

SOME PIONEER WOMEN OF ITALIAN CHEMISTRY

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Abstract: With the aim of putting them as references to society and that they can serve as examples of overcoming to the rest of the women, this communication shows the biographies of some Italian women who were pioneers of Chemistry in their country, although their figures and their scientific work are not well known by society. They are, in alphabetical order, Emma Fenaroli, Lidia Monti, María Piazza, María Ragno and Caterina Rossi, who began their remarkable professional careers in the first decades of the 20th century. Of all of them, their main biographical data and the scientific work they developed during their lives are presented, emphasizing in a particular way those activities that most contributed to the current development of Chemistry in Italy. Several biographical notes are also given of a woman not born in that country, but in Russia, Maria Bakunin, who, due to her remarkable teaching and scientific work, developed entirely in Naples, can also be considered a pioneer of Italian chemistry. The methodology followed has consisted of searching different sources for all kinds of data on these women, trying to complete with them the very few biographies that can be found about them in the literature.

Keywords: Women scientists; pioneers women of Italian chemistry; Emma Fenaroli; Lidia Monti; María Piazza; María Ragno; Caterina Rossi; María Bakunin.

1. INTRODUCTION

As a general rule, there are not many women scientists around the world who lived and worked in times before the 20th century that society has any knowledge of, in part because they certainly were not too many, since the current laws of that time made it very difficult for women accessing higher education and later exercising their professions, and in part, above all, because of the gender difficulties that women have always suffered at that time, facilitated the fact that during their lives they were practically ignored, and that after their deaths, except in some special cases, not many either, no remnants of the memories of their lives or their actions were preserved. Do not forget that at the time in question, the role expected of women by society was only to take care of their family and their home,

considering it inappropriate, even by some of them, to work in professions traditionally assigned to men.

In this regard, this communication follows the path of several very similar previous ones by the author, presented at different congresses related to gender difficulties, aimed at bringing to light the biographies of these scientific women and putting them to society as what they truly are: models and references that all other women should know. It shows the biographies of the first Italian women to graduate in Chemistry and exercised their activity in that country on equal terms with their male colleagues. In alphabetical order, they were Emma Fenaroli, Lidia Monti, María Piazza, María Ragno and Catherine Rossi.

The structure of the communication is as follows: after exposing the objectives and the methodology followed, the results are indicated, on the one hand, the biographies of the five women mentioned above, all of them Italian women who practiced their profession in that country and who somehow, they laid the foundations, joint with their male colleagues, for Chemistry in Italy. On the other hand, with the aim of contextualizing the state of Italian Chemistry at that time, the biography of Maria Bakunin, a Russian woman, later nationalized Italian, is also shown. She also graduated in Chemistry in Italy and developed all her professional work in that country, being highly recognized for it by her peers but very little by society in general, because of the scant data available about her in the literature. A final section of conclusions ends the communication.

2. OBJECTIVES AND METHODOLOGY

The objective of the communication is to bring to light the most relevant biographical data of some of the first Italian women who graduated in Chemistry in that country and then began to practice their professions there, performing the same functions as their male colleagues, reaching some cases very relevant results, which have generally gone unnoticed, in order to put them all as models and referents for women in society.

The methodology used has consisted of searching for data on these women in different files, newspaper archives and bibliographical references, trying to complete with them the very few biographies that can be found about them in the literature.

3. RESULTS

The five parts of the first subsection of this section are dedicated to presenting, respectively and in alphabetical order, the profiles of the five women that appear in Table 1, all of them Italian and pioneers of Chemistry in that country. The second subsection

shows the biography of another woman with a degree in Chemistry from the University of Naples at that time, the first decades of the 20th century, not Italian by birth (she was born in Russia), although she was in a natural way adopted, since she developed her entire brilliant career in the Italian country: Maria Bakunin

Table 1. Pioneer Italian. Source: Personal elaboration

| Name | Year of birth | Undergraduate year | Undergraduate University | Year of death |
|-----------------|---------------|--------------------|--------------------------|---------------|
| Fenaroli, Emma | 1886 | 1909 | Pavia | 1959 |
| Monti, Lidia | | 1913 | Rome | Post 1962 |
| Piazza, María | 1894 | 1916 | Naples | 1976 |
| Ragno, María | 1897 | 1923 | Naples | 1970 |
| Rossi, Caterina | 1890 | 1912 | Florence | 1966 |

3.1. Pioneer women of Italian Chemistry born in the country

This subsection shows the biographies of five Italian women who, due to the dates on which they graduated in Chemistry and due to their scientific activities at the time they were developed, can be considered pioneers of Chemistry in that country. In alphabetical order of surnames, they are Emma Fenaroli, Lidia Monti, María Piazza, María Ragno and Caterina Rossi.

