

## Between school and university: The study of the historical scientific instruments collection of the Liceo Maffei in Verona

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**Summary.** — Since 2014 the Museum of the History of Physics of the University of Padua has been working on the study and valorisation of the collection of historical scientific instruments kept at the high school “Scipione Maffei” in Verona, one of the oldest high schools in Italy. The Cabinet of Physics of “Liceo Maffei”, founded in 1802, currently consists of about 550 instruments, acquired until the 1960s. Besides the Museum’s staff, the project has involved two physics teachers and a group of students, who participated in different phases of the work on the collection. This article intends to present the collection, the project, and the results achieved so far. We also aim at highlighting the potentialities and possible future developments of the project, a project which can become a model for other schools.

The collaboration between the high school “Scipione Maffei” of Verona and the Museum of the History of Physics of the University of Padua began in 2014, when an agreement was signed between the school and the Department of Physics and Astronomy “Galileo Galilei”, where the Museum is housed. The aim was to work on the collection of scientific instruments kept at the Liceo. The working group consisted of two school teachers, Giorgia Vittori and Leonardo Aldegheri, the curator of the Museum of History of Physics, Sofia Talas, and the author, Fanny Marcon, research grant holder working at the Museum. The Museum of History of Physics had previously collaborated with two other high schools in Padua – “Liceo Tito Livio” and “Istituto Scalcerle”- to study and promote their historical scientific heritage, but the project carried out with the “Liceo Maffei” can be considered an exemplary model, as it went further in involving staff and students of the school. After describing Liceo Maffei’s collection of scientific instruments, the present paper will show how the first results of the research activities have opened new perspectives for further studies in the history of science. I will then outline the way the project was organized and carried out, and examine how it could be “exported” and become an example for other schools in Italy.

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The “Liceo Maffei” is a high school established on 28 December 1804 under the Napoleonic domination with the name “Liceo Centrale in Verona pel Circondario dell’Adige”. It is one of the oldest still existing high schools in Italy. The Cabinet of Physics originated even earlier, in 1802, and in 1804 it was enriched with the collection donated by the Count Giovanni Battista Gazzola (1757–1834), an intellectual and scientist from Verona who gave to the school some 18th-century scientific instruments [1]. The first professor of physics was Giuseppe Zamboni (1776–1846), who held the chair of “Elementi di Fisica Generale e Sperimentale” from the foundation of the school in 1804 till his death in 1846. Zamboni’s cutting-edge and well-known researches on dry piles were carried out right in the Liceo.

In 1807 the Cabinet included 73 instruments, described in the inventory as follows: “37 apparecchi per l’aerologia, tra cui due macchine pneumatiche e relativi accessori, vari barometri e termometri, una macchina d’Atwood, una cassetta con le forme delle cristallizzazioni, una cassetta con due serie di reagenti chimici ed altro; 20 apparecchi per l’elettricità, fra cui due macchine elettriche a disco di cristallo, varie bottiglie di Leyden, scaricatori, un quadro magico, una pistola di Volta, elettrometri ed altro; 7 apparecchi pel magnetismo, bussole e calamite; 4 apparecchi per l’ottica, fra cui due microscopi, 5 cannocchiali, prismi, specchi metallici e di vetro, lenti, un quadrante astronomico, un microscopio solare ed altro”<sup>(1)</sup> [2].

The above-mentioned inventory of the Cabinet of Physics, whose instruments were transported from the earlier site of S. Sebastiano to the current location in 1810, remained almost unchanged until that year, when Zamboni decided to repair the old machines and purchase new ones for the presentation of his three pupils’ final essays. At the end of 1810, a new inventory was actually set up, showing a considerable increase of the Cabinet of Physics, with new instruments such as: twenty-five mechanical machines and two acoustics instruments. The number of instruments to study electricity rose to twenty-seven; those for hydrostatics to eight, while optical instruments to twenty. However, the number of the machines for the study of aerology decreased to twenty-one, and likewise those for the study of magnetism were reduced to five [3].

