

## Italian physicists of all times: A biographical dictionary in preparation

A. LA RANA<sup>(1)(2)</sup>

<sup>(1)</sup> *Centro Fermi, Museo Storico della Fisica e Centro Studi e Ricerche “Enrico Fermi” - Rome, Italy*

<sup>(2)</sup> *Dipartimento di Fisica, Sapienza Università di Roma - Rome, Italy*

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**Summary.** — This paper describes the historical research activity aimed at accomplishing the first prosopography of Italian physics. The investigation spans over a period of time of more than five centuries, starting from the Renaissance period and including the physicists born up to 1948. The data which are being collected will be articulated in a biographical dictionary, which is gradually being prepared and will be published in 10 separate dossiers. Up to now the research activity focused on the scholars who were active between the Risorgimento and World War II, allowing to list about 1000 Italian physicists born between 1770 and 1918. Many of them, including about 250 high school teachers, had been neglected so far by historical-scientific literature. Almost 100 women physicists were also identified, attesting a gradual evolution of Italian society and of its scientific culture. Concerning the above-mentioned period of time, the first four dossiers of the biographical dictionary (letters A–Z) are about to be completed and published within 2020. To show the significance of such a prosopographic investigation, a case study is described, concerning Enrico Stracciati (1858–1937), a little-known physicist who had an important role in Orso Mario Corbino’s education.

### 1. – Introduction

The project *Prosopography of Italian Physics* is the first extensive historical research aimed at making a census of all Italian scholars who contributed to the progress and the dissemination of the physical sciences. The purpose is to collect the data available from bibliographic sources and from primary sources (*i.e.*, printed documents from the time and archival sources), and to trace their biographical and scientific profiles<sup>(1)</sup>.

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The compendious notes which are being prepared will be published in a biographical dictionary, made up of three separate volumes devoted to different time frames, as described below. All the biographies will also be available in digital form, as individual data sheets freely downloadable online.

The research activity is articulated over three main periods of time:

- 1) from the Renaissance to the Risorgimento (physicists born up to 1770);
- 2) from the Risorgimento to World War II (physicists born between 1770 and 1918);
- 3) from the Second Postwar Period to the dawn of the Third Millennium (physicists born between 1918 and 1948).

The choice of the above time intervals was adopted to organize the work and the contents of the dictionary. This pragmatic subdivision is motivated both by contingent considerations on the collected data and by more general considerations of historical character. The first period spans over 300 years, starting from Leonardo da Vinci (1452–1519), considered as the beginner of the scientific Renaissance, and going up to Giovanni Pozzi (1769–1838). In this long period of time it is possible to count about 150 Italian scholars contributing to physics, whose lives and scientific activity are already relatively well known. During this first stage of Italian physics, the Galilean method was born and gradually became established during the Enlightenment age. The reason for choosing the year 1770 as a demarcation date for the second section is connected to the profound transformations triggered in Italy by the French revolution. The scholars born in 1770 or shortly later began indeed to give their contribution to science only in the post-revolutionary years, when the military campaign conducted in Italy by Napoleon between 1796 and 1799 generated the brief experiences of the Italian “Sister Republics”. The aspirations towards libertarian and republican ideals and towards the unification of Italy spread among the intellectuals over the first decades of the nineteenth century. Also the scientific community adhered to the will of overcoming the frontiers of the monarchic states reaffirmed with the Restoration, organizing the first Congress of Italian Scientists, held in Pisa in 1839. The meetings took place once a year in different cities in Italy up to 1847. As described by the historian Barbara Reeves, “the congresses were the first large-scale, truly national organization in the politically fragmented peninsula” [1]. However, the first gathering is particularly significant as a watershed between the eighteenth century Enlightenment physicists and the scholars of the age of the Risorgimento. The oldest physicist taking part in the first Congress of Italian Scientists was Giuseppe Morosi, who was born in 1772: a contingent reason for the choice of the conventional year 1770 in our prosopographic study.

