

Perennial Value of Great Physics Laboratory Equipment Collections

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Abstract. *The education in Mathematics, Physics and, Chemistry has been basic for the training of Romanian higher technical staff during all its history in Bucharest, even since "Princely Academy of St. SAVA" (1694). The first Physics and Chemistry experimental laboratory equipment was bought in 1833 and the first Physics Laboratory was active in 1850. For the new campus (Polizu street) of the „National School of Bridges and Roads”, built between the years 1884-6, it had been ordered, to E. DUCRETET scientific equipment company in Paris, a full collection of Physics laboratory equipment (867 pieces, later on developed), intended for course demonstrations and students' laboratory work. The collection was honoured at 1885' Anvers International Exhibition. It played an important role in the development of Bucharest Polytechnics. Today, there are being exhibited in the UPB Museum 17 devices of the initial DUCRETET collection, found by the first author, some of them being also used to teach Experimental Physics to classes of pupils.*

Keywords. Interactive museum, DUCRETET collection, repertory of museums, repertory of collections, competitions for scientific archaeology, scientific equipment restoration.

1. Introduction

The basic sciences education has been fundamental for the training of higher technical staff along all its history in Bucharest [1, 2, 3, 4], even since "Princely Academy of St. SAVA" (1694, Greek language¹) and the first Romanian "Higher Technical School" (1818²).

At the "St. SAVA College" (1832), one of the four offered curricula was in "Exact

Sciences".

The first experimental laboratory equipment for Physics and Chemistry was bought in 1833 and the first Physics Laboratory (called as that) was operational in 1850.

The higher technical education in Bucharest was reorganized many times. Since 1991, the official name of Bucharest Polytechnics has been the University "POLITEHNICA" in Bucharest (UPB)

2. The Museum

In the new campus (Polizu street) of the „National School of Bridges and Roads" (SNPS), campus designed by the French architects Lecomte de Nouy and Bernard Cassien and build between 1884-6, it was reserved a large room (called **MUSEUM**), close to the main amphitheatre, in the building A, for the equipment for the experimental demonstrations during courses and laboratory activities of "élèves".

A full collection of Physics laboratory equipment was ordered, by the Director of SNPS, Prof. Gheorghe DUCA, to the internationally renowned Eugène DUCRETET scientific equipment company in Paris (35, rue des Feuillantines, that time).

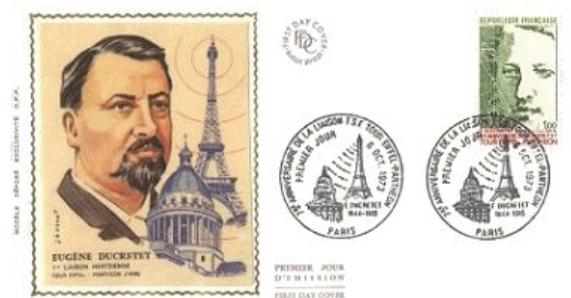


Figure 1. Mail envelope to commemorate the 75 anniversary of the 1898 wireless connection Tour Eiffel – Panthéon.

¹ Analogue to Latin language in Western Europe

² This autumn is to be celebrated the 190th anniversary of starting engineering education in Romanian language, in Bucharest.

Eugène DUCRETET (1844-1915), in spite of being a self made man, produced new devices for leading physicists of his time, became an active member of the French Physics Society (more than 30 papers published) and a patent holder (especially in radio communications), a gold medallist of and finally an organizer of universal exhibitions [5, 6, 7].

In November 1897, E. DUCRETET conducted the first experiments on wireless communications between his workshops (street Claude Bernard, Paris) and PANTHEON (400m).

On November 5, 1898, a fully operational equipment was publicly tested under the supervision of the "Academie de Sciences" in Paris, the Academy member MASCART confirming the success of the experiments of wireless communications between the 3rd platform of Tour Eiffel and the Panthéon (see Fig. 1) [8]. One year later, DUCRETET equipped the Russian Navy with its equipment (the system "POPOV-DUCRETET").

The MUSEUM, founded in 1886, was continuously developed, including collections of „POLITEHNICA" achievements.

Some of its exhibits have been exposed at world exhibitions , f. e. at the 1900 Exhibition in Paris was exhibited the model of the bridge build over Danube, at Cernavoda, bridge designed and built, by competition, by Prof. Anghel SALIGNY (one of the participants at that competition being Gustave EIFFEL!).



Figure 2. The found pieces from DUCRETET Collection, at the re-opening of the Museum, on December 3, 2003

During a visit in the Museum, on June 3, 1904, the King Charles I st of Romania accepted that one of his hands be irradiated by a, just

arrived, Radium source, and examined the resultant radiography.

Since its beginning, the MUSEUM was the nursery of new experimental courses which started with the documentation abroad of the Director of the Museum, the acquisition of experimental equipment for teaching and for the practical work of the students, in the new emerging fields. Later on, followed new curricula and eventually, new departments, for instance the "Electrical Engineering", after comprehensive documentation visits in Western Europe.

The MUSEUM was reorganized as the INDUSTRIAL MUSEUM OF THE „POLYTECHNIC SCHOOL", in 1927, the Museum's collections being developed by acquisitions, by exhibits produced in the Museum workshop or donated by professors or industrial companies.

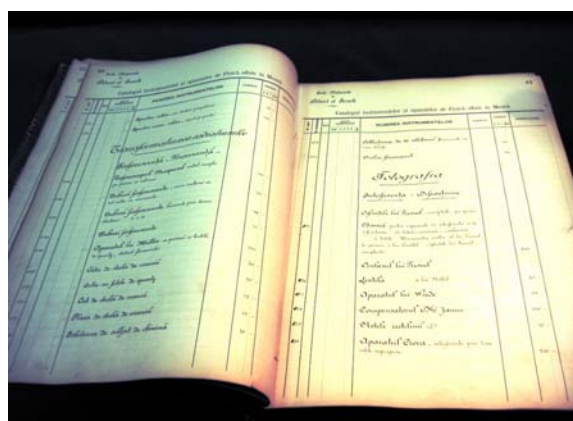


Figure 3. The original Catalogue (1886) of DUCRETET' Bucharest Collection.