3.1.1.Emma Fenaroli

Emma Fenaroli (de soltera Levi) nació en Turín el 24 de diciembre de 1886 y se licenció en Química en la Universidad de Pavía en 1909.

Emma Fenaroli (née Levi) was born in Turin on December 24, 1886 and graduated in Chemistry from the University of Pavia in 1909.

After starting her professional activity working at the Merck company in Milan, she married in 1912 Piero Fenaroli, specialized in Chemistry and military (he was lieutenant colonel), who had founded in Via San Vincenzo number 38 a research and analysis laboratory, the unique in Italy at that time, specialized in the study of essences, perfumes and soaps, to which other sectors such as glass, textiles and colors were later added. Due to that marriage, Emma Fenaroli converted to Catholicism.

From that moment, she began to collaborate intensely with her husband in the laboratory, although unfortunately, a few years after their marriage, her husband suffered an accident in the laboratory, poisoning himself with an asphyxiating gas (phosgene) and died in 1918, leaving three children still young.

Far from being discouraged by such a terrible loss, Emma Fenaroli was encouraged to continue working, although in 1919 she was forced to leave her workshop where she had been working with her husband, leaving it to her eldest son, and she devoted herself first to directing the journal of essences and perfumes, which had been created by Riccardo Subinaghi, one of the pioneers of the Italian essences industry and later to own it.

After becoming the owner of that journal, Emma Fenaroli worked for years on her aspiration to unite all Italian essential workers in a single society, which she finally achieved with the creation, on May 8, 1926, of the Italian Union of Producers of Aromatic Materials, based in Milan.

In 1936 she received a prize from the Italian Academy for her 17 years of activity in the field of essences and officinal plants, although two years later, in 1938 and due to racial laws, she was disqualified from the Italian Institute of the History of Chemistry in Rome.

That same year and due to the same racial laws, it was also forced to interrupt the publication of the New Journal of Vegetable Oils and Soaps, which merged with the Essence Journal, although first she had to relinquish responsibility for its management, which it resumed finally in 1945.

In 1949, she founded the “Italian Committee for Aesthetics and Cosmetology” and three years later, she also laid the foundations for the creation of the “School of Aesthetic

Dermatology, Cosmetology and Skin Hygiene” in Milan, with programs approved by the Ministries of Education and Health and with specialized teachers in all the subjects that were taught in the different fields of education.

In 1950, Emma Fenaroli (Figure 1) created the “Italian Fragrance Foundation”, which joined the American Foundation of the same name, with the aim of promoting new applications and uses in the field of perfumery.



Figure 1. Emma Fenaroli. Source: (Scorrano, 2008, p. 502)

Other of her many later professional activities were her participation in the main European cosmetic and perfumery events, her appointment as an expert in professional education for estheticians by the International Committee of Aesthetics and Cosmetics and the organizations of the Congress of Aromatherapy in Milan of 1957 and of the International Congress of Aesthetics and Cosmetology also in Milan.

Emma Fenaroli died after great suffering on May 21, 1959, after having become for more than forty years a representative and organizational element of relevance in various sectors of her specialization such as essence, perfumery, herbalism and cosmetology (Rovesti, 2008, pp. 502-503).

3.1.2. Lidia Monti

After working for a time in industry, Lidia Monti graduated in Chemistry from the University of Rome in 1913.

Two years later, in 1915, she took over the management of the Municipal Chemical Laboratory of Rome and in 1917 she was called to direct the chemical laboratory that the Rossi Electrochemical Company had at its headquarters in Ponte Mammolo.

In 1925 she returned to Rome, to work at the Chemical Institute of her University and in 1927 she was appointed assistant professor in the chair of Aviation Materials Technology, directed by Professor Nicola Parravano.

After working as an assistant to Professor Luigi Bargellini at the Superior School of Malariology in 1930, she obtained the following year and on an interim basis the chair of Organic Chemistry, which was vacant at the University of Rome.

From 1934 she was in charge of teaching the Chemical Preparations Course at that University until in 1940, she obtained through competition the chair of Pharmaceutical and Toxicological Chemistry of the Faculty of Pharmacy of the University of Siena, in which she remained for more than twenty years, becoming its dean between 1958 and 1960.