During the XIX century, with the unification of Italy and the reformation of education, an unprecedented unitary organization was given to Italian universities and scientific institutions. The field of physics underwent a substantial change, growing both in the number of scholars and in the variety of topics covered. The second time frame takes into account the physicists born before 1918, in order to include those who had started their scientific activity before World War II, and to exclude those born in the last hundred years, allowing a wider historical perspective. After the war, indeed, the field of physics lived a new and profound change of scale, starting to play an unprecedented role in society and international politics.

The third volume of the dictionary, devoted to the physicists born between 1918 and 1948, will be substantially different from the first two, lacking the historical perspective.

Indeed, many living physicists are included. However, the 1948 term was chosen to exclude those who still have an official role in the academic community. Though the time interval considered is much smaller than the previous ones, the order of magnitude of the number of physicists is around 1000, testifying the rapidly growing activity in the field. The prosopographic research accomplished so far, and described in the following pages, was focused on the physicists living between the Risorgimento and World War II. About 1000 scholars have been tracked down, many of whom were never mentioned in previous historical studies. The related volume of the biographical dictionary (Volume II) is about to be published in four dossiers, which will be released as single issues of the editorial series *Supplementi del Giornale di Fisica* of the Italian Physical Society. The individual data sheets included in Volume II are already available in open access on the web page <http://osiris.df.unipi.it/~rossi/Indice%20Dizionario.htm>.

## 2. – Italian physicists between the Risorgimento and World War II: Where to find them?

In a prosopographic study a first part of the work deals with making a census of the people belonging to the category one is interested in: in our case, the Italian physicists of all times. For the physicists included in the first time frame it is quite easy, because of their relatively small number and of the historical-scientific literature already existing on them. Also for the third period, it is not difficult to make a survey: the number of researchers is high, but also the availability of documentation is much increased. Instead, the task is much more challenging in the case of the Italian physicists born between 1770 and 1918, as no previous census or comparable extensive study is available. Indeed, the aim is to include in the prosopography not only all the scientists already mentioned in the literature for their scientific contributions and for their role in the Italian universities, but also those who had only a temporary academic position and nevertheless contributed to spreading the scientific culture, in particular the scholars who became high school teachers.

In section II of the biographical dictionary all the physicists who carried out at least one of the following activities are thus included:

- participation in the first Congresses of Italian Scientists;
- publication of at least one paper in *Il Nuovo Cimento*, at the time the most authoritative Italian scientific journal, with international relevance, published since 1855;
- work in the physics institute of a university, including the researchers having only a temporary position (as, for example, fellows and assistants);
- teaching in a scientific faculty as *liberi docenti*, which meant scholars qualified for holding a specific course at the university, independently of having or not having an academic position, and who could therefore teach by appointment or privately.

In addition, also several mathematicians were included among the physicists, for their contributions to mathematical and theoretical physics, as well as the engineers who have dealt with studies that were not strictly applicative. For the contiguity of the research fields, especially in those early times, all professors of rational mechanics were also taken into account, together with astronomers who held a professorship at the university.

Particular attention was paid in tracing back the first women graduated in physics, who often became high school teachers after working for some time in the university. Difficult and unusual as it was for women to undertake higher education (and scientific education in particular), the few women physicists strongly committed to their studies. Some of them possessed two degrees, both in physics and in mathematics, which was also rare among male colleagues. Nevertheless, it was almost impossible for them to find professional and institutional positions appropriate to their own, often very high, skills.

A great number of primary sources have been explored, with the aim of making a census of all possible physicists born between 1770 and 1918 and collect as much information as possible on their scientific careers and lives. In particular we consulted:

- yearbooks and Seniority Roles of the Ministry of Education;
- yearbooks of several Italian Universities;
- personal files of University staff in the archives of Italian Universities;
- personal data from the archives of the registry offices of the different municipalities and, before the compulsory registration of birth by the official anagraphic service (1871), from diocesan and parish archives;
- obituaries and commemorations in the publications of national academies and scientific journals;
- scientific journals, in particular *Il Nuovo Cimento*, *Physical Review*, *La Ricerca Scientifica* (published by the Italian National Research Council, CNR, since 1930), *Rendiconti dell'Accademia dei Lincei*.

