

## Macedonio Melloni between physics and political commitment

E. COLOMBI(\*)

*Physics and Earth Sciences Department, University of Parma  
Campus - via G.P. Usberti, 7/a - 43124 Parma, Italy*

ricevuto il 31 Gennaio 2014; approvato il 29 Maggio 2014

*“Melloni’s words have been an electric spark stronger  
than those produced by his Leyden’s jars”  
Antonio Gallenga*

**Summary.** — Macedonio Melloni is an outstanding figure in the scientific world of the nineteenth century. His life can be divided into two main periods, and the interruption is due to his deep involvement in the political risings that shook Europe in 1831. In the first period, he was a professor at the School of Physics of the University of Parma. Since the very beginning, he devoted a special attention to the properties of radiant heat, and the theoretical insights about the nature of thermal phenomena were doubled by a smart attitude in improving the laboratory tools. The political events of 1830-31 caused stir inside the University of Parma. Melloni delivered a celebrated speech, leading to stormy meetings, the closure of the School of Physics of the University, the arrests and deportations of students. Nevertheless they gained support from the whole town: Parma in fact rose up and a provisional government was formed of which Melloni himself became a member. Accounts on these events can be found in the documents of the Archivio di Stato (the Public Records Office), as well as in the diary of Lombardini, the Chancellor of the University, and in the short stories by Gallenga (a deported student), besides letters and memories of Melloni himself. The subsequent exile, apart from difficulties in private and familiar life, gave him the chance of establishing relations and collaborations with the scientific European circles. Thus, the 1831 uprising caused both dramatic changes and rich opportunities in the career of a patriot who, as others in the same period, was divided between political engagement and scientific passion.

PACS 01.65.+g – History of Sciences.  
PACS 01.75.+m – Science and Society.

(\*) E-mail: [emanuela.colombi@fis.unipr.it](mailto:emanuela.colombi@fis.unipr.it)

## 1. – Introduction

The events that shook Europe in 1831 caused stir even in Italy, since in that first phase of the Risorgimento period a considerable number of Italian scientists had to balance, their scientific activity with an intense political engagement [1]. Even in the Duchy of Parma and Piacenza, the risings involved the whole town of Parma, including the cultural and academic circles. In particular, they seem to have caused the greatest upheaval at the University. Obviously, as everywhere in Europe, the life of many scholars was deeply influenced by such events, as it was the case of the parmesan scientist Macedonio Melloni (1798-1854). The case of Melloni is particularly interesting because the initial negative impact of his political engagement on his life was also the cause of a positive enlargement of his scientific activity and of an interchange with other important European scientists. We shall describe his personal story as regards both the political and the scientific sides. In this sense, the particular case of Melloni intersects other relevant aspects of the cultural life in Italy during the Risorgimento period.

We plan therefore to focus on the role played by Melloni during the risings and, conversely, on the influence these events had on his subsequent life as a man and as a scientist. Our research will highlight some interesting aspects of the ideological and cultural background in Parma through the direct testimony of a number of protagonists. In those days Melloni, as a professor of theoretical and experimental Physics and Director of the annexed Physics laboratory, was only at the beginning of his academic career. However, he had already established intense relations with other interesting figures of the period. We remember, for instance, two of his friends in Modena, which were physicists and constructors of scientific instruments and, also, were involved in the uprising [1]: Leopoldo Nobili (1784-1835), and Giovanni Battista Amici (1786-1863). Nobili, that had to relocate himself because of his participation to the risings of 1831, is famous for his astatic electromagnetic galvanometer. Amici, after the participation to the temporary government in Modena, had to move to Florence, where he eventually became the Director of the Astronomical Observatory, and kept working on the construction of microscopes and telescopes.

Some of the witnesses to take into consideration, besides Melloni himself, are Antonio Lombardini and Antonio Gallenga. The former, after teaching Mathematics at the Parma University, was appointed Chancellor. The latter, a student, was one a most politically active figure of the period.

Through these contributions, and by relating them with other minor ones, it is possible to reach a deeper understanding of the historical, political and cultural background in Parma from 1829 to 1831, especially about the relevant role played both by University teachers and students and, in particular, by the School of Physics of the University.

In sect. 2 we will present Melloni's life and scientific activity. In sect. 3, the written sources documenting the uprising in Parma and the role played by Melloni will be summarized. The peculiar features of the persecution of Melloni, and a conclusive discussion of the meaning of those events on his life, will be presented in the conclusions.

## 2. – Macedonio Melloni: his life and scientific activity

Macedonio Melloni was born in Parma on April 11, 1798, as reported in the *Liber Baptizatorum* from the Battistero of Parma. As customary in those times, he and his elder brothers started their first studies at home with tutors teaching Humanities, Mathematics and Science. Several of his biographers number among his tutors Antonio Lombardini, the future University Chancellor for mathematics, Professor Casa, teaching Logics, and

Professor Sgagnoni for Physics. Melloni pursued his studies attending the Academy of *Belle Arti* under Professor Pasini's guidance, where he demonstrated great ability both in drawing and painting. In many of his bibliographies it is said that later he moved to Paris in order to improve his artistic education and that, during his stay there, he decided to devote himself to scientific subjects and particularly to Physics, putting on one side his drawing studies [2-4]. A document<sup>(1)</sup> of Lombardini mathematics, of July 16, 1819, specifies his skills and the goal of his studies in Paris. The document states that Melloni had studied for four years, that he was familiar with the basics of the discipline, that he also had an in-depth knowledge of the theory of series and equations, spherical trigonometry, conic sections, infinitesimal calculus, and also of applied mathematics, dynamics and statics. Lombardini closes this list of skills by explicitly recommending his student to the teachers in Paris. This is an official document, written by Lombardini on letterhead of the Duchy, countersigned by the secretary and by the president of the University Marquis Filippo Dalla Rosa. Actually, no documents about his studies in Paris have been found.

He came back to Parma in 1824, at first as a substitute teacher, and later on the Chair of Theoretical and Experimental Physics and the function of Director of the annexed Physics laboratory as for ducal decree issued in 1827 by Maria Luigia Duchess of Parma, Piacenza and Guastalla. As a professor, he organized lectures, updated the physics laboratory, recruited a laboratory assistant for the laboratory and decided the construction of new rooms and closets where placing the scientific instruments bought from foreign countries with the funding that the sovereign had granted. The unrest of 1830-31, which will be discussed in the third section, caused his dismissal from the university and his later removal.

After the revolution, he began his new life as a refugee. At first, he went first to Dole, France, then to Geneva, Suisse, in the laboratories of Pierre Prevoste and Auguste De La Rive. In his *Carteggio* [5] we find some hints of his relationship with important contemporary physicists like Ampère, Arago, Biot, Dulong and Faraday, the last one a dear friend until the end of his days. He went then back to Paris, hoping for an immediate return to his country. Finally, in 1839, he was called in Naples to become the Director of the new Meteorological Vesuvian Observatory. The love for freedom soon led him to share the revolutionary movements of 1848. After those events, he was fired by all the public jobs and retired himself in Portici, Naples, where he kept working on his instruments until his death (by cholera) in 1854.