In 1962 she was awarded the Gold Medal of Merit from the College of Culture and Art, for her dedication to teaching and research.

Within her intense scientific activity, her research on acridine, thiopyrimidine, quinazoline and quinoline derivatives deserves mention, as well as her studies on the action of nitrous vapors on organic substances and on the oxidizing action of selenium dioxide.

She died on June 4, 1993, after a long illness, at the age of 102 (Franchi, 2008, pp. 723-724).

3.1.3. María Piazza

María Piazza was born in ArianoIrpino, province of Avellino, on July 2, 1894, and graduated in Pure Chemistry at the University of Naples in 1916, after completing an experimental thesis with Professor Zapato. In 1925 she also graduated in Natural Sciences at the University of Rome, where she held the position of assistant for a few years (Linguerra, undated).

The beginning of the exercise of her profession was very varied. She first worked in the industry. Later, at the suggestion of Professor TulioTentori, she devoted herself to teaching, giving classes in various centers in Rome: the Tasso Lyceum, the E. Pimentel Fonseca Normal School and finally the EQ Visconti Institute-gymnasium, from 1929.

During that period, she simultaneously taught with the studies of the Natural Sciences career and also dedicated herself to scientific research under the direction of Professor Federico Millosevich, from who she was assistant from 1926 to 1932.

During her work in the lyceums, she focused primarily on providing a good education for young women, a task to which she devoted all her knowledge and enthusiasm, especially in the Tasso, Visconti and Righi secondary schools in Rome.

From 1930 to 1937 she collaborated in the writing of the Italian Encyclopedia in the part of mineralogy and geology. However, in 1938, due to the racial laws that, promulgated by the fascist regime, deprived citizens of Jewish origin of civil and political rights, she was expelled from teaching, banned from university and expelled from the Italian Geological Society as well as the Italian Society for the Advancement of Sciences, of which she had been a member (Linguerra, undated),

From 1939 to 1943 he taught chemistry in Jewish schools attended by Jewish students who had been expelled from public schools. These were special secondary schools granted and controlled by the regime through an "Aryan" Commissioner, appointed directly by the Ministry of National Education. The one in Rome was organized in less than two months and was divided into an institute-gymnasium, a teaching institute and a technical institute with a commercial address.

Although the school was parastatal, the students attended it at the risk of their personal safety, being constantly threatened by the actions of the fascist squads. Both professors who had lost their professorships, including Maria Piazza herself and Emma Castelnuovo, and some brave Aryan teachers in solidarity with their Jewish colleagues were recruited as teachers. The headquarters of the school, inaugurated in December 1938, was a building located in via Celimontana, near the Colosseum. In 1940-41 the center had to move to the facilities of the Jewish Asylum located at no. 13 Lungo Tevere Sanzio, a few steps from the special court organized by the regime to monitor citizens.

María Piazza (Figure 2) also lived the experience of the so-called "clandestine Jewish university". After completing high school, in fact, not only were Jewish students prohibited from enrolling in public universities, but the Jewish community was also prohibited from instituting private university courses. In December 1941, under the fictitious name of "Integrating Courses in Mathematical Culture", she opened a true university "outside the law" which was in operation for the following two years, until the liberation of the capital, and in which she stood out as expert teacher and claimant.

She also worked in the Chemical Society, and in particular in the Section of Lazio, Abruzzi and Umbria, of whose Council she was a member of the Council, contributing her personal activity to improving the problem of chemists who taught in secondary schools and technical institutes.



Figure 2. María Piazza. Source: (Scorrano, 2008, p. 659)

Appointed Commander of Merit of the Republic, María Piazza died suddenly in Rome on April 27, 1976 (Marini-Bettolo, 2008, p. 659).

3.1.4. María Ragno

Born in Naples on November 30, 1897, Maria Ragno graduated in Pure Chemistry in 1923 at the University of Naples and then went on to practice her profession working as an analyst at the Bauxite Company.

In 1928 she was appointed civil servant and soon after director of the Office of Surveys and Statistics of the National Federation of Chemists. In 1930, that Federation commissioned her to write the first edition of the "Yearbook of the Chemical Industry".

In the following years she also devoted herself to writing two monographs: "The soap industry in Italy and abroad" and "The Italian industry of colors and paints", which were published, respectively, in 1936 and 1938.

