradictory culture to the progress of science. Although scholars, such as Peter Galison have recently shown the relevance

[54] André-Marie AMPERE, *Essai sur la Philosophie des Science ou Exposition analytique d'une classification naturelle de toutes les connaissances humaines*. Paris: Bacheller 1843.
[55] CUNNINGHAM – JARDINE, *Romanticism and the Sciences*, p. 13–25.
[56] René CHATEAUBRIAND, *Mémoires d'Outre-tombe*. Paris: Flammarion, IV, 1984, p. 10.

of Romanticism in the construction of the notion of scientific objectivity,[57] we can appreciate how it has been frequently rejected as a real approach to analyse the history of science in the case of particular biographies, such as that of Ampère. Thus, for example, James R. Hoffman dismissed Ampère's affinities with Romantic Movement, because he was a more cultivated man in the sciences of that time than other Romantic personalities.[58] Deep down, this association between Ampère's electrodynamics and the Enlightenment Movement was based on the supposition that science and, notably, mathematics should be regarded as an exclusive product of the faculty of reason that has nothing to do with the creative imagination.

However, Ampère portrayed himself in his autobiography in a different way, as a scientist who discovered his vocation in making an appeal to sentiments and passions inspired by the rise of Romanticism in France and, specially, by Jean-Jacques Rousseau's works. According to Rousseau's *Emile*, he described his childhood in Poleymieux au Mont D'Or as a period in which he developed his own natural virtues towards knowledge without any kind of sanctions from the part of his father. Furthermore, Ampère's melancholic feelings after the death of his father during the Siege of Lyon revealed also a common pattern in early 19th century French scientific biographies of that time, such as that of Lacépèce and Buffon.

As I have shown Ampère's autobiography was a typical manuscript belonging to early 19th century French culture, because it was precisely during Romanticism when the biographical approach became a kind of literary fashion in order to celebrate the cult of the self. Although biography has been currently understood as a genre focused on extolling the virtues of the individual, it goes beyond the anecdotic proposing different ways to explore the cultural dynamics of science and, moreover, establishing a public understanding of how to picture a Romantic life dedicated to science.

[57] Peter Galison, "Objectivity is Romantic," [online]. *American Council of Learned Societies*, vol. 47, 1999. Available at <http://archives.acls.org/op/op47–3.htm#n*>.
[58] HOFMANN, *Ampère : Enlightenment and Electrodynamics*, p. 3.