The biographical data we looked for, to be included in the data sheets, are the following:

- 1) place and date of birth and death;
- 2) family members (mother, father, spouse, etc.);
- 3) place and period of primary and secondary education;
- 4) place and period of university studies;
- 5) scientific and/or professional career (periods, places, roles);
- 6) date of retirement;
- 7) main scientific fields of research;
- 8) publications on *Il Nuovo Cimento*;
- 9) other publications;
- 10) bibliographical and/or archival sources.

Bibliographical sources and repertoires have been very precious allies of this wide investigation. It is possible to follow year by year the career of the researchers belonging to Italian Faculties of Science in the accurate work of Droescher [2], a repertoire of data concerning the academic years from 1860 to 1915. It must be pointed out that physics was taught not only in the faculties of science, but also in the following: Engineering,

Medicine and Surgery, Pharmacy, Architecture, Veterinary science. Furthermore, in some universities such as those of Parma and Perugia there was no faculty of Science and professorships of physics belonged respectively to the faculties of Pharmacy and Medicine and Surgery<sup>(2)</sup>. With the purpose of making a complete survey, the yearbooks of the Ministry of Public Education and of the various universities continue to be a fundamental source also in the time range 1860–1915.

Another very useful tool is Giuliani's repertoire of all the scientific papers related to physics published by *Il Nuovo Cimento* between 1855 and 1944 [3]. An accurate year-by-year collection of authors of scientific publications is Poggendorff's *Biographical-Literary Dictionary of the History of Exact Sciences* [4]<sup>(3)</sup>.

### 3. – General results and a quantitative comparison with existing repertoires

The prosopographic investigation carried out for Volume II led to identifying about 1000 physicists, among which about 250 secondary school teachers and about 100 women physicists.

The 250 biographical data sheets about school teachers represent a completely original new repertoire, which is meaningful for several reasons. In those early years, there used to be strong connections between high school teachers and universities. It was not unusual that high school teachers held university courses and made valuable experimental research, benefiting of physics cabinets which were furnished with modern and refined instruments and in several cases better equipped than the laboratories available in many universities. A good example is the physics cabinet of the Technical Institute of Florence, where physicists as Gilberto Govi (1826–89) and Adolfo Bartoli (1851–96) could work at measurements, which kept pace with the scientific frontiers of the time. A career in school teaching was very often preferred to the university career, not only because it represented a safer and straightforward path: it guaranteed also a high social prestige and a good salary, which was greater than the one assured by long years of university assistantship. Furthermore, the role of teachers in addressing brilliant and goodwilling students towards scientific studies was very important for the development of Italian physics in those early times of the united country. It must not be forgotten that several teachers were also authors of appreciated textbooks on physics, which provided the first generations of Italian students with the rudiments of the scientific method.

Another very relevant result of the historical investigation carried out so far is having listed 97 women physicists, who in many cases were completely unknown before: they were the first Italian women graduated in physics. Up to now the biographical data sheets collected represent the most complete repertoire available about the female portrait of Italian physics between the Risorgimento and World War II. In most cases, these women became secondary school teachers, not rarely turning to the teaching career after spending some years working for a Physics Institute. Some of them continued to hold a form of

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<sup>(2)</sup> Other Italian Universities where the Physics Institute belonged to the Medical school were those of Bari, Sassari and Siena, while in the free University of Urbino the Physics Institute was part of the School of Pharmacy.

<sup>(3)</sup> The *Biographical-Literary Dictionary of the History of Exact Sciences* was founded in 1863 by Johann Christian Poggendorff (1796–1877). This repertoire includes biographical information about scientists, including place and dates of birth and death, main research fields and scientific institutions for which they worked. The year-by-year collection started in 1863 has been carried on along all the XX century.

collaboration with the academic world for all their lives, either for teaching or for carrying on a research activity at the university.

