

# The setting up of the Chemistry Laboratory at the University of Palermo

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*Abstract:* By the end of 1861, Stanislao Cannizzaro arrived at the University of Palermo, as Professor of Inorganic and Organic Chemistry; soon he focused on getting, from academic authorities, the room and the funds to set a chemistry laboratory. It had to be modern and well-equipped, in order to allow efficient teaching, that involved, since their first year, students with different university curricula. The setting of the laboratory was conducted according to similar projects already carried out in the most advanced European countries, such as Germany, and, after 1870, France as well. There, great importance was devoted to the training of pupils who would eventually become technicians. They would have contributed to the industrial development of the country, and therefore its economical, political and military growth. The laboratory was finished in late 1867, within the very University building. It had been equipped not only with the ultimate tools for advanced teaching and research, but also with a significant number of co-workers (both Italian and foreign), who, under the direction of Cannizzaro, gave rise to one of the leading Schools of Chemistry in nineteenth-century Europe. The laboratory set up by Cannizzaro, and his way to conduct both teaching and research (inspired by what Piria had achieved in Pisa in the second half of the 1840s), were a reference for University laboratories yet to be built. For instance, the one in Turin, set up under the lead of Michele Fileti, or the one in Naples, after the pressure of Agostino Ogliaodoro-Todaro (both students of Cannizzaro). Last but not least, the laboratory in Rome, in Via Panisperna, set up by Cannizzaro himself.

*Keywords:* History of chemistry at the University of Palermo, Chemistry laboratory at the University of Palermo, Stanislao Cannizzaro.

## 1. Introduction

Before Stanislao Cannizzaro (1826-1910) was appointed Professor of Organic Chemistry, the University of Palermo simply lacked a chemistry laboratory where experimental research could be performed and lecture demonstrations prepared; this condition was shared by most of the Italian Universities.

Cannizzaro was born in Palermo; from 1845 to 1847, he served as laboratory assistant (*preparatore*) at the University of Pisa, thus getting acquainted with chemistry, under the mastership of Raffaele Piria (1814-1865).

In 1848, while in Palermo for a short stay, Cannizzaro took part in a riot against the Bourbon Government; sentenced to death, he was forced to exile. Therefore, he spent two years in Paris, working in the laboratory of Eugene Chevreul (1786-1889), under the direction of Stanislas Cloëz (1817-1883).

At the end of 1851, Cannizzaro was again in Italy, as professor at the “Collegio Nazionale di Alessandria”, and in 1855 he won the chair of Chemistry at the University of Genoa. There he found a poorly adequate laboratory for research and teaching: “a dark and wet room, unfitted even for the simplest experimental lecture demonstrations” (Cannizzaro 1926, p. 8).

On September 1860, he attended the First International Congress of Chemistry, held in Karlsruhe; there, he showed a correct and unambiguous method to obtain atomic weights of the elements, from molecular weight and per cent weight composition of their compounds.

Shortly before, a military expedition led by Giuseppe Garibaldi, had freed Southern Italy from the Bourbon rule, joining it to the Kingdom of Italy. In 1861, the new Government appointed Cannizzaro Professor of Organic Chemistry at Palermo University.

## 2. The need for a laboratory

During his stay in Pisa, Cannizzaro had realised how important experimental practice was in the learning process of Chemistry. He strongly believed that an efficient and well equipped laboratory (like that Justus von Liebig had realized in Giessen), where research and teaching activities could be carried out, was essential to the achievement of this goal. So, before accepting his charge in Palermo, Cannizzaro asked the University administrators to build a chemical laboratory, where he could carry out a regular research activity, and achieve a double teaching aim:

- a. to provide instruments and chemicals to arrange lecture demonstrations,
- b. to allow all students, whatever their curriculum, to perform, by themselves, ordinary laboratory activities, in order to acquire chemical skills.

Furthermore, in such laboratory a School of Practical Chemistry could be realized, where specialized technicians could be trained, in order to support the industrial and economic take off of the country. In his opinion, an up-to-date technical education of young people would have created a new intellectual elite, that would start, manage and complete a process of economic and industrial growth, which would transform Italy into a modern country, ranking at the same level with others in Europe. In particular, since Sicily appeared very underdeveloped, under this respect, Cannizzaro was planning to set up a large scale production of sulphuric acid, exploiting the abundant Sicilian deposits of native sulphur (Paoloni 2005, p. 43).