In 1945, María Ragno (Figure 3) founded the publishing house "TecnindustriaEditrice" for the publication of the "Chemical Industry Directory", a very

useful collection of data related to products and manufacturing industries, which was published for the first time in 1949 and was updated every two years. In 1949 she also founded the publication "RassegnaChimica", a magazine that had considerable success, especially in the sectors of basic products and applied chemistry.



Figure 3. María Ragno. Source: (Scorrano, 2008, p. 625)

She was one of the Chemistry graduates who founded the National Union of Italian Chemists (UNCI) in 1954, holding a position on its Board of Directors from the very beginning. One of her functions in that society was to create and promote the Chemical Equipment Exhibition, which has taken place every year since 1961.

In 1947 she published an article titled (in Italian) “L' industriachimicaitaliananei due dopoguerra 1914-18 e 1939-45” in the journal “*L' Industria: rivista di economia e politicaindustriale*”

Two days before her death, which occurred on November 30, 1970, the National Union of Italian Chemists, at its Assembly of Members held in Genoa, named her an Honorary Member for her work and merits acquired in that society. (Scorrone, 2008, p. 625).

3.1.5. Caterina Rossi

Born in Florence on March 3, 1890, Caterina Rossi graduated in Pure Chemistry from the University of her city in 1912, with the highest marks. That same year she obtained a master's degree in Chemistry at the Institute of Higher Studies and in the academic year 1912-13 she obtained the diploma corresponding to the specialization course.

From 1913 to 1917 she was a chemistry teacher in several secondary schools in Florence and in 1917, after leaving teaching, she devoted herself to industry when she was hired to direct the analytical laboratories of the chemical and pharmaceutical industry "Molteni", with the assignment particular to carry out experimental research for the synthesis of organic drugs. In that period, she published two works, one on the oximes of santonin and the other on the polymers of isosafrole.

In 1924, Caterina Rossi moved to Milan to coordinate the Proceedings of the National Congress of Industrial Chemistry, held in that city in April of that year, and became a technical collaborator of the Industrial and Applied Chemistry Journal (later called, in 1935, Chemistry and Industry), a position she held until her death.

In 1926, Caterina Rossi (Figure 4) returned to teaching after winning the competition for the teaching of Chemistry and raw materials at the Commercial and Technical Institutes for Topographers, so that year she moved to Camerino, where she remained until 1928, then passing to Ravenna and already, at the end of 1934, to Pavia.

In 1942 she moved to the "Italo Balbo" Industrial Technical Institute for Chemists and then to the "Ettore Molinari" Scientific High School in Milan, also working as a teacher in the department of General Chemistry, Chemical Analysis, Physical Chemistry and Electrochemistry, where she remained until her retirement on October 1, 1960, although after retiring and at the request of the dean of the Institute, she spent one more year working without being paid for her services.



Figure 4. Caterina Rossi. Source: (Scorrano, 2008, p. 580)

During her teaching activity she made a valuable contribution to the publishing sector by writing several Chemistry textbooks for secondary schools (in her own language). Among them, the following two can be highlighted (Figure 5)

- Elementi di merceologia per la terza classe industriale femminile. Carlo Signorelli Editore, 1931.
- Chimica per gli Istituti Industriali. Editore: Libreria Yelets, 1952.

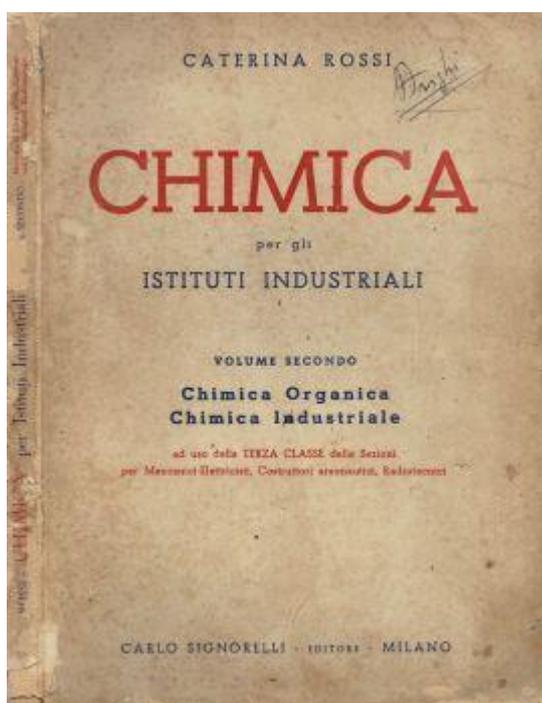


Figure 5. Cover of one of the books written by Caterina Rossi. Source: Livri Vintage

Interestingly, in the first of them, entitled in English "Elements of merchandise for the third industrial class of women", Caterina Rossi deals with a not well-known science, Merceology, which studies the nature or origin, composition or function of all the movable things susceptible or not of commerce and according to it, their classification, also taking charge of the knowledge of impurities and falsifications, and of the methods to recognize them. The second, "Chemistry for Industrial Institutes", is already more typical of her profession.