Over the years the collection was continuously increased by Zamboni himself first, and then by his successors according to the scientific developments of the time, with instruments such as electric motors, dynamos and x-ray tubes. It counted more than 230 instruments in the inventory compiled in 1899 and more than 550 instruments in the inventory updated in the 1960s. It is extraordinary that very few instruments went lost over time and almost the whole collection is still preserved at the school. This rich collection not only documents the evolution of physics teaching in a high school in the 19th and 20th centuries, but it also highlights the fact that high schools in 19th-century Northern Italy were also research centers. A part of the collection is actually linked to Zamboni: various prototypes of his piles are preserved here as well as two-winding watches and other objects related to his researches on the subject that made him internationally known (fig. 1).

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<sup>(1)</sup> 37 aerology devices, including two air pumps and their accessories, various barometers and thermometers, an Atwood machine, a box with crystallization forms, a box with two sets of chemical reagents and more; 20 instruments for the study of electricity, including two crystal disk electrical machines, various Leyden bottles, electrical dischargers, a magic box, a Volta gun, electrometers and more; 7 apparatuses for the study of magnetism, compasses and magnets; 4 optics devices, including two microscopes, 5 telescopes, prisms, metal and glass mirrors, lenses, an astronomical quadrant, a solar microscope and more.



Fig. 1. – Dry pile made by Giuseppe Zamboni, 1820 ca. (Courtesy of Liceo Maffei Verona).

To further underline the fact that the Liceo Maffei was also a research center, it is worth mentioning that the study of the collection led us to enlighten links between the Liceo and the University of Padua. In particular, we found out scientific exchanges between Zamboni and Salvatore Dal Negro (1768-1839), professor of experimental physics at Padua University from 1806 to 1839. An electrometer designed by Dal Negro and some thermometers were for instance found at the Liceo Maffei [4]. The Dal Negro electrometer<sup>(2)</sup> (fig. 2) was made in Padua, while the thermometers were constructed by Angelo Bellani (1776-1846)<sup>(3)</sup> for Dal Negro and then donated by the latter to Zamboni (fig. 3). Furthermore we found at the “Biblioteca Civica di Verona” some letters sent to Zamboni by Dal Negro in 1835, where he explained to his “*amico e collega carissimo!*”<sup>(4)</sup> the result of some of his experiments on magnetism [5]. This led the Museum of the History of Physics to start a research work on the relationship between the schools of the Veneto Region and the University of Padua in the 19th century, and on the specific role played by these institutions in the development and transmission of scientific knowledge. This research has actually become the focus of the current PhD program of Fanny Marcon<sup>(5)</sup>.

Of course, the study of the collection also encompassed the study of the archival material preserved at the high school and in other institutions, like the “Biblioteca Civica di Verona”. Here, in addition to Zamboni’s correspondence, we found six notebooks that belonged to three Zamboni’s students. In these notebooks the students recorded their physics lessons, with beautiful drawings of the instruments used by the professor. These notebooks were an extraordinary discovery, because they allow us to understand the precise way Zamboni gave his lectures and how he used the instruments themselves [6-8]. The evolution of physics teaching practices is another research line that the Museum has started to analyze thanks to the collaboration with the schools of the territory.

We have introduced the collection and some of the first results of the researches we carried out so far, but how was the work of study and valorisation actually carried out?

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<sup>(2)</sup> It is a particular model of a condenser electrometer devised by Salvatore Dal Negro. The instrument, designed to detect even very small amounts of charge, was based on the attraction exerted by a brass finger connected to the condenser and terminating with a bead of the same material towards a very sensitive mobile index. The distance between the bead and the index was adjusted using a sophisticated mechanism of micrometer screws. The instrument was made by Giuseppe Stefani (? -1842), who was mechanic at the Observatory of Padua from 1834 to 1842.

<sup>(3)</sup> Angelo Bellani (1776-1852) was a physicist and priest from Monza. He also invented several instruments, dedicating a part of his workshop to the construction of thermometers, barometers and hygrometers.

<sup>(4)</sup> “Dear friend and colleague!”.

<sup>(5)</sup> The PhD is codirected by Jan Lacki, Université Paris 7, and Sofia Talas, Museum of the History of Physics, University of Padua.

