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The recovery of an unpublished Fermi's and Bovalini's university handout

ENRICO BAGNI(*)

Department of Economics and Management, University of Pisa - Pisa, Italy

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Summary. — The author's research revealed a university handout relating to Prof. Umberto Sborgi's course in Physical Chemistry in the academic year 1920–1921 by the students Enrico Fermi and Enrico Bovalini at the Royal University of Pisa. The article reports also the discovery of the minutes of the individual special exams taken by Enrico Fermi as a student of the Degree Course in Physics at that University, in order to include the Physical Chemistry exam taken by the student Enrico Fermi in his university career.

1. – Introduction

The goal of this paper is to illustrate the results of the author's research that points out the discovery of a university handout relating to Prof. Umberto Sborgi's course in Physical Chemistry in the academic year 1920–1921 by the students Enrico Fermi and Enrico Bovalini at the Royal University of Pisa. On the other hand, this activity had been anticipated by Enrico Fermi, a Luigi Puccianti's student, in his letter to Enrico Persico written on 11 December 1919, where Fermi said: "Tra le altre cose mi sono dato all'industria delle dispense (...)". Historians knew Fermi's letter to Persico in which the student of the Royal University of Pisa said to devoted himself over to the handout industry, but no one had identified them, thinking that since so much time had passed it might be difficult to find their traces. The opening of a digitized file registered to Enrico Fermi gave rise to an unexpected search. In fact the author, visiting the Lazio 900 website (`https://www.lazio900.it`), which collects some funds from academies and scientific institutions of interest for the history of science, and typing the name Enrico Fermi, found a digitized file inside which the description of the following handout was found: "Prof. Umberto Sborgi. Lezioni di Chimica fisica a cura degli studenti E. Bovalini ed E. Fermi. Anno Accademico 1920–1921". This handout, within Enrico Fermi's file, is kept at the National Academy of Sciences, known as "Accademia dei XL", in Rome. There is no mention of this handout in the aforementioned letter from Fermi to Persico. At that point, an unknown story opened in Fermi's life, but documented by the title of the handout. The author, in order to include the exam of Physical Chemistry into Enrico Fermi's university career, through a timely and detailed analysis of the General Archives of the University of Pisa, has discovered the individual reports of the special exams taken by Fermi as a student of the Degree Course in Physics at the Royal University of Pisa in the period 1918–1922. These reports include also the Examination Commissions, grade, hour and date of each exam. Also the detailed report of Enrico Fermi's graduation session has been discovered and it is included in the present work.

(*) E-mail: `8enricob@gmail.com`. ORCID: 0009-0007-9662-8255,
Scopus Author ID: 57223622020 - WoS ResearcherID: HSH-3155-2023.

Fig. 1. – Handout front cover property of "Accademia dei XL".

TABLE I. – *Index of the Handout.*

2. – The discovery of the handout

The handout (fig. 1) consists of 320 pages, without the presence of an index. Given that on the last page (page 320) of the handout in question the discussion is interrupted, a search was carried out to find its completion through the person in charge at the "Accademia dei XL", a search which however gave a negative outcome. From the analysis of the handout the index in table I emerges (personally drawn up from the pages of the handout itself).

TABLE II. – *Volumes containing the minutes of the special exams of the R. University of Pisa.*

Volumes	Period	Number of reports
171	23 October 1918 – 8 July 1919	1–440
172	30 September 1919 – 30 July 1920	1–553
173	16 October 1920 – 20 December 1921	1–518
174	17 January 1922 – 16 December 1922	1–356

3. – The discovery of Enrico Fermi's exams at the Royal University of Pisa

By analyzing the volumes containing the minutes of the special exams of the R. University of Pisa in the period 1918–1922 (volumes 171 to 174, see table II), it was possible to find those relating to Fermi's exams, detailed in terms of date, grade and examining commissions, as illustrated in table III. Moreover, table IV details the final graduation exam of Enrico Fermi.

4. – Conclusions

As results of the research illustrated in this paper, it is possible to underline that:

- the correspondence with Enrico Persico is re-evaluated, which allowed us to make real discoveries through hints made by Fermi himself, as happened with the handout on Physical Chemistry examined in the present work;
- the discovery of the handout relating to the Physical Chemistry course of Prof. Umberto Sborgi([1]) (a.y. 1920–21), drawn up with Enrico Bovalini([2]), confirming what Enrico Persico mentioned about devoting himself to the handout preparation (handout interrupted);
- the possibility of deducing, from the analysis of the index of this handout, the presence in the program developed by Sborgi of the first theories on the model of the atom (Thomson; Rutherford; Bohr) and the first elements of quantum theory;

([1]) *Umberto Sborgi* (1883–1955) was born in Cecina on 15 March 1883 to Guglielmo Sborgi and Giuseppa Varoli. He obtained the Diploma of Pharmacist on 22 November 1904, with a score of 38/50, at the Royal Institute of Higher Practical and Specialization Studies in Florence. He graduated in Chemistry in 1908 from the Royal University of Pisa with a grade of 110/110. He enrolled in the Degree Course in Mathematics at the Royal University of Pisa in 1910. He graduated on 12 February 1913 from the School of Teaching of the Royal Scuola Normale Superiore Universitaria of Pisa with a score of 70/70, passing the qualification exam in Chemistry. He obtained the Professorship in General Chemistry at the Royal University of Pisa on 30 July 1913. In 1928 he moved to the Royal University of Camerino and then to the Royal University of Parma, where he held the position of Rector too. From 1936 he moved to the Royal University of Milan, where died on 10 January 1955.