Caterina Rossi passed away on March 5, 1966 (Giuffrè, 2008, p. 580).

3.2. María Bakunin

Maria Bakunin was born on February 2, 1873, in Krasnoyarsk (Siberia). She was the third daughter of the marriage that formed the Russian revolutionary philosopher Mikhail Bakunin and her Polish wife Antonia Kwiatkowska. Her older brothers were Carlo and Sofía (Anonymous, 2019). Maria was also the aunt of the famous mathematician Renato Caccioppoli (Naples, 1904-1959), son of her sister Sofia. Some sources indicate that in 1938 her nephew Renato was imprisoned after publicly delivering a speech against Hitler, Mussolini and the fascism, on the occasion of the former's visit to Naples. Renato was not only satisfied with making that speech, but also hired an orchestra to play La Marseillaise. Fortunately for him, Maria Bakunin was able to obtain his release by convincing the judges that Renato did not know what he was doing due to he was insane, for which he was admitted to a psychiatric hospital (Ciardi, Focaccia, 2011). To obtain this release, Maria Bakunin had to argue in court that despite fascism's ban against men walking small dogs (to safeguard their virility), Renato used to walk the streets of Naples with a rooster with collar and leash (Anonymous, 2019).

And as for her father, Mikhail Bakunin (1814 – 1876, this was a Russian anarchist thinker and activist, socialist, main ideologue and founder of collectivist anarchism. He is considered one of the most influential figures of anarchism and one of the main founders of the revolutionary socialist and anarchist tradition. Their thought is summed up in the suppression of classes and private property, along with the need to promote revolutionary acts to end the social fabric. Their revolutionary character was decisive between the Russian nihilists and the Catalan and Italian anarchist movement. “God and State”, his most important work, was not published until 1882 (Fernández y Tamaro, undated).

Despite her birth in Russia, Maria Bakunin lived from a very young age in Italy, a country where she acquired all her cultural and scientific training. The whole family had moved to Naples after the father's death in Bern, being welcomed by the socialist lawyer Carlo Gambuzzi, a close friend of the deceased, who took care of all the family's needs, also marrying the Bakunin's widow a little later, although Maria Bakunin did not obtain Italian nationality until 1946 (Anonymous, 2019).

The lawyer's house was a true cultural and political center, in which great ideals of freedom were breathed and individual stimuli were favored, so Maria Bakunin and her brothers were able to go to the best schools in the city.

Already in her university student stage, she was a "preparator" in the chemical laboratory of the Federico II University in Naples, where in 1895 she graduated in Chemistry with a thesis in stereochemistry, also receiving the Academy Award for it. of Physics and Mathematics of Naples in 1900.

After graduating and less than twenty years old, she began her academic career as a professor at the Institute of General Chemistry, directed by Professor AgustínOgialoro-Todaro, whom she married, although she never had children. In 1903 she was hired as a professor of Applied Chemistry at the Faculty of Engineering, later converted into the Higher Polytechnic School of Naples

The following year she worked as a professor of technological organic chemistry at the same school, where she became professor by competition in 1912. She held that position until 1940, when she asked to be transferred to the Chair of Organic Chemistry at the Faculty of Sciences of the University of Naples, where she remained until her retirement.

In 1906, Maria Bakunin was part of a research team studying the eruption of Mount Vesuvius, and in 1909 she compiled a geological map of Italy. As part of the project, she studied oil shale and ichthyolitic deposits in the mountains in the Salerno area. Following this, from 1911 to 1930, Bakunin worked as an advisor to companies and local governments interested in the industrial development of ichthyol mines in the Giffoni district of the Picentine Mountains (Nicolau, 2004).

In 1914, the Minister of Agriculture, Industry and Commerce, Nitti, commissioned her to study at the professional schools of Belgium and Switzerland, considered at the time to be at the forefront of teaching methods. Maria Bakunin noted with bitterness the existence of differentiated education for men and women. To solve the problem of Italian schooling, she asserted with determination that it should be the rich who pay, through taxes, for the education of the poor.