Turning back to the 1831 facts, the dramatic extent of the change in his private life due to those revolutionary events can be found in his letters about the exile. In fact, on November 15, 1830, at 10 a.m., as a Professor of Physics, Melloni delivered his lecture at the end of which he is said to have inflamed the audience with words clearly hinting to liberal ideas. Probably, Melloni did not make a written copy of his famous speech, as he was used to give impromptu speeches, but some extracts of it have apparently been reconstructed. In his letter of October 15, 1835 to Victor Cousin, Minister of *Educazione Nazionale*, who was in charge of appointments and subsidies, Melloni describes the risings, his role and responsibilities in them, and the condition as an exile he shares with his brother. This letter was found by Lorenzo Bocci in Cousin's Correspondence and it was later published in *Aurea Parma*, in the January-March 1956 No. 1 Issue, though remaining almost unknown to the large public and it does not even appear in the *Carteggio* about Melloni's correspondence [5]. Together with this letter,

---

<sup>(1)</sup> Biblioteca Palatina, bottom Micheli, drawer Melloni, folder 6. (unpublished document).

we are in possession of the trial records and of the bill of indictment, which are filed at the State Archive in Parma, where excerpts from his inaugural lecture are quoted. We can also find the conclusive remarks in a letter Melloni wrote to Arago on October 20, 1835, and that was published by Stern in his *Séances et Travaux de l'Académie de Sciences Morales et Politiques*, while relating on the relationships among Melloni, Arago and Metternich [6]. Since this document, which was published only in 1905, did not have a high circulation, it is interesting to report the description of his condition as a refugee.

*Monsieur (Arago),*

*je vous remercie beaucoup de l'intérêt que vous inspire la position d'un pauvre exilé. – Vous l'avez deviné, Monsieur – mon plus grand bonheur serait de pouvoir continuer tranquillement mes recherches scientifiques, des places qui exigeraient une grande perte de temps ne me conviendraient guère et ma délicatesse m'empêchera toujours, d'accepter des pensions gratuites ou des sinécures. Il me semble avoir déjà eu l'honneur de vous dire, que j'appartiens à une famille passablement aisée, et que, rendu à mon pays, je n'y manquerai de rien... ici, je ne parviens à travailler qu'à force de privations, car la vie y est chère, et nos rentes diminuent tous les jours, depuis que l'un de mes frères, fort habile dans l'agriculture, a été forcé de quitter l'administration de nos fonds et de m'accompagner dans l'exil. Les conservateurs de vos belles et nombreuse collections d'instruments de physique ont tous mis leurs cabinets à ma disposition avec une bonté dont je ne saurais trop les remercier... mais il n'est pas nécessaire de dire à M. Arago que "le nouvelles inventions exigent presque toujours de nouveaux appareils... à mesure que j'avance dans la science, je me vois dans la nécessité de réduire les dépenses de la vie purement animale. Mais il y a une limite à tout, et j'oscille maintenant autour de cette limite poussé par l'action alternative de deux forces contraires: l'amour de la science, et l'instinct de la conservation individuelle..."<sup>(2)</sup>.*

The scientific activity of Melloni begun at the University of Parma and never stopped despite his politics troubles. His first works were in the meteorological area. At the beginning of 1824 he researched a relation between the barometric changes and the status of the sky, looking also for an explanation about the origins of the wind. In this research area it is valuable also the work done on the scientific instruments that led to the realization of Melloni's hygrometer (fig. 1), designed to remedy the inaccuracy of the previous Sausse's hygrometer. The work on the hygrometer can be considered as a forerunner of modern European research projects due to the character of international cooperation settled up with a group of physicists like Prevost and Nobili, with whom he shared the theoretical lines, De La Rive, for his help on the production of glass structures, and Amici, who performed the construction of a system for the fine adjustment.

The interest of Melloni for meteorology never turned off, as is shown by lots of memories by him, proving his interest for the subject, also during the exile, *e.g.* the observations about the melting of snow<sup>(3)</sup>, some explanations about the dew's phenomenon<sup>(4)</sup> and the atmospheric electricity<sup>(5)</sup>.

<sup>(2)</sup> Macedonio Melloni's letter to François Arago - Paris, le 20 octobre 1835.

<sup>(3)</sup> Observation sur la cause qui produit la fonte hative de la neige autour des plantes, *Comptes Rendus*, VI, 1838, pp. 801-807.

<sup>(4)</sup> Nuove esperienze di formazione della rugiada, Biblioteca di farmacia, chimica, fisica e medicina, XXIII, 1845, pp. 191-194. Sur la theorie de la rosee, *Compt Rendue*, XXV, 1847, pp. 145-160.

<sup>(5)</sup> Osservazioni attorno agli effetti del fulmine, *Corrisp. Scient.*, Roma, II; 1853, pp. 274-276.



Fig. 1. – Hygrometer of Melloni, built in the physics laboratory of the Ducal Universities, from the Macedonio Melloni Collection of Physics, in the Department of Physics and Earth Science of the University of Parma. The photograph was made by Studio photo Vaghi in the 1954, for the celebrations of the centenary of the death of Melloni.

The sight offered by the nature in its multiple forms was cause of his interest and study, as he wrote in the introductions of the *Termocrôse, ou la coloration calorifique*, his mature work in which he suggested and explained his ideas and his studies in an organized form<sup>(6)</sup>. Even the studies on the solar radiation and the “radiant heat” started in the parmesan years.

One must recall that the “radiant heat” was observed for the first time by Sir William Herschel. As reported by John Tyndall, “In the year 1800 Sir W. Herschel passed a thermometer through the various colors of the solar spectrum, and marked the rise of temperature corresponding to the color. He found the heating effect to augment from the violet to the red; he did not, how-even, stop at the red, but pushed his thermometer into the dark space beyond it. Here he found the temperature actually higher than in any part of the visible spectrum. By this important observation, he proved that the sun emitted dark heat-rays which are entirely unfit for the purposes of *vision*”<sup>(7)</sup>. Definitely, Herschel was the first to discover the infrared radiation, but he did not try to explain the nature of what he had recorded. Even the name, “radiant heat”, points to the differences between the light radiation and the caloric radiation, rather than to the possible analogies, as Melloni did. The instruments used so far to measure the radiant heat were thermometers, which were based on the increase of the volume of bodies due to the absorption of heat. Over time, the tools were improved, *e.g.* the liquid in the thermometer was replaced by the — more expanding — air. Moreover, the traditional thermometers were joined as a differential to Leslie or to Rumford<sup>(8)</sup>,

<sup>(6)</sup> The work was structured in two parts but Melloni was able to write only one before his death.

<sup>(7)</sup> John Tyndall, *Six lectures on light*, London, Longman’s Green and Co., 1873, Lecture V, p. 172.