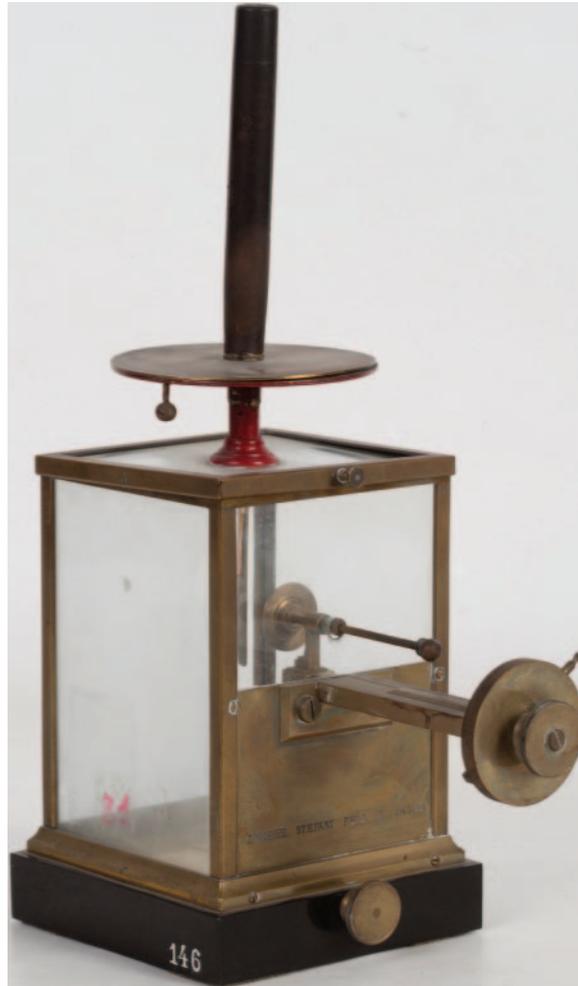


Fig. 2. – Electrometer Dal Negro, made by Giuseppe Stefani, 1834–1839 (Courtesy of Liceo Maffei Verona).



Fig. 3. – Thermometer signed “Bellani fece per Prof. Dal Negro nel 1814”, made by Angelo Bellani, 1814 (Courtesy of Liceo Maffei Verona).

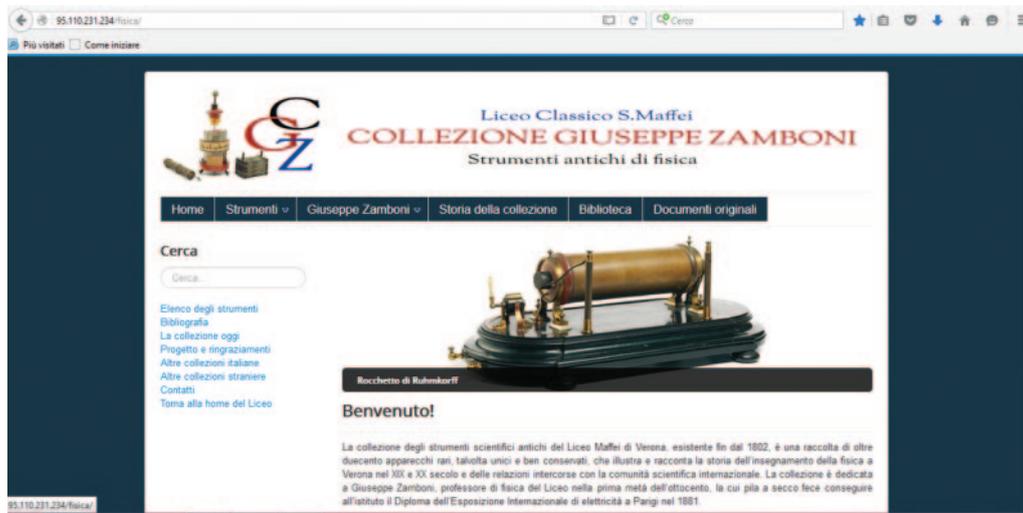


Fig. 4. – Liceo Maffei website (<http://95.110.231.234/fisica/>).