It must be pointed out that, for its intrinsic nature, a prosopographic study as the one presented here will always be a work in progress, which will hopefully benefit in the future of discoveries and reports from other historians and people interested in contributing to the collection of data and information. However, it is worth making a comparison of Volume II of our biographical dictionary with the state of the art of some extensive repertoires as the *Treccani Biographical Dictionary of the Italians* and the *Biographical Dictionary of Italian Women in Science* [5-7].

Selecting only the physicists born between 1770 and 1918, the present index of the *Treccani Biographical Dictionary* includes about 220 names; while the *Biographical Dictionary of Italian Women in Science* contains about 60 entries devoted to women physicists. The numerical difference is substantially related to the different aims of these repertoires with respect to a prosopography of Italian physics, which tries indeed to describe the evolution over time of all the community of people educated in the field, who have contributed to build, teach and share the knowledge of physics in Italy and establish its institutions.

#### 4. – An exceptional teacher: Enrico Stracciati

In the present section a significant case study is presented, concerning the physicist Enrico Stracciati (1858–1937).

In scientific and historical-scientific literature, the name *Enrico Stracciati* appears in relation with the better known physicists Adolfo Bartoli (1851–1896) and Orso Mario Corbino (1876–1937). Indeed, the journal *Il Nuovo Cimento* displays 21 papers co-authored by Stracciati and Bartoli, published between 1883 and 1895 and concerning mainly measurements of solar heat and calorimetry. The connection with Corbino is reported in several biographies of this Sicilian physicist and politician [8]. A man called *E. Stracciati* is mentioned as the professor of physics of Corbino at the high school *Spedalieri* in Catania, where he was a student in the years 1889–92. Some sources speak of Corbino’s professor using the uncorrect first name *Emanuele*, but no teacher of physics called *Emanuele Stracciati* appears in the yearbooks of the Ministry of Education of the time. Instead, one finds a physicist named *Enrico Stracciati* who taught in Catania at the Technical Institute *Gemellaro* from 1886 to 1892; it is interesting to notice that he did not teach in the high school attended by Corbino.

Of the 21 papers written together with Adolfo Bartoli, 14 date back to the period of time when Stracciati was teaching in Catania. The two could actually work together, because Adolfo Bartoli was professor at the Institute of Physics of Catania University since 1886 and held this position until 1893, when he moved to the University of Pavia.

Further information on Stracciati comes from scrolling through the yearbooks of Pisa University and of the Scuola Normale Superiore (SNS), which was already at the time an institute of excellence for the education in physics. Enrico Stracciati, born in Arezzo on 12 December 1858, appears among the students of the Pisan Faculty of Physics (1878–82) and of the SNS (1880–82). It is worth noticing that about 10 years before also Bartoli had been a student of the SNS in Pisa. This fact is very likely not just a mere coincidence. After graduating in physics in Pisa, Bartoli became assistant of Emilio Villari (1836–1904) at the Physics Institute of the University of Bologna (1874–76) and afterwards became professor of physics at the Technical Institute in Arezzo (1876–78). Stracciati was a student in the latter school in the same period, obtaining his diploma in 1878, as

reported by the yearbooks of the SNS. It is not difficult to imagine that as a brilliant student of Bartoli, Stracciati was addressed by his professor to study physics at the University of Pisa and to compete for a post within the SNS, where he was accepted in 1880. Here he met Vito Volterra (1860–1940), who was also attending the Pisan Faculty of Physics and the SNS. They became friends and remained in touch in the following years, as highlighted by the epistolary preserved in Volterra’s personal archive at the *Accademia dei Lincei* in Rome.

Stracciati graduated in physics in 1882 with honors and in the same year became assistant at the Technical Institute in Florence (1882–84), where he met again Bartoli, who was teaching there since 1879. The first experimental researches carried out together date back to the two years spent by Stracciati in Florence. They worked side by side in the very well equipped cabinet of physics of the school.