<sup>(8)</sup> These thermometers are very similar. This consists of a glass tube, bent in the shape of letter U, and having at each end a glass ball filled with air, while the horizontal branch contains a colored liquid.

in order to increase the sensitivity of the instrument in such a way to appreciate small changes in temperature. The phenomenological picture of the time confirmed that there is “something” in the dark area close to the violet end and to the red end on the other side: these phenomena were named, according to their effects, and called respectively chemical radiation and caloric radiation. Following the discovery of Herschel, other scientists of the time devoted themselves to the study of radiant heat. In this regard, it is of interest the work done within the Arcueil Society, which was a group of scientists, including C.L. Berthollet, P.S. Laplace, A. Humboldt, J.L. Gay-Lussac, J. Baptiste Biot, J.E. Berard and others, who met in Arcueil (a small village in the south of Paris), in the summer weekends, to discuss both theoretical and experimental scientific issues. In the December 1812 Memoires of the Society<sup>(9)</sup>, they discuss some of the properties of the calorific and chemical rays and, while remarking that light and caloric radiation can produce similar effects, they do not conclude that these are due to the same cause. To such effects — chemical radiation, light and caloric radiation — were assigned different names because they thought that these were different phenomena. Melloni was the first one to think that the light of visible spectrum could be expanded, and that radiations can exist which are not visible to our eyes.

At the time, the experiments clashed with the low sensitivity of the thermometers, since they could not detect weak temperature variations. The careful researches of Melloni were indeed made possible by his development of a new instrument: the thermomultiplier.

Inspired by the thermoelectric effect, that had been just discovered by T. J. Seebeck (1770-1831), Nobili had built in 1829 a first thermopile, that is a set of metal bars of bismuth and antimony placed in alternating sequence and welded to the extremes. The metal bars were large and placed in a wooden box full of sealant, some junctions emerged from the box while the others were immersed in the insulating matrix, providing a progressive rise in temperature that could not be measured. Melloni achieved an enhancement of Nobili’s instrument, that worked by contact, making it suitable for the measurement of radiant heat (fig. 2). The improvement introduced by Melloni consisted in increasing the number of bismuth and antimony pairs, and in changing their arrangement and shape. The bars were made much thinner and numerous, symmetrical to the extremities, placed next one another and separated by strips of paper that assured isolation. All these enhancements, due to experimental observations because the underlying principles of Ohm at the time were not yet known<sup>(10)</sup>, led to the construction of the new instrument. He blackened the areas destined to collect the heat radiation, in order to absorb the whole radiation almost as a “black body”. The battery was then covered with a cylindrical brass structure, covered with paper and open at the ends, where cones of the same material could be placed. Such cones were used to direct the radiation towards the junctions of the stack, but also to isolate the structure from the variations of the environment temperature, and in particular from the disruption caused by the surrounding bodies. The increased sensitivity of the instrument allowed measurements of low-intense radiations. In its optimal conditions, it could give the “heat of a human body to the

---

<sup>(9)</sup> *Memoire de Physique et de Chimie de la société d’Arcueil, Sur les proprietes des differentes espèces de rayons qu’on peut separer au moyen de prisme de la lumière solaire*, par J. E. Berard, 21 decembre 1812, pp. 5-47.

<sup>(10)</sup> M. Melloni, *La thermochrôse ou la coloration calorifique*, Joseph Baron, Naples, 1850, p. 51. Melloni, after twenty years, thinks again of his discoveries.



Fig. 2. – Thermopiles constructed and employed by Melloni. From the left, thermopile with 14, 16, 25 and 10 elements. Macedonio Melloni Collection of Physics. Photo Vaghi 1954.

distance of 45–50 feet”<sup>(11)</sup>. By a galvanometer, it was then possible to detect the weak currents produced in that way. The current circulating in the galvanometer makes the magnetic needle rotating around its equilibrium position by an angle which depends on the intensity of the radiant heat. The preliminary work of the experimental apparatus was not yet finished: one should look for the correlation between the intensity of radiant heat and the values given by the galvanometer, which does not provide a linear response for angles greater than 20 degrees. Melloni prepared therefore the tables for the calibration of the instrument<sup>(12)</sup> [7]. The measurements of radiant heat required also the realization of a modified optical worktable, afterwards called Melloni’s worktable. The optical bench was formed by a copper bar of about one meter of length, mounted on a wooden support, on which various elements could be set up: sources, screens, mirrors and dispersive elements. Melloni employed four different heat sources: the flame of a Locatelli lamp (that is a contemporary lamp used for experiment on thermal radiation), a spiral of platinum wire made incandescent by an alcohol lamp flame, a copper plate heated to 400 degrees and another one heated to 100 degrees (the latter is the face of a Leslie’s cube containing boiling water). The thermopile was mounted on a swivel arm to extend the possibilities of measurement (fig. 3).

The revelator developed and used by Melloni, the so-called “termomoltiplicatore” (*i.e. thermomultiplier*), consists of a thermopile and an astatic galvanometer. It was the key tool of his experiments in those years and, as he declared in a April 9, 1831 letter to Pierre Prevost, he carried his beloved instrument with himself also in his exile [1].

With the new instrument, Melloni could repeat some experiments on the transmission of heat in the air by a direct and immediate propagation, which took the name of irradiation, and which was different from the propagation by conduction and convection, that instead required a long time. In fact, the caloric radiation of the Sun arrives on Earth through the atmosphere, the air warms up, and the bodies exposed to the radiation warm up at a higher temperature than the air. Similar effects are observed with a fire warming the bodies at a distance, without a correspondent growth of the air temperature and independently of the air currents. The propagation of heat is carried out therefore even without a material mediation. It is instantaneous, since it does not depend on the

<sup>(11)</sup> See footnote<sup>10</sup>, p. 67.

<sup>(12)</sup> See footnote<sup>10</sup>, chapt. 1, sect. 5.

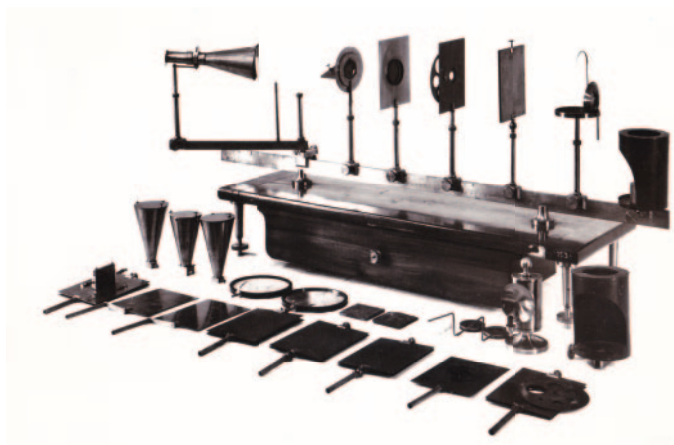


Fig. 3. – Melloni's optical bench. Physics department of the University of Naples. Photo Vaghi, 1954.

distance between the source and the detector, as Melloni explained<sup>(13)</sup>. If we set the stack to a distant source of caloric and place an opaque body in the vicinity of the first stack and then in the vicinity of the source, in both cases by removing the screen the time necessary to the galvanometer for the measurement are perfectly equal and almost instantaneous<sup>(14)</sup>.

Accurate measurements of the intensity of the radiant heat have also confirmed that it decreases with the law of the inverse square of the distance, a fact which was not accepted by all physicists of the time, *e.g.* Leslie.