Likewise, in 1935, she traveled to Russia to officially participate in the congress that was held in that country on the occasion of Mendelejeff's centenary, taking advantage of her stay to carry out a survey on the state of the cellulose industry in some South American countries.



Figure6. María Bakunin. Source: (Nicolaus, 2004)

At the end of World War II, Maria Bakunin (Figure 6) worked with Benedetto Croce to rebuild the Pontanian Academy, and in 1944 she was elected its president, a position she held until 1949. One of her tasks was the restoration of the Academy Library (Nicolaus, 2004). Remember that Benedetto Croce (Pescasseroli, 1866 - Naples, 1952), an Italian writer, philosopher, historian and politician, was a leading figure in liberalism, whose work influenced Italian thinkers as diverse as the Marxist Antonio Gramsci, the fascist Giovanni Gentile or the Liberal Piero Gobetti. He is an author closely linked to Hispanic culture.

Her scientific activity was highly appreciated and recognized by different entities. She was a correspondent member of the Academia dei Lincei, an ordinary member of the Society of Sciences, Letters and Arts, of the Pontaniana Academy and of the Development Society. In addition to holding the presidency of the Pontanian Academy, between 1944 and 1949, she was also president of the Section of Physical and Mathematical Sciences of the Society of Sciences, Letters and Arts, between 1932 and 1952.

Regarding her scientific activity and research, Maria Bakunin published her first work in 1890, when she was only 17 years old, referring to the preparation of phenylnitrocinnamic acids.

This would be followed by more than 100 subsequent publications related to her two research lines under study, the Perkin synthesis mechanism and the isomerism of the compounds of the cinnamic series, paying special attention to the most suitable conditions for the transformation of ones into the others.

In 1900, at the age of 27 and competing with none other than E. Erlenmeyer, she won a Stereochemistry prize sponsored by the Academy of Physical and Mathematical Sciences (German chemist Richard August Carl Emil Erlenmeyer, known simply as Emil Erlenmeyer (1825 - 1909), was a professor at the Polytechnic Institute of Munich between 1863 and 1883. His most notable achievements were the synthesis of guanidine and tyrosine, as well as the explanation of the structure of compounds such as lactone. He is also well known for the flask of precipitates that bears his name).

In the very detailed report by the jury at the time of awarding that prize, in which the reasons why it had been awarded were fully explained, the following was said:

Mrs. Dr. María Bakunin presents 6 reports on stereoisomers of phenylcinnamic, phenylnitrocinnamic and phenyloxycinnamic acids and their derivatives, published between 1895 and 1901. They are the result of assiduous, clear and intelligent experimental work. The first article on the numerous compounds of three stereoisomeric pairs of nitrocinnamic acids are carefully described and a thorough knowledge of the subject is manifested. In the second, the transformation of halocomposites into those and their behavior in different reactions is studied. The third describes the stereoisomer of phenylcinnamic acid, already tried in vain to prepare by other chemists. In the fourth, the non-existence of an oxyphenylcinnamic acid, which Vandavelde believed he had achieved, is demonstrated with impeccable experience. In the fifth, the constitution of phenylnitrocinnamic acids is discussed and it is established that it belongs to the planosymmetric formula, to which the axial formula belongs, the indones corresponding to these acids are prepared, and a new method of dehydration of organic bodies is shown. based on the use of phosphoric anhydride in bodies dissolved in neutral solvent. Finally, in the sixth memory, the author deals with this new dehydration process, showing, with numerous experiences, its advantages.

From what we have briefly explained, Mrs. Bakunin, through assiduous experimental work, rich in new data, overcoming not a few difficulties, has clarified a chapter of stereochemistry and has made a not insignificant contribution to the progress of this part of Chemistry.

Therefore, the Physical Sciences Section proposes that the prize of one thousand lire be awarded to Dr. Maria Bakunin.

Estanislao Cannizzaro and Emanuele Paternó, speakers.

In addition to these fundamental studies, Maria Bakunin also carried out others on the Zincke synthesis, on the constitution of picrotoxin, on the esterification of phenols and on the catalytic action of some colloidal solutions in organic synthesis.

Moreover, her studies on shales and bituminous oils made interesting contributions in the field of applied chemistry and led to the preparation of important pharmacological products, obtained by sulfonation of distilled oils.