After another two-year period teaching in the Technical Institute in Arezzo (1884–86), Stracciati became professor at the Technical Institute *Gemellaro* in Catania (1886–92) and later moved to the Technical Institute *Paolo Sarpi* in Venice (1892–93). He ended his career in Rome at the high school *Leonardo da Vinci* (1893–1928).

However, his professional life still reserved a surprise. When Stracciati retired, Orso Mario Corbino was the director of the Royal Physics Institute of Rome, in via Panisperna, a position that he had been holding for ten years, after the death of the founder and first director Pietro Blaserna (1836–1918). Searching the yearbooks of the University of Rome, one comes across the following team of physicists working at the Royal Physics Institute in the academic year 1928-29: Orso Mario Corbino (Director), Franco Rasetti (assistant on leave), Nella Mortara (assistant), Mario Martoscia and Emilio Segrè (partners of the Italian Society for the Progress of Science), Rosina Spadea (volunteer assistant) and, surprisingly, Enrico Stracciati engaged as *temporary assistant in charge*. After his retirement, indeed, Stracciati was invited by Corbino to hold this temporary position for two academic years. The first year he replaced Franco Rasetti (1928-29), who was on leave for research activity abroad, and afterwards Emilio Segrè (1929-30), on leave for military service. The choice of a retired 70 year-old school teacher for the role of assistant may appear very outlandish, but it is the sign of a long relationship of esteem and friendship that linked Corbino to Stracciati. Indeed, Corbino had met Stracciati when he was a student in Catania, but not, as known so far, while attending his courses in high school. The circumstances of their meeting were in fact more interesting and meaningful, as it was possible to learn from the documents kept in a folder concerning the history of the Royal Physics Institute of via Panisperna in Edoardo Amaldi’s archive [9]. In 1972, Edoardo Amaldi had made an interview to the railway engineer Guglielmo Stracciati about his father Enrico and reported this conversation in a brief biographical note on Enrico Stracciati. Here one can find the following paragraph:

In Catania he was professor of Orso Mario Corbino in special circumstances, which Corbino himself described writing to him in 1911: *As you may have learned later, when I was a high school student, I stealthily attended your lectures at the Technical Institute of Catania, and I also attended those in physics and mathematical physics of Bartoli, all of which have exerted a profound influence attracting me to physics studies. Since then I have had almost a religious veneration for your wonderful works.*

One can hardly imagine Corbino skipping his school lessons to sneak into the Technical Institute and listen to Stracciati’s lectures. However, the stealthy participation in Stracciati’s lessons and in those of Bartoli at the University of Catania shows that in the

scientific training of Corbino there was a cultural heritage deriving from the Pisan school of physicists represented by Ottaviano Mossotti (1791–1863), Carlo Matteucci (1811–1868) and Riccardo Felici (1819–1902). This scientific imprinting was based on a strong experimental tradition never unrelated to the attempt of theoretical interpretation, an imprinting that later would have found in Enrico Fermi (not by chance wanted in Rome by Corbino) the exaltation of a method capable of producing exceptional results.

## 5. – Conclusions

A prosopographic study allows to trace the *academic genealogies* of physicists, following the possible influences of the various Italian schools of physics on the development of the field, as suggested by the example of Enrico Stracciati. It also allows to follow the evolution of the community of Italian physicists over time, for example by showing how the number of male and female scholars changed in the different ages.

For its nature of extensive research, the present work will always be subject to improvements and integration that will be promptly reported online, in the open access data sheets.

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*Note added in proofs:* During the publication process of this paper, the dossiers A–C and D–L of Vol. II and the whole Vol. I (A–Z) were completed. The dossier A–C was published in October 2019 [10], while the dossier D–L and Vol. I have been submitted to the Publisher and the related proofs are being prepared. The dossiers M–P and Q–Z of Vol. II are nearing completion.

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