Further experiments led him to determine the emissive power of the bodies and their absorbent and reflective powers (fig. 4). The absorption was studied for different materials using the four sources of the workbench, which emit at different temperatures. The non trivial result was that, while the metal disc covered with black smoke equally absorbs from any kind of sources, other discs coated with lead carbonate, if exposed to radiation of different caloric sources will reach different temperatures, in a ratio between 100 and 24. Such experiments evidenced that the heat radiation of bodies at different temperatures contain different species of caloric rays.

By his studies on the passage of caloric radiation through solids and liquids, Melloni was led to propose a new nomenclature for the science of caloric, as new words are needed to describe and classify new properties. Melloni proposed the name *Thermochrology*, that is to say, *Doctrine of colored heat*, in order to designate the science of radiant heat. In other words, radiant heat is composed of various elements, as the light is composed of various colored components. Different terms were also required because there exist bodies, such as glass, which, while transparent to light, completely stop the caloric radiation (if emitted by a source at a temperature below a certain threshold temperature, *e.g.*, 180 degrees in his experiments). The thermic transparency of body

<sup>(13)</sup> M. Melloni, remarks to the *Fisica sperimentale di Poulet*, Napoli, Puziello Editore, 1846, p. 298.

<sup>(14)</sup> See footnote<sup>13</sup>.



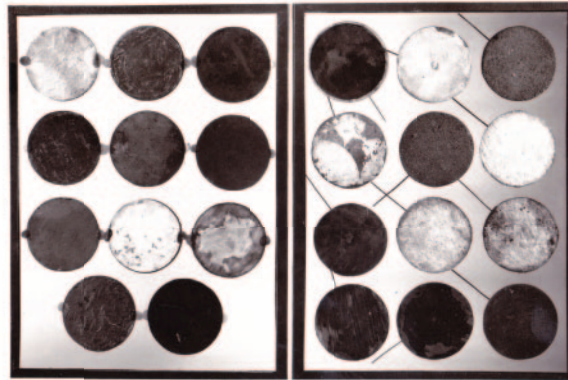


Fig. 4. – Disks of tin covered by Melloni with various substances, used for the study of the diffusive power. The notes in the back, with the indication of the substances, are written by Melloni himself. Macedonio Melloni Collection of Physics. Photo Vaghi, 1954.

was called *Diathermasy*<sup>(15)</sup> and the corresponding opacity<sup>(16)</sup> *Adiathermasy*. Rock salt is a special substance, completely “diathermic”, and is also transparent to light (suitable for the manufacture of lenses). Other substances such as smoked quartz are diathermic, but this property depends on the source, on the thickness of the sample and on the roughness of the surface.

Melloni performed also many experiments on the polarization of caloric ray, using mica or tourmaline as polarizing materials, verifying both the polarizability of the thermic radiation, and the dependence of the polarized portion on the direction of the rays, in contrast to the theory proposed by J. D. Forbes, sustaining the dependence on the temperature of the source<sup>(17)</sup>. These experiences were particularly complex from the experimental point of view, but they helped to bring further evidence to his ideas.

Melloni investigated the heat emitted by hot bodies, from both bright and non-luminous sources, the latter emitting the so-called dark radiant heat. He went so far in his studies as to try and measure the infrared radiation emission from the Moon, thus giving start to a new kind of explorations of the space. He also started the study of the solar spectrum from the point of view of the caloric. By means of a prism of rock salt he observed that the maximum heat is always located in the space over the dark red, at a distance comparable to that between yellow and red in the visible spectrum. If you change the material of the prism, even the heat distribution only in the invisible part changes drastically, shifting the position of the maximum<sup>(18)</sup>. However, the energy associated with the issuance of the invisible radiation is greater than the visible one.

A great part of his research was dedicated to the study of the radiant heat and to sustain the thesis of the principle of identity *i.e.* the fundamental idea that light and radiant heat have the same nature [7]. Tyndall’s words explain very well this principle:

<sup>(15)</sup> The name Diatermancia, as reported by Melloni, it has been suggested by Ampère.

<sup>(16)</sup> M. Melloni, *Proposal of a new Nomenclature for the Science of Calorific Radiation*, Bibliothèque Universelle de Genève, N. 70, October 1841. pp. 527, 536.

<sup>(17)</sup> See footnote<sup>16</sup>, p. 318.

<sup>(18)</sup> See footnote<sup>16</sup>, pp. 320-321.

“That they are identical in *all* respects cannot of course be the case, for if they were so they would act in the same manner upon all instruments, the *eye* included. The identity meant is such as subsists between one color and another, causing them to behave, alike as regards reflection, refraction, double refraction, and polarization”<sup>(19)</sup>.

At a time in which even the wave theory of light was not yet fully established, his findings were hard to be accepted in the international scientific context. However, the multitude of data and experimental observations, carried out with carefulness and scientific accuracy, taking into account possible secondary emissions and using appropriate measures, contributed to make his work widely known. After so many works and experiments Melloni wished an acknowledgment by the scientific world. The recognition that Melloni expected, arrived only in 1835. In that year a report, on his work on the radiant heat, commissioned to S.-D. Poisson, F. Arago and J.-B. Biot by the Academy of Sciences of Paris, was edited by Biot. It is a document of 139 pages which analyzes experimental method, too and results obtained by Melloni. The referees close their report with words of praise, advising the Academy to give its approval to the experiences of Melloni and to publish all of his memories in the collection of foreign scholars. The report was so important that Melloni sent it to Parma with a dedication to his father by “a very affectionate and grateful son”<sup>(20)</sup>.

Melloni’s pioneering research on infrared radiation [8,9] won him a prominent position inside the European scientific community of his time. In fact, he became a member of the French Academy of Sciences in Paris and, thanks to Faraday’s support, the London Royal Society awarded him the Rumford Medal for his scientific achievements. Even in the *First meeting of the Italian Scientists* (Pisa 1839), when Italy did not yet exist as a nation, scientists spoke of him and of his discoveries. In that conference, more than four hundred scientists met together to accomplish their purpose of development, spread and applications of science. Skimming through the Acts of the First Meeting, we can get an idea of the scientific climate of the time through the description of the various scientific projects. Melloni, though not present, was acknowledged as one of the top scientists in his time. In the report of Prof. F. Corridi, general secretary of the meeting, the different work sessions are analyzed. In the Physical Chemistry and Mathematics section, the words<sup>(21)</sup> of the President Prof. P. Configliacchi are reported: “*cui piacque ragionare sulle ultime sperienze del Melloni sulla Diatermancia, cioè sulla facoltà che hanno i corpi di dar passaggio in certi casi ad alcuni raggi particolari contenuti nel fascetto di calore incidente. Ei colse quella opportunità per animare i cultori delle fisiche discipline ad istituire indagini sopra un nuovo ramo di fisica moderna, la Dialettromancia, che a buon diritto di stima ubertoso di fenomeni utili all’avanzamento delle scienze naturali*”<sup>(22)</sup>.

Those researches went on during his entire life. It is meaningful, for attachment of Melloni to the physic, to remember that the expected delivery of a new scientific

<sup>(19)</sup> John Tyndall, *Six lectures* cit, p. 179.