From the beginning, students have been involved in the project, and this provided them the opportunity to feel this heritage as their own, to discover a different approach to the history of physics through these instruments and to get closer to the history of their institution. The group of twenty students has been mainly involved in taking measurements and in describing the materials the instruments are made of. Then, always co-supervised by their two professors, Giorgia Vittori and Leonardo Aldegheri, students performed an outstanding bibliographic research on the history of the instruments, which helped the writing of the catalogue records. Prof. Vittori and Aldegheri took care to carry out all the researches on the history of the school and the history of the collection, by consulting the archive stored in the school and in other Libraries and Archives.

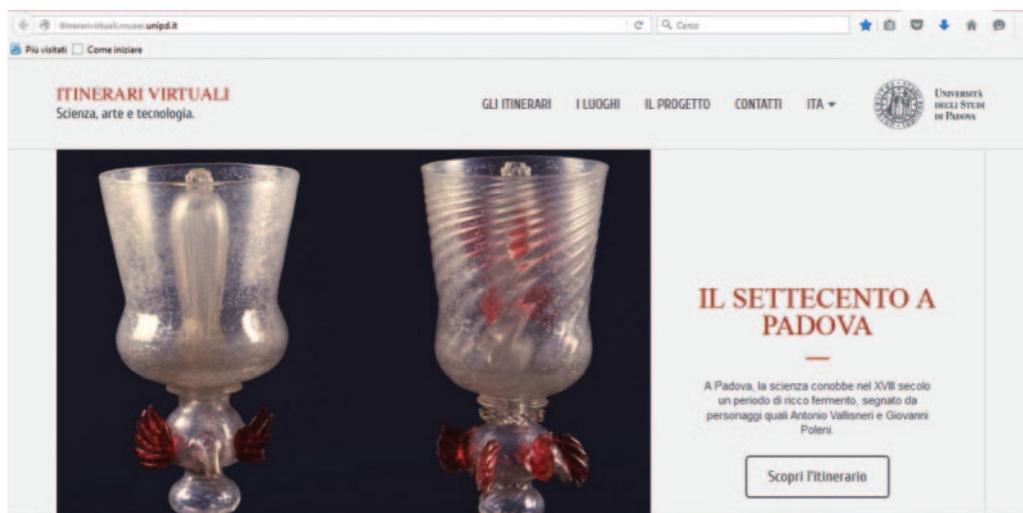


Fig. 5. – “Itinerari virtuali” portal (<http://itinerarivirtuali.musei.unipd.it/>).

Let us also point out that the maintenance of the collection has been done over the last 40 years by Armando Benini, the school laboratory technician: without him, many of the tools would surely be lost forever. As for the Museum of History of Physics, we started by updating the inventory and we carried out researches on the instruments and their history. I also wrote about 220 catalog entries, which include all the instruments purchased until 1899. These entries have been now published on a website maintained by prof. Vittori and Aldegheri (<http://95.110.231.234/fisica/>) and hopefully they will soon be collected on a paper catalogue (fig. 4).

A further opportunity of presenting the collection to the wider public is now provided by the portal “Itinerari virtuali” (<http://itinerarivirtuali.musei.unipd.it/>), set up by the University of Padua to promote the heritage kept at the University and in the surrounding territory (fig. 5). The schools of the Veneto Region that own historical scientific instruments will be given direct access to insert data about their collections in the portal. This will give birth to one or more virtual tours through the Veneto Region, documenting the history of physics’ research and teaching in the various institutions of the region. Some schools will start inserting data about their historical collections from the next months within the National project “alternanza scuola-lavoro”. This will not only offer to the general public the possibility to discover the extraordinary scientific heritage of their territory, but it will represent a precious research infrastructure for historians of physics, to analyze for instance the circulation of scientific knowledge, scientific practices and instruments throughout the centuries.

In this sense, and in general, the collaboration that was set up in the last years between high schools and the University of Padua to enhance the study, preservation and promotion of the schools’ scientific heritage, gives results beyond any expectation. The case of the Liceo Maffei is particularly interesting because it is a long-term sustainable model: the University acted as a consultant to guide the researches and write the catalog entries, but much work was achieved by the Liceo’s students and professors. A model that could be widely spread, in particular at a moment when the involvement of students in activities out of their curriculum is strongly encouraged by the Ministry of Education though the already mentioned “progetto alternanza scuola-lavoro”.

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