### 3. Setting up the laboratory

The ruling class, which had been recently installed in Palermo by Garibaldi himself, fully understood the significance of Cannizzaro's proposal, accepting it. One of the first acts of the new Government was to improve public education, by deeply modifying the structure of Schools and Universities. It had allocated a six-million-lire fund (Paoloni 2005, p. 36) to build up new Institutes and Laboratories in the Universities of Palermo, Messina and Catania.

At Palermo University, little attention had been paid to chemical practice: since the years when Cannizzaro had attended it as a student, nothing had changed. Teachers had at their disposal nothing other than a few closets, containing chemicals and apparatus to perform very simple lecture demonstrations (Cannizzaro 1926, p. 9). By agreeing to Cannizzaro's requests, it was stated to build the new *Gabinetto di chimica* (Institute and Laboratory of Chemistry) at the upper floor of the University building, the former house of the Theatine Fathers, at the very heart of Palermo.

At the same floor were allocated a library, a collection of paintings, several wax anatomic models, a collection of archaeological and epigraphic findings, the instruments of Physics and the Mineralogy and Geology Museum (Ferla 2012, p. 234), whose direction and organisation had been committed in 1860 to Gaetano Giorgio Gemmellaro (1832-1904). In recent years, this Museum had inherited, from Count Cesare Airoidi Arrigoni (1774-1858), a large collection of minerals, stored in bulky boxes.

As the chemistry laboratory was to be set up in the rooms where these materials were stocked, the Museum had to be moved beforehand. Furthermore, administrative, financial and bureaucratic difficulties were added, thus delaying, for a long time, the completion of the laboratory.

Cannizzaro had been planning it for a long time: during his stay in Karlsruhe, he had bought a copy of the plans of the Heidelberg chemical laboratory.<sup>1</sup> Moreover, as emerging from his correspondence with several chemists abroad, he had been collecting hints on how and where to buy the best instruments and chemicals. Finally, he warmly supported the transfer to Palermo of the Austrian chemist Adolf Lieben (1836-1914), from whom he was sure he could receive useful advice to set up the laboratory. Cannizzaro committed him the supervising of works and the purchase of analytical balances, instruments, chemicals, scientific papers and books.

Lieben regularly kept Cannizzaro informed about the progress of works, while slowing overcoming technical and bureaucratic hurdles.<sup>2</sup> The analytical room, provided with a fuel gas distribution system, was finished in 1866.<sup>3</sup> At last, the Chemical Laboratory and the School of Practical chemistry were completed in 1867, shortly after Lieben's move to the University of Turin.

Nevertheless, Cannizzaro had at that time a significant number of co-workers: among them, Giovanni Campisi (1836-1907) was his substitute, Domenico Amato

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<sup>1</sup> Letter of A. Pavesi to M. Lessona, 1861, in Paoloni (1992, p. 196).

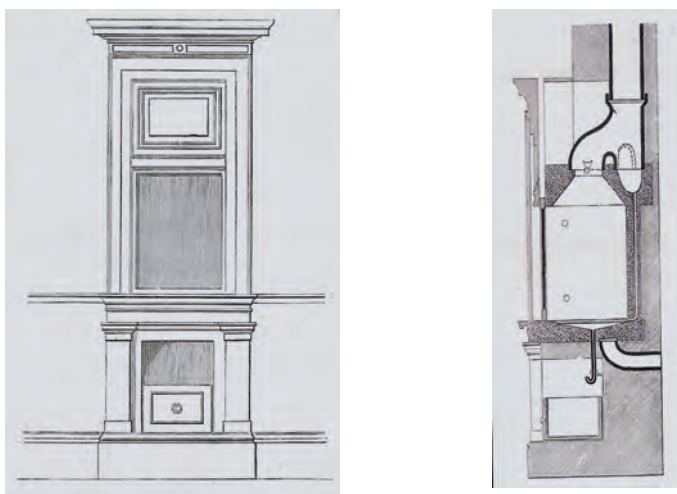
<sup>2</sup> Letter of A. Lieben to S. Cannizzaro, 1864, in Paoloni (1993, p. 234).