<sup>(20)</sup> The autographed report is kept at the Department of Physics and Earth Sciences, University of Parma.

<sup>(21)</sup> Note of The first meeting of the Italian scientists, in Pisa, Tipografica Nisti, 1840, p. XLVIII.

<sup>(22)</sup> Who liked to think about the past experiences of the Diatermancia of Melloni, that is on the faculty who have the bodies of allowing the passage in some cases to some particular rays contained in the incident beam of heat. He took that opportunity to animate the cultivators of physical disciplines to establish a new branch of research of modern physics, the Dialettromancia, which rightly are estimated to be rich of phenomena useful to the advancement of the natural sciences.

instrument by a craftsman in Naples in 1854, was just the occasion of his improvident return to a city plagued by cholera that brought him to death<sup>(23)</sup>.

We shall review now the main 1831 occurrences touching the Melloni's career. In fact, undoubtedly, his involvement in the revolutionary events in Parma and his subsequent exile have played a major role in the further development of his scientific life, tossing him into an international scientific dimension.

### 3. – The raising: the people and the events

The raising of 1831 had been a very difficult time for the Duchy of Parma: there were hubs of political conspiracy to which a general dissatisfaction against the government was added. The political conspiracy was using the pages of the newspaper *The Eclectic* and publishing brochures such as the translated French constitution in order to gain consent. An important center of political conspiracy was the country home of the Melloni family, where they gathered their weapons and were planning uprisings. Even schools and students' homes were places of conspiracy. The atmosphere was electric and a spark could be enough to provoke an uprising [10].

We start with a short account about the outstanding personalities of that period having a role in the University insurrection, and the events that involved Melloni and the University's students.

**3.1. Historical evidence from Antonio Gallenga e Antonio Lombardini, two contemporaries of Melloni.** – The student Antonio Carlo Napoleone Gallenga (1810 –1895), because of his involvement in the risings, had to flee as an exile first to Corsica and later to Marseille [11]. He joined the “Giovane Italia” founded by Mazzini and planned, among other things, to kill the king Carlo Alberto, a bold enterprise he did not carry out. He again was back to Italy in 1854, when he was elected as a deputy in the Subalpina Chamber. Nevertheless, one year later he had to resign because, faithful to his deep commitment to the truth, in his book *History of Piedmont* (1855) he admitted to have attempted on the king's life [12]. After that, he kept on working as a correspondent for the Times.

He signed his first works as Luigi Mariotti, the pen name he had adopted during his exile. Only after his marriage did he start to use his true name. His writings did not report direct descriptions of the facts that had taken place in 1831, but a lot of it can be found or reconstructed by reviewing all his works and, in particular, his contribution to the periodical *Rivista Contemporanea*. For *Rivista Contemporanea*, in fact, he started to write a novel entitled “*La nostra prima carovana*” based on the 1831 risings in Parma. It consists of an extensive narration starting with the students' conspiracies and unrests inside the University leading up to his arrest and imprisonment with other students at Fort Compiano, in the Parmesan Apennines

This novel was never finished [13]. The published part is marked by a seriocomic style with characters taken from real life but presented under a false name. The university students are referred to as the cheeky boys of San Rocco, from the name of the monastery later to become the seat of the University.

Another interesting testimony comes from a state official, Antonio Lombardini. Former teacher of Mathematics at Parma University, he was appointed Chancellor by a sovereign decision on March 18, 1825; since that very day he started writing a personal diary. We can read in its first page: “*Memorie storiche attorno alla Ducale Università*”

---

<sup>(23)</sup> Letter of M. Melloni to his brother Henry, Portici August 7, 1854.

*degli Studi di Parma a cominciare dal 18 marzo 1825 (al 1835)*"<sup>(24)</sup>. The date in brackets shows a different handwriting, therefore it cannot be supposedly ascribed to Lombardini. That date coincides with the final abolition of the University, a process which had started immediately after the revolutionary risings and was permanently ratified in 1835 with the opening of the *Scuole Superiori* as an intended replacement of the University<sup>(25)</sup>. On the cover Lombardini explains the right meaning he attributes to this work: "*Notizie storiche scritte a penna corrente senza la menoma pretenzione per la sola memoria delle cose avvenute 1825-...*"<sup>(26)</sup>. The diary was conserved in the University Archives even during the Austrian occupation, when the University buildings were turned into barracks and the vast halls into horse stable. When in 1854 the Austrian soldiers left the premises, the archives remained untouched and all the boxes sealed. We have to wait until 1886 to see these documents reappear, at the time when they were partially used to reconstruct the history of our University. Lombardini's Diary, in particular, was saved by Senator Giovanni Mariotti [14], local history scholar, who worked just on a part of it, leaving the rest unpublished.

We summarize now the sequence of the events where Melloni was directly or indirectly involved. Drawing from our sources, in the academic year 1829-1830, the usual opening ceremony was being postponed due to disagreements between the Headmaster of the University and the Theology Professor, who was expected to give the speech and insisted in giving it in Italian while the Headmaster demanded it in Latin.

**3.2. Main acts of the revolt and the active participation of Melloni.** – A new academic year started with social unrests, on November the 11th, 1830, and the inaugural lecture was held by Don Marco Tamagni, Professor of Dogmatic Theology. Professor Tamagni got his own way and managed to pronounce his inaugural speech to start the academic year in Italian, but his act of disobedience was immediately punished with the suspension from his office which was signed by the Duchess herself the following day.

Even the inaugural lecture of Melloni, November 15, had important consequences. We prefer to leave a detailed account of what happened to our eye-witnesses. This is what appears as reported in Lombardini's Diary: "*Il D. Macedonio Melloni Professore di fisica ha aperto oggi, alle 10 di mattina le proprie lezioni con una prolusione, nel termine della quale si è lasciato trascorrere a frasi liberali ed allusioni politiche si ardite da esaltare fuor di modo gli animi della Gioventù, e da intercorrere altamente nella Sovrana disapprovazione. Per disposizione di S.M. ed in conseguenza dell'impressione con cui è stata ricevuta dalla corte la notizia del detto discorso, rimane espressamente vietato ai Professori di leggere qualunque Prolusione o qualunque Orazione tanto per l'apertura delle Scuole che per altre circostanze*"<sup>(27)</sup> (fig. 5).

---

<sup>(24)</sup> Historical memories about the Ducale Università di Parma, beginning from March 18, 1825 (to 1835)

<sup>(25)</sup> The Diary, once classified as the code D.X.S.I. of the Historical Archives of the University, has now the code number inv. 183.

<sup>(26)</sup> Historical news handwritten without any literary pretension, only to remember. 1825- ...

<sup>(27)</sup> Professor Macedonio Melloni, teacher of physics, has started today at 10 a.m. his lesson with a prolusion ending with liberal expressions and political allusions as to exagerately exalt the minds of the students, which made him fall in the Duchess's dislike.

As ordered by Her Majesty and as a consequence of the speech [...], from now on it is forbidden to all the teachers to give any prolusion either at the beginning of the lessons or in any other circumstances.