Apart from her research work, Maria Bakunin carried out an important teaching activity, which greatly contributed to achieving the efficiency of the Neapolitan chemical institutes, either by favoring the immediate and extraordinary understanding of the continuous evolution of studies, or by educating a large crowd of students, many of whom reached prominent positions in life (remember, as an example, the later relevance reached by her favorite student, Francesco Giordani), or by transmitting to her closest entourage her love for research, the rigor of scientific work well made and, above all, the fundamental virtues of conscientiousness and concern.

From a personal point of view, Maria Bakunin, better known as Marussia Bakunin or, generally by "the Lady", as everyone designated her (Figure 7), was essentially a woman of great righteousness, who at all times had the cult of God intact. sincere and deep friendship. She was always extraordinarily strict with the students and with herself, with the aim of getting the most out of the young chemists and the formation of a strong professional conscience.



Figure 7. María Bakunin. Source: (Scorrano, 2008, p. 511)

Although she never defined herself as an anarchist, unlike her father, Maria Bakunin had a strong and generous character and a great sense of justice, good human qualities and great courage in abundance that she manifested at all times. As anecdotes of her life the following are told (Anonymous, 2021)

Riding in a carriage along Via Toledo in Naples, she had to tame the raging horse. On another occasion, she saved her sister Sofía, who had fallen into a well, by lowering herself with a rope and grabbing her by the hair.

During fascism, she refused to have a child, appearing for chemistry exams dressed as a soldier, despite the decree of the authorities that ordered all soldiers to have children. She was saved only thanks to the providential intervention of her husband.

Also, when the Germans burned down the university libraries, she sat near the flames with her arms crossed. The German commander, surprised by the gesture, gave the order to withdraw and the damage was limited. It was precisely for this gesture that the aforementioned Benedetto Croce proposed her in 1944 to preside over the Pontian Academy, a long-standing cultural association that had been suppressed by the fascist government.

During the war she was also responsible for rescuing the Chemical Institute from German reprisals and the aftermath of Allied occupation, also paying the price of having her house burned down in an act of retaliation against the Neapolitan University.

Her house in via Mezzocannone, where she welcomed innumerable cats, was for many years and until the end, a meeting place and a place of welcome for exponents of the cultural world, for the persecuted and for refugees.

María Bakunin died at the age of 87, in her beloved Naples, the city where she spent practically her entire life, which, together with her remarkable scientific work, makes her worthy of appearing as one of the first relevant women in Chemistry Italian, despite not having been born in that country (Nicolaus, 2008, pp. 511-512).

In Naples, there is a plaque in her memory at the door of the University's Faculty of Chemistry and a promenade in the outskirts also bears her name.

In Figure 8, she can be seen, dressed in a wide long skirt, mantilla and hat, as the only woman who was part of the large group of Chemistry graduates who attended, in 1896, at the age of 23, the meeting held in tribute to the 70th anniversary of the illustrious chemist Stanislao Cannizzaro (Palermo, 1826 – Rome, 1910), recognized by all as the master of Italian Chemistry.

In this regard and considering it of value, let us collect the verbatim phrases that Scorrano wrote in his work "La Chimica italiana" in recognition of the scientific work of Professor Cannizzaro (Scorrano, 2008, p. 23):

To understand and appreciate the greatness of her work, it is necessary to consider the conditions of Chemistry in the first half of the last century, when everything was dark in the minds of chemists, even the greatest. In her famous "Sunto", Cannizzaro demonstrated the need to assume Avogadro's hypothesis as the foundation of atomic theory. The atomic weights obtained by applying her rule, among other things, allowed Mendeleeff to establish his periodic system. The tetravalence of carbon that [Cannizzaro] confirmed also provided a solid foundation for Organic Chemistry.

With reference to the above, remember that Stanislao Cannizzaro was appointed Professor of Chemistry at the University of Genoa in October 1855 and there he continued his work on aromatic alcohols, such as benzyl alcohol, which he obtained from the respective aldehydes, together with the corresponding acids, by means of a reaction currently known as the "Cannizzaro reaction". During his stay in Genoa he published, in addition to the experimental works, his famous "Summary of a Course in Chemical

Philosophy” (known as Cannizzaro's “Sunto”), which was published in the prestigious magazine “NuovoCimento” in 1858, in which he shows that reaction, which allows the choice of the atomic weight, a reaction later known in the chemical field as the “Cannizzaro reaction”, also called the “law of atoms”.