<sup>3</sup> Letter of G. Campisi to S. Cannizzaro, 1866, in Paoloni (1993, p. 125).

(1839-1897) and Guglielmo Körner (1839-1925) were first *preparatore* (assistant), while the young Emanuele Paternò (1847-1935) was second *preparatore*.

#### 4. Inside the Institute

The first detailed description of the Institute of Chemistry (including a map) was given in 1883 by Paternò (Paternò 1883). It consisted of a large lecture hall (adjoining a small room where demonstrations could be prepared), the Director's room and laboratory, a room for balances, a storeroom, and a room to store instruments. It was completed by a large students laboratory, built according to Cannizzaro's teaching method; it was equipped with two large benches and a smaller one, where 26 working places were arranged, and three fume hoods, to remove noxious gases and vapours.



**Fig. 1.** Front view and section of an evaporation niche in the Bonn Chemical Laboratory

Each hood was large enough to contain several vessels or apparatus, and had glass walls, in order to allow a good illumination and a clear sight of its interior, also when it was closed. Chemists could work through the side windows, without removing the frontal protection glass.

This was a noteworthy functional improvement, compared with the evaporation niches of laboratories elsewhere. A drawing of such a niche, observed in the Bonn Laboratory by Adolf Wurtz (1817-1884), during his investigation on German scientific laboratories (Wurtz 1870, pp. 20-33), is shown in Fig. 1. As it can be seen, it was small (a square base 55 cm on each side, and 83 cm high), and was built into the wall. Only one vessel could be introduced in it, while chemical manipulations often required the use of several apparatus releasing noxious fumes (Wurtz 1870, figs. on pp. 31, 33).

Lieben was well aware of the differences and of the greater efficiency of the hoods built in Palermo. While designing his new chemical laboratory at the University of Prague, where he had been appointed professor of Chemistry in 1871, he wrote to Cannizzaro:

Regarding the evaporation niches, I believe they can be useful, provided that they are large and with a hood, like those we had in Palermo. The niches used in Berlin are unfitting because they are small, and do not allow to put inside more than one apparatus. Finally, rather than slate tiles, I will use sheet of glass, into a wood frame. Such a hood is affordable, light and clean.<sup>4</sup>

## 5. The pupils

Once he had obtained an efficient laboratory, Cannizzaro allowed his co-workers to carry out their scientific researches there. In this way, he succeeded in creating in Palermo a School of Chemistry of international ranking (Zingales 2009), as the scientific fame he gained at Karlsruhe attracted there young chemists from abroad: Alfred Naquet (1834-1916) from France, Lieben from Austria and Guglielmo Körner (1839-1925) from Germany. Their researches and investigations made the University of Palermo the place where hypotheses on spatial arrangement of organic molecules were put forward and experimentally verified (Bargellini 1926).

Students too were admitted into the laboratory, to be trained in chemistry. Cannizzaro spent there most of his time, encouraging them, praising them for their results, correcting their errors and comforting them when an experiment failed. In this way, he aroused their love for scientific research. His best pupil was Emanuele Paternò di Sessa (1847-1935), who took Cannizzaro place when he moved to Rome, in 1872. Among Paternò's pupils in Palermo, we must remember Michele Fileti (1851-1914), who, in 1881, became Professor of Chemistry at the University of Turin, where he built a modern chemical laboratory; Agostino Ogliastro Todaro (1847-1923), who, in the same year, took the chair of Chemistry at the University of Naples (where he too built a new laboratory), and Pietro Spica Marcataio (1854-1929), who became a first class toxicologist at the University of Padua.

Thanks to the work of chemists trained at Cannizzaro's School, the realization of updated research and teaching laboratories could spread all over Italian Universities.