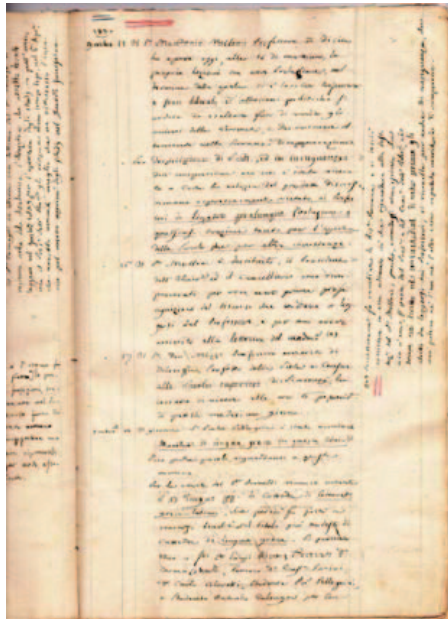


Fig. 5. – The page from *Lombardini's Diary* reporting on the inaugural speech by Melloni and further disciplinary measures taken by the Sovereign. (Courtesy of the Historical Archive of Parma University.)

Here follows the testimony by Gallenga concerning Melloni's speech and the enthusiasm it aroused in the students: "*Ausonio Merlino (il nome non corrisponderà forse a quello che si trova nell'elenco della facoltà di quell'anno, e a dir vero sull'autenticità d'altri nomi che occorrono in questa narrativa sarà lecito al lettore l'intrattenere i suoi dubbi), uomo salito poscia ad alta fama, ma allora il più giovine e il più benviso di tutti i nostri istruttori. Egli era allievo della Scuola Politecnica di Parigi, né dubitò nel suo discorso di tesser l'elogio dello slancio generoso con cui gli antichi suoi condiscipoli s'eran lanciati sulle barricate nelle famose giornate del luglio scorso, ed avevano avuto mano in quel bel guazzabuglio che aveva sostituito il vecchio ramo dei Borboni il non men putrido ramo degli Orleansesi, ed aveva scosso fin dalle fondamenta il rimanente d'Europa.*

*Quella parola gittata dal Professore tra noi, d'elogio a tumultuose scolaresche fu scintilla più assai elettrica di alcun'altra mai che uscisse dalla più possente delle sua bottiglie di Leyden. L'intero giovanile uditorio balzò in piedi: gli applausi stroncarono l'arringa, l'oratore fu piuttosto portato che accompagnato a casa da ben trecento giovani; e la sera fin oltre a mezzanotte furon tripudi e serenate nella Strada Santa Lucia sotto le finestre di casa Merlino: che più? Tra le arie della Cenerentola e della Gazza-ladra è fama che risuonassero le sinistre note della recente Parisienne!<sup>(28)</sup>." [15]*

<sup>(28)</sup> Ausonio Merlino (the name will not be found in any other document of that year's Faculty list, and the reader is legitimated to doubt about the authenticity of the other names in this text) who was to become a famous man, at that time was the youngest and politest of all our teachers. He was a student at the Polytechnic School of Paris, and in his speech he was sure to praise his fellow students that the previous July had fought and had taken part in that muddle responsible for the fall of the Borboni and the consequent succession of the not less rotten branch

Probably the more accurate testimony concerning Melloni's speech is annexed to a bill of indictment and betrayal written by the State Secretary Baron Werklein against some of Parma's notables [16]. It had been sent to Maria Luigia and kept in the State Archive of Parma at the section *Segreteria di Gabinetto*. This act contains an extract<sup>(29)</sup> taken from Melloni's inaugural lecture.

*“Giovani egregi, date opera nell'apprendere questa nobile e fecondissima scienza ed in questo mentre le più sublimi virtù vi rendano magnanimi. E tu ne sarai esempio nobilissimo Ateneo della più colta metropoli del mondo: tu che imbandisci le armi a scudo della patria in mezzo alle accademiche esercitazioni, e fatto sei primo rigeneramento di una Era in cui la Francia ha stupefatto l'Europa che si commuove tutta quanta a tanta azione strepitosa, ed offre inaudito esempio di patriottismo. Mirate o giovani il vero valore, non dal lungo ordine degli avi, inutile vanto, non da quegli onori sempre vili che compransi dalle anime piccole e vendonsi al dispotismo, ma da quelle virtù che ardita si dimostra sulla fronte degli uomini franchi e liberi, lungi dai palagi dei grandi ove non ha che prepotenza, ignoranza e servilità: visitate al contrario i tuguri e là troverete questa virtù che langue oppressa e calcata dall'onnipotente forza del despota. Ma io vi dico che per breve tempo rimarrà questo regno della forza, e che vicino si è il momento in cui dovrà soccombere e così trionfare il patriottismo vero che si debbe tutti ammirare.*

*Vedete, sentite le verità, non mancavi energia per predicarla, vi stia sempre a cuore la custodia della vostra libertà personale e dei propri diritti. L'amor patrio vi sia sempre guida, e se il vorranno propizie le circostanze, non ricusate il soccorso del vostro braccio per meritervi la civica corona.*<sup>(30)</sup>”

The day after this speech, Melloni was suspended from his office by a Sovereign Decree. In the Historical Archive of the University we can find some documents concerning both

---

of the Orleanensi, and that had made the entire Europe crumble.

That words of praise for tumultuous students, said by the professor, caused an electric spark stronger than those produced by his Leyden's jars” The entire audience stood up: the speech was interrupted by applause, and the speaker was carried rather than accompanied home by three-hundred students; and then until midnight there have been dances and songs in the Santa Lucia street, under the windows of Merlino house: what else? With the music of “Cenerentola” and “Gazza Ladra” it is notoriously said that, that night, also the sinister notes of the recent Parisienne were heard.

<sup>(29)</sup> Archivio di Stato (Public Records Office) Segreteria di gabinetto b. 391, appendix B.

<sup>(30)</sup> Noble students, your duty is to learn this noble science and at the same time learn the highest virtue. And this university will be for you the highest example: this university that celebrates the motherland in the course of the lessons, and that promotes the revolution that from France spread all over Europe [...], is the highest example of patriotism. The valor comes not from an ancient, celebrated past, nor from money or privilege given by some old palace. It comes from that virtue typical of the honest and free man, far away from the halls of power where there is nothing but arrogance, servility and ignorance. Dear students, you have to visit the poor neighborhoods, and see this virtue oppressed by the Despot. But I tell you that soon this reign of oppression will come to an end, and all the people of our land will soon be animated by the same patriotism that now guides all of us. You have to see and hear the truth, and you must to spread this truth all around you: always hold dear the conservation of your own freedom and rights. The love for the motherland will guide you, until you reach, one day, the decoration for your virtue.

the Sovereign Decree and the note containing the detailed instructions to look for a substitute for the Chair Professor of Physics.

As soon as Gallenga heard about the removal, he called a general meeting of all the students to organize actions.