([2]) *Enrico Bovalini* (1900–1977) was born in Siena on 5 December 1900 to Giunio Bovalini and Carolina Naldini Landi. He graduated in Chemistry from the Royal University of Pisa on 18 December 1923 with 108/110 as graduation score. He was Assistant of the Institute of General Chemistry of the Royal University of Pisa. From 1939 to 1942 he was Director of the Institute of General Chemistry and of the Institute of Physical Chemistry of the Royal University of Pisa. In 1943 he won the competition as Full Professor at the Royal Naval Academy of Livorno, where he taught until 1971, the date of his retirement. From 1948 to 1971 he was also Director of the Institute of General Chemistry of the University of Siena. He died in Siena on 13 July 1977.

TABLE III. – *Enrico Fermi's special exams at the R. University of Pisa (1918–1922).*

n	Exam	Grade	Date	Time	Members of the Examining Committee		
1	Analisi Infinitesimale	30 Lode	24 June 1919	8:00	O. Niccoletti	L. Bianchi	A. Mazzarri
2	Geometria Analitica	30 Lode	24 June 1919	8:00	O. Niccoletti	L. Bianchi	A. Mazzarri
3	Analisi Algebrica	30 Lode	24 June 1919	8:00	O. Niccoletti	L. Bianchi	A. Mazzarri
4	Fisica Sperimentale	30 Lode	21 June 1920	9:00	L. Puccianti	U. Sborgi	P. Aloisi
5	Geometria Proiettiva	30 Lode	25 June 1920	10:00	E. Bertini	G. A. Maggi	C. Rosati
6	Chimica Inorganica	30 Lode	5 July 1920	15:00	L. Puccianti	R. Nasini	A. Quartaroli
7	Chimica Organica	30	5 July 1920	15:00	R. Nasini	L. Puccianti	A. Quartaroli
8	Fisica Matematica	30 Lode	26 June 1921	8:30	G. A. Maggi	L. Puccianti	G. Polvani
9	Geodesia Teoretica	30 Lode	30 June 1921	9:00	G. Armellini	G. A. Maggi	G. Bartorelli
10	**Chimica Fisica**	**30 Lode**	**30 June 1921**	**16:00**	**U. Sborgi**	**L. Puccianti**	**A. Quartaroli**
11	Meccanica Razionale	30 Lode	1 July 1921	9:00	G. A. Maggi	G. Armellini	G. Bartorelli
12	Preparazioni Chimiche	30	11 July 1921	18:00	R. Nasini	U. Sborgi	C. Porlezza
13	Analisi Superiore	30 Lode	27 June 1922	8:00	L. Bianchi	O. Nicoletti	G. Polvani
14	Meccanica Superiore	30 Lode	27 June 1922	9:30	G. Armellini	G. A. Maggi	A. Chiellini
15	Disegno a Mano Libera	24	29 June 1922	14:00	G. D'Achiardi	B. Longo	G. Luperini
16	Esercitazioni di Fisica	30 Lode	30 June 1922	8:00	L. Puccianti	U. Sborgi	G. Grazi

TABLE IV. – *Enrico Fermi's Graduation Session on July 4, 1922.*

Candidate	Committee Members	Questions	Notes
Enrico Fermi di Alberto, Roma	Luigi Puccianti Gian Antonio Maggi Giuseppe Armellini Mario Canavari Eugenio Ficaldi Luigi Bianchi Giovanni D'Achiardi Umberto Sborgi Silvio Chella Giovanni Polvani Mariano Pierucci	Prova pratica: Esperienze di Melde variate e fotografate Tesi: Studi sopra i Raggi Röntgen Quesito di Analisi (Prof. Bianchi): Teoremi di Minkowski sul solido convesso Quesito di Fisica Matematica (Prof. Maggi): Peso delle masse elettromagnetiche Quesito di Chimica Fisica (Prof. Sborgi): Calori specifici dei corpi solidi	Per l'approvazione SI: 11 Per merito punti: centodieci su centodieci e lode Il Presidente Luigi Puccianti Il Segretario Mariano Pierucci

- through a timely and detailed analysis of the General Archives of the University of Pisa, the individual exams taken by Enrico Fermi at the Royal University of Pisa have been identified, with related commissions, days, months, years and grade obtained;
- it was noted that the Director of the Institute of Experimental Physics and Meteorology of the Royal University of Pisa, Prof. Luigi Puccianti, was present as commissioner in six of the sessions of Fermi's special exams, besides presiding over his physics degree session.

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