## 6. Instruments and apparatus

Most chemical instruments are delicate, as their components are made of fragile materials, such glass and porcelain, or decaying materials, as caoutchouc or rubber, while metallic components are easily oxidizable. For these reasons, only few instruments, from those acquired in the first years of the laboratory activity, survive to date. They are

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<sup>4</sup> Letter of A. Lieben to S. Cannizzaro, 1872, in Paoloni (1994, pp. 280-281).

catalogued and preserved in the University Museum of Chemistry: unfortunately the oldest inventory books did not survive and it is impossible to date exactly the instruments bought before 1881. Anyway, from Cannizzaro correspondence, it is possible to form an idea of the instruments he bought for his laboratory: analytical balances, built in Germany from Staudinger, chemicals from H. Frommsdorf (Erfurt, Prussia), German glassware, which could be warmed without breaking, combustion tubes, made of Bohemia glass, combustion ovens, built in Heidelberg by Peter Desaga, and the new spectroscopic device, arranged by Kirchhoff and Bunsen, produced by Steinheil in Munich.<sup>5</sup>

Fig. 2 shows a Dumas apparatus, used to determine the vapour densities of solid and liquid substances; this procedure was essential to determine relative molecular weights of newly produced organic substances, a routine activity of advanced chemical research at the end of the nineteenth century.



**Fig. 2.** Dumas apparatus for the determination of vapour densities (Museum of Chemistry, University of Palermo)

Several different experimental methods had been developed to determine vapour densities by Gay-Lussac, Hofmann, Bunsen and Meyer. Accordingly, Cannizzaro's laboratory was equipped with the proper instruments. In the inventory drawn up by Giuseppe Odio in 1924, a Gay-Lussac apparatus, two Hofmann apparatus, a Bunsen effusiometer and two Meyer apparatus are recorded. None of them has survived to date.

Synthesis and analysis of organic molecules were routinely performed, but Paternò complained (Paternò 1883) about having only one combustion oven to determine carbon and hydrogen per cent weight in organic substances, although he and his collaborators carried out more than 250 analyses each year.

<sup>5</sup> Letter of F.K. Bielstein to S. Cannizzaro, 1861, in Paoloni (1992, pp. 51-53).

## 7. The successive sites

The Institute did not undergo any significant change until the end of the nineteenth century.<sup>6</sup> At the beginning of the following century, funds allocated in 1860 became available, to improve or rebuild scientific laboratories of the University. Meanwhile, the main building had become inadequate to host all the different Institutes of the University: General Chemistry and Pharmaceutical Chemistry Institutes were housed into narrow and mostly dark rooms, unsuited to the usual teaching and research activities. Furthermore, liquid drainage and gaseous exhalations caused noise to neighbouring Institutes.

So, the Dean, Luigi Manfredi, decided to move away the scientific Institutes, to structures to be built on ground acquired by the municipality from the Duke of Archirafi heirs, near to the Botanic Garden, at the outskirts of the city. The new site building came to a stop in 1908, due to funding shortage; under the pressure of Giorgio Errera (1860-1933), Director of the Chemistry Institute, works restarted in 1913, but stopped again in 1915, at the beginning of the First World War, as the building was used as a military hospital. Only in 1923, at the end of the War and of the following political turmoil, the site was freed and the Institutes of Chemistry forced to move there, although the structure was not completed.



**Fig. 3.** The main laboratory at the General Chemistry Institute, in Via Archirafi



**Fig. 4.** The Library at the General Chemistry Institute

At the end of 1928 the new academic year could start in Via Archirafi site. The new Institute of Chemistry had been realized according to the plans of the new Director, Giuseppe Oddo (1865-1954), who had skilfully followed its setting up. The two-storey building consisted, among other things, of a large lecture hall (300 seats), and two student laboratories. The larger one (see Fig. 3), about 140 m<sup>2</sup> large and 6 m high, had 64 working places and four large fume hoods; the smaller one (70 m<sup>2</sup>) had 36 working places and two hoods. At the upper floor there was a large library (still existing) with two-order wall bookcases providing about 1600 m of shelves (see Fig. 4).

<sup>6</sup> Sampolo gives accurate descriptions of the Laboratory of General Chemistry and of its equipment (1899, pp. 93-94).

About 70 years after Cannizzaro first requested a laboratory, chemists in Palermo could finally have a building expressly planned and realized for their needs, properly furnished, and placed in a healthy area of the city.

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