This is Gallenga's report concerning the blockade of the Physics lessons by the students: *“La mattina seguente, il fatale 3 gennaio, sorse fosco e piovoso. Si riunivano nell'atrio dell'Università i soli studenti componenti il corso di fisica. ... Centinaia di membri più adulti delle facoltà mediche e legali, uditori, graduati dell'Università, ed altri numerosi e poderosi ausiliari, si astennero a richiesta nostra, perché si volle evitare tutto ciò che avesse pur l'ombra di sfoggio e di parata. Dall'atrio la radunata scolaresca ascese in corpo per l'ampio scalone, e percorse lentamente i vasti e lunghi corridoi che, girando tutto intorno al palazzo, terminavano appunto nella gran porta del Teatro di Fisica. La porta era chiusa ...*

*Regnava in tutto il vasto edificio l'usato silenzio: non c'era segno d'allarme, non apparato d'offesa o di difesa: la facoltà e il Governo non davan segno d'inquietudine, ma ciascun di noi sapeva come si potessero alloggiare interi reggimenti negli imi penetrati di quell'edificio e specialmente nelle interminabili catacombe delle cantine senza che anima viva se ne accorgesse. .... L'orologio della torricciuola posta dirimpetto alla specola battè finalmente le nove. L'ora era scoccata e più di un cuore spesseggiò i suoi battiti. Uno dei mazzieri spalancò i battenti della porta del Teatro di Fisica, e secondo il costume di quell'antico classico stabilimento, pronunciò con voce stentorea il suo: EST HORA, O DOMINI! ...*

*Sedeva al suo posto in cattedra, dietro la tavola, il professore novello ... era livido e sbattuto in volto, chè aveva udito come i suoi allievi volessero fargli la festa ... la voce del bidello cadde inavvertita. ... la grave adunanza continuò a camminare innanzi e indietro pel corridoio lentamente e tranquillamente come se, venendo, non avessero avuto altro scopo al mondo ...*

*Due o tre volte secondo il costume e il regolamento, si ripeté la chiamata d'intervalli di 5 minuti. Compito il quarto d'ora di rigore, che accordavasi agli studenti in casi straordinari, si richiusero stridendo i poderosi battenti” [17]<sup>(31)</sup>.*

On January 5, it happened again. Lombardini does not describe what happened on January 3 and 5. He reports, however, about the events that occurred on January 8 as

<sup>(31)</sup> The next morning, the crucial January 3rd, it was wet and cloudy. In the courtyard of the University only the students of physics were present. Hundreds and hundreds of students of medicine and law, listeners and graduated adults weren't here because of our request, because we did not want a parade. From the atrium, we went to the “Theater” of Physics, walking slowly along the corridors and up the stairs. The doors of the theater were closed.

In the building all seemed normal. There was no alert signal, nor sign of offense or defense: the university and the government were silent. But everyone of us knew how easy it was to hide entire battalions in that building, and especially in the crypts [...].

The clock finally struck nine. The university porter opened the doors of the “theater”, and shouted as it was usual in that ancient university: EST HORA, O DOMINI!” ...

The new professor at that moment was sitting behind the desk. His face was pale, because he had heard what his new students wanted to do. . . the voice of the porter was ignored.

The group of students went on walking back and forth in the corridors, as if they had nothing else to do.

The porter shouted again two or three times [...], as the custom and the rule said. When 15 minutes passed [...], the doors were closed with no one inside, except for the new professor behind the desk.

well as the content of the Sovereign's *Motu proprio* that decrees the cancellation of the course of Physics, the expulsion of every foreign student, and the prompt closure of the entire University in case of new turmoil. In the annexed note (written on a separate sheet of paper) it is established to imprison and lock in Compiano's castle some unruly students: Campanini Pietro, Gasparotti Agostino, Ricci Antonio, Rondani Emilio, Sidoli Giovanni, Dazzo Giacomo, Gallenga Antonio and Mori Alessandro. At least five of them are Physics students.

Here again is Gallenga's testimony: "*Dietro la scolaresca stava tutta la popolazione, giacché Parma non era, come Pavia, Padova o Pisa, semplicemente città universitaria, dove il più degli studenti vengono da fuori, e non v'hanno relazione od appoggio: gli studenti nostri eran tutti dello stato e il più cittadini; erano il fiore del giovane sangue parmense, e il popol nostro, sebbene borbottasse talvolta a qualche nostra scappata più grossa delle altre, non avrebbe però troppo leggermente patito che al più pusillo e al più tristo dei nostri monelli venisse torto un capello*"<sup>(32)</sup> [18].

In the days immediately following the arrest of the students, the rebellion broke out in town, events came to an end in a few days: on February 13, the ducal troops were seized and disarmed and Baron Werklein was forced to leave. On February 14, civic consent was summoned, and during that night the Duchess left town seeking refuge first in Casalmaggiore and, later, in Piacenza. The following morning, February 15, a provisional government was appointed: it was composed by five members and presided over by Count Filippo Linati.

As reported by Lombardini, Melloni came back to town: "*La mattina del 17 febbraio verso il mezzodì o poco dopo il Pr. Melloni, di ritorno a Parma, seguito da una corte di giovani in armi reca trionfalmente una Bandiera tricolore all'Università, la colloca su Portone principale d'ingresso, vi stabilisce un corpo di guardia permanente, e viene nella sala delle adunanze una convocazione di studenti per aggiungere di nuovi membri il consesso civico di Parma. la sera del 18 o del 19 arrivano da compiano gli otto studenti che vi sono stati mandati in arresto, fatti liberi per ordine del Governo Provvisorio e sono accolti sulla piazza e lungo le vie dai rumorosi applausi dei loro condiscipoli*"<sup>(33)</sup>.

Melloni was appointed a member of the new provisional government, which worked steadfastly making every possible effort to save the State from anarchy. In only twenty-eight days of very hard work, in spite of the lack of financial resources, it eventually brought about relevant measures, some of which would concern also the University rules, such as the one about the Headmastership, which would become an elective office: the Headmaster was to be elected every year by the university teachers from a list of three candidates designated by the students.

But in the morning of March 13 the German troops broke into town restoring the government of Her Majesty Maria Luigia: freedom was suppressed, rebellion was put down.

<sup>(32)</sup> All the town was supporting the students, because Parma was not, as Pavia, Padova or Pisa, some simple university town where almost all the students were foreigners [...]: our students were all of the Duchy, and most of them were citizens; they were the elite of the town, the new generation, and though sometimes people did not approve certain behaviors, nobody would ever accept that they could be harmed anyway.

<sup>(33)</sup> On February the 17th, around noon or shortly after, Melloni [...] followed by a court of armed young, brings triumphantly a three-colored flag at the University, places it on the main gate, puts a guard duty at it and then goes back to the [...] class to meet his students. On February The 18th or 19th, at night, the eight jailed students come back to the town from Compiano, freed up by an order of the New Government [...].



One of the first acts issued by the restored government, dated Piacenza March 14, and published in Parma on March 17, was the closure of all Parma University courses. All the foreign students were sent away. The Austrian troops took possession of the University buildings. The Head of Parma Police, Vincenzo Cornacchia, started his “manhunt” to arrest all citizens and students who had taken part in the risings. On top of the list of the persons wanted by the Police was Antonio Gallenga, who had proved to be the most politically active among the students. But while he was being hunted in the mountains, he had found shelter in Mariotti’s villa in Monticelli d’Enza. He then managed to escape as an exile under the assumed name of Luigi Mariotti. Many rebels were arrested, interrogated and brought to trial. Melloni managed to escape, choosing exile.