Figure 8. Maria Bakunin in 1896, only woman, last on the right, at the 70th anniversary meeting of Professor Cannizzaro. Source: (Scorrano, 2008, portada)

4. Conclusions

From the research carried out, it can be deduced, without the slightest hint of a doubt, that all the women who appear in this communication can and should be considered as true models and references to society in general and to Italian women in particular, since, not in vain, all of them performed the same functions that current women chemists perform today, despite the fact that at the time of their degrees the role of women in society was not considered relevant at all, limiting themselves only to the care of the home and of the family. However, these women managed to overcome all the difficulties that arose to be able to graduate in Chemistry and then practice their professions in a completely similar way to that of their male colleagues.

Thus, it can be noted that Emma Fenaroli created and directed magazines on essences and perfumes and founded several institutions, such as the Italian Union of Producers of Aromatic Materials, the Italian Committee for Aesthetics and Cosmetology, the School of Aesthetic Dermatology, Cosmetology and Skin Hygiene. and the Italian Fragrance Foundation, thus being one of the pioneering women in the field of Italian perfumery.

For her part, Lidia Monti was awarded the Gold Medal of Merit from the College of Culture and Art, for her dedication to teaching and research, and María Piazza was appointed Commander of Merit of the Republic, for her outstanding Teaching work.

María Ragno, founder of a publishing house and one of the promoters of the creation of the National Union of Italian Chemists, was named Honorary Member of that entity for her work and merits acquired in it, and Caterina Rossi, professor of Chemistry at several secondary schools in Florence, also devoted herself to industry and research.

And what say about Maria Bakunin, without a doubt the woman with the most brilliant resume of those cited in this communication due to her merits. Teacher, researcher, in Italy and abroad, author of numerous publications, winner of several prizes and distinctions, and founder and president of several prestigious Italian chemical institutions, her work, together with that of the other women mentioned above, allowed to open the door for other women to follow that path later and contribute equally with their work to the enormous development that Italian chemistry has today.

Hence, it is very fair that all of them can be considered true references to society.

REFERENCES

- Anónimo (21 de febrero de 2019). *Marussia Bakunin: historia de la emancipación de una mujer con apellido embarazoso*. Portal libertarioOaca. Available in <https://www.portaloaca.com/historia/biografias/marussia-bakunin-historia-de-la-emancipacion-de-una-mujer-con-apellido-embarazoso/>[Accessed, 2 Sept, 2022]
- Ciardi, Marco; Focaccia, Miriam (2011). *Maria Bakunin (1873-1960)*. In Apotheker, Jan; Sarkadi, Livia Simon eds). *European Women in Chemistry*. Editorial John Wiley&Sons.
- Fernández, Tomás y Tamaro, Elena (undated). *Biografía de Mijaíl Bakunin*. In *Biografías y Vidas*. La enciclopedia biográfica en línea. Barcelona, España, 2004. Disponible

- en <https://www.biografiasyvidas.com/biografia/b/bakunin.htm> [Accessed, 2 Sept, 2022]
- Franchi, José (2008). *Lidia Monti*. In Scorrano, Gianfranco (2008). *La Chimica Italiana*. 723-724.
- Giuffrè, U. (2008). *Caterina Rossi*. In Scorrano, Gianfranco (2008). *La Chimica Italiana*. p. 580.
- Linguerrì, Sandra (undated). *María Piazza. Scienza a due voci*. Available in <http://scienzaa2voci.unibo.it/biografie/301-piazza-maria> [Accessed, 2 Sept, 2022]
- Marini-Bettolo, Gramo B. (2008). *Maria Piazza*. In Scorrano, Gianfranco (2008). *La Chimica Italiana*. p. 659.
- Nicolaus, Rodolfo Alessandro (2004). *Ricordo di Maria Bakunin. Attidell'Accademia Pontaniana LII* (Napoli), 27-32.
- Nicolaus, Rodolfo Alessandro. (2008). *Maria Bakunin*. In Scorrano, Gianfranco (2008). *La Chimica Italiana*. p. 511-512.
- Rovesti, Paolo (2008). *Emma Fenaroli*. In Scorrano, Gianfranco (2008). *La Chimica Italiana*. 502-503.
- Scorrano, Gianfranco (2008). *La Chimica Italiana*. Padova. Available in <https://www.soc.chim.it/sites/default/files/Chimici%20Italiani.pdf> [Accessed, 2 Sept, 2022]