Soon after Maria Luigia was put back to the throne, a real “manhunt” was undertaken and, during a house search in the Melloni family estate, the Ducal Dragons Guards found tricolour cockades. The Public Prosecutor, after hearing all the witnesses for the prosecution and having examined all the gathered evidence, issued a bill of indictment against all the chief actors in the risings, including also Melloni. Many rebels were put on trial and, thanks to the Sovereign’s mercy, some of them got a verdict of acquittal and were even reinstated in their office on a full salary, but this wasn’t Melloni’s case!

#### 4. – Conclusions

We may wonder why just Melloni, of all the people, was denied permission to come back to his native country.

Melloni himself seemed to be unable to find a reason for this unfair treatment and his correspondence echoes all his sorrow for not being allowed back to his homeland [19,20].

Three different reasons could be suggested as a reason for this denial:

- 1) A legal-juridical difficulty: a house search had led to the confiscation of a tricolour cockade in a hayloft located near a house belonging to the Melloni family, in Valera, a country village a short way from Parma. The house had been rent to a farmer, who had eventually undergone trial, but it was apparent that the whole Melloni family must have been behind this, supporting the risings as well as the rebels.
- 2) Melloni’s public image: he had been the undisputed protagonist, the charismatic leader of all the University students. On this point the articles which appeared on the newspaper *L’Ecclettico*, that could be defined as the “mouthpiece” for the risings, are really enlightening. The newspaper that was founded in Parma by Francesco Pastori on November the 1st, 1829, and had to close down on March the 8th, 1831. During its brief existence it helped spread the ideals of freedom, supporting the provisional government and putting great hope and expectations in the University students and their teachers.
- 3) A personal revenge: Maria Luigia had invested heavily in the University and, in particular, in a few of its best-known representatives, like Melloni.

In fact, many improvements had been brought about by Maria Luigia’s government in favour of the University: a new wide Physics laboratory had been built (many interesting documents on this matter have been recovered); under her rule the development of the Scientific Faculties had been promoted; museums had been opened, entire collections had been donated (for example, Bolca’s fossil fishes collection had been given to the Geology Faculty); Physics had been granted a substantial loan for renovation, new furniture,

assistant lecturers and, last but not least, all the necessary equipment for research had also been supplied.

After examining all the testimonies and documents gathered so far, we can conclude that Melloni was not merely involved in the events of 1831, but played a relevant role as an active protagonist. We have also ascertained that in this leading role he achieved widespread success both with the university students and, at least partially, with the academic world. This is a clear sign of how deeply the new ideals had permeated the cultural fabric in Parma in those days.

The harsh treatment he received could thus be ascribed to this leading role, together with the desire, on the part of Maria Luigia's court, to take revenge on a man who, in the previous years, had been strongly favoured and supported.

Finally, we would like to point out that if, from a legal point of view, his situation appears to have been particularly unfavourable, it proved indeed very propitious if we consider the cultural aspects and his scientific activity. In fact, during his long exile he had the opportunity to make the acquaintance of relevant personalities in the scientific world, to whom he was able to pay frequent visits, and to work in well-equipped and prestigious laboratories, like Prevost' and De la Rive's in Geneva.

From the old and new documents in our possession we can conclude that the seeds of the Risings of 1831 began to sprout inside the University of Parma, where they found a particularly favourable ground to grow, especially at the School of Physics of the University. Furthermore, the exile forced upon Macedonio Melloni, one of the chief protagonists, played a relevant role on the development of scientific research.

#### REFERENCES

- [1] LEONE M., PAOLETTI A., ROBOTTI N., "I fisici e il risorgimento", *Il Nuovo Saggiatore*, **27** (2011) 30.
- [2] GUARESCHI I., *Nuove notizie storiche sulla vita e sulle opere di Macedonio Melloni* (Carlo Clausen, Torino) 1908.
- [3] NOBILE A., *Elogio storico di Macedonio Melloni* (Stabilimento tipografico di G. Nobile, Napoli) 1855.
- [4] CIARAVELLA A., "Macedonio Melloni il patriota e lo scienziato", *Aurea Parma*, **38** (1954).
- [5] SCHETTINO E., *Macedonio Melloni - Carteggio* (1819-1849), in *Archivio della corrispondenza degli scienziati Italiani* (Olschki Editore, Firenze) 1994.
- [6] STERN A., *Une correspondance de Francois Arago, du prince De Metternich et de Macedonio Melloni*, in *Séances et travaux de l'Académie des sciences morales et politiques* (Paris) 1909, pp. 85-97.
- [7] CARAZZA B., *Il contributo di Melloni allo studio dell'infrarosso*, in *Gli strumenti nella storia e nella filosofia della scienza* (IBC Emilia Romagna, Bologna) 1983, pp. 141-155.
- [8] SCHETTINO E., "A new instrument for Infrared radiation Measurements: the Thermopile of Macedonio Melloni", *Ann. Sci.*, **46** (1989) 511.
- [9] SCHETTINO E., "Nobili, Melloni e il termomoltiplicatore", *G. Fis.*, **25** (1984) 365.
- [10] TOGNINELLI L., *All'ombra della corona* (Alessandro Farnese, Parma) 2012.
- [11] LASAGNI R., *Dizionario Bibliografico dei Parmigiani*, Vol. **2** (PPS Editrice, Parma) 1999, pp. 880-884.
- [12] ORSI P., *Antonio Gallenga dalla Nuova Antologia* (Società Anonima Treves-Treccani, Roma) 1932, pp. 1-20.
- [13] GAROSCI A., *Antonio Gallenga vita avventurosa di un emigrato dell'ottocento*, Vols. **I** e **II** (Centro Studi Piemontesi, Torino) 1979.
- [14] MARIOTTI G., *L'Università di Parma e i moti del 1831*, extract from the volume XXXII dell'Archivio Storico Parmense.

- [15] GALLENZA A., *La nostra prima carovana memorie semiserie del 1831* (Rivista Contemporanea, Torino) 1857, p. 8.
- [16] DEL PRATO A., *L'anno 1831 negli ex Ducati di Parma Piacenza e Guastalla* (Officina Grafica Fresching per la Deputazione di storia patria, Parma) 1919.
- [17] GALLENZA A., *La nostra prima carovana memorie semiserie del 1831* (Rivista Contemporanea, Torino) 1857, pp. 40-41.
- [18] GALLENZA A., *La nostra prima carovana memorie semiserie del 1831* (Rivista Contemporanea, Torino) 1857, p. 22.
- [19] STERN A., *Une correspondance de Francois Arago, du prince De Metternich et de Macedonio Melloni*, in *Séances et travaux de l'Académie des sciences morales et politiques*, Paris, 1909, pp. 85-97.
- [20] BOCCHI L., "I moti del '31 in una lettera di M. Melloni", *Aurea Parma* (1956).