The MUSEUM disappeared from documents in 1948, during the soviet's imposed reform of education in the country. Nevertheless, a part of the DUCRETET Collection has been preserved in the Department of Physics, for experimental demonstrations during experimental courses, until 1960'.

The Museum has been re-opened on December 3, 2003, during Prof. Ioan DUMITRACHE rectorship, on the celebration of the anniversary of 185 years from the first higher technical courses taught in Bucharest, in Romanian language.

There have been exhibited 14 pieces of the DUCRETET collection, pieces found in the Department of Physics of the University "POLITEHNICA" in Bucharest (UPB).

3. The initial DUCRETET Collection

This DUCRETET collection, firstly made out of 867 pieces (the catalogue of which has been found), was exhibited, before to arrive in Bucharest, at the 1885 International Exhibition of Anvers, where received the "Honour Diploma".

The Collection started to be used in Bucharest, since 1886, when the new POLIZU campus was ready.

The Catalogue (Fig. 3, actually an Inventory, mentioning quantities and values) shows that the DUCRETET Collection was structured in the sections:

- A 001-148 - Measuring devices and Mechanics
- B 149 – 235 - Statical electricity
- C 236 – 254 - Magnetism
- D 255 – 414 - Heat
- E 415 – 493 - Acoustics
- F 494 – 709 - Optics
- G 713 – 863 - Dynamical Electricity
- H 864 – 881 - Telegraphy, Telephony, Photophony.

For a couple of years, following the initial acquisition, there had been ordered to DUCRETET Co., every year, about 20 new laboratory items illustrating newly discovered phenomena (radio, Roentgen rays, radioactivity a. s. o.).

The King CAROL I of Romania honoured Eugene DUCRETET with the title of „Officier de l'instruction publique, de la Couronne de Roumanie”.

By its size, its variety, its actuality, its quality, the high precision of its components made up to date and its reliability, (many of them even today working!), this collection of lab equipment has been unique in Romania and probably, very rare in the world.

The existence of such a Collection imposed the founding in the Department of Physics of the POLYTECHNICS of Bucharest of a mechanical and electrical workshop, initially for maintenance and repairs but lately for building new didactic and research equipment, later on multiplied by specialized companies.

Since the arriving of the DUCRETET collection (1886), the courses of Physics taught to engineering students (freshmen, sophomore and juniors) were experimental ones, until 1960' when a communist reform transformed Physics taught in Polytechnics in a theoretical discipline offered to seniors, only. Since then, the

destruction of the collection was very fast, it being considered financially totally depreciated and disappearing from records.

During its existence, working components of the collection were exhibited at different National Exhibitions.



Figure 4 The telescope of a goniometer (F 539)

The DUCRETET collection was used, since 1890, by the commission empowered to issue recognition and equivalency certificates for the engineering diplomas obtained abroad, commission hosted by Bucharest National School of Bridges and Roads.

The Collection was used for research especially interdisciplinary, training of school teachers, of gifted students attending scientific conferences at POLITEHNICA and of Romanian participants in international Olympiads, as models for didactic equipment built by local and other Balkan companies and research institutes.

The Collection has been a source of progress along all its history.

4. The DUCRETET devices existing in the Museum

The Museum has been re-opened on December 3, 2003 (as "Museum of UPB"), in the old POLIZU campus, but in the building M.

There have been found and exhibited the **Catalogue** (Fig. 3) of the Museum of the

National School of Bridges and Roads in Bucharest, opened in 1886 describing the components of DUCRETET Collection and 14 pieces of the initial DUCRETET collection, all in state of operation, starting with a genuine metre-etalon and its metrological certificate issued in Sevres.

Three more devices have been found, also by the first author, this year.

A dozen of pieces have been found, some in regular use, in student's laboratories (f. e. FRESNEL LENS - Fig.5, ASTRONOMICAL Lunette) but many pieces have been lost, under legal and administrative official coverage of "depreciation".



Figure 5. Large RUHMKORFF's induction coil for 35 cm sparks (G 825)



Figure 6. FRESNEL's lens (F 557)

Table 1 List of DUCRETET exhibits in the Museum of UPB

Code	Name	Cost (RO LEI, 1885)
	Scoala Nationala de Poduri si Sosele; CATALOGUL MUSEULUI; 1886	
A 003	Metre etalon (Ag in brass) with, centimetre, certificate and box	140
A 018	7 ivory spheres to study collisions (recently found)	70
E 432	LISSAJOUS' optical comparison device with electrical excitation	140
F 502	Correcting prism with support	70
F 504	Variable rectangular diaphragm	30
F 505	Set of interchangeable diaphragms	12
F 539	Telescope (recently found; from BABINET's goniometer ?)	375
F 557	FRESNEL's lens (stepped)	300
F 558	Empty prism (for Carbon Sulphide) annex to the goniometer	50
F 617	MUELLER's device for studying fluorescence (with prism and lens)	220
F 645	Astronomical telescope with searcher with tripod	300
F 660	Aplanetic objective (recently found)	115
F 666	Table for polishing glass	42
F 690	BERTIN's set to study polarisation (FRESNEL's arrangement)	35
F 707	Newton's device to generate interference rings	50
G 825	Large RUHMKORFF's coil for 35 cm sparks	1250
G 843	FARADAY's device to study the rotation of the plane of polarization	950



Figure 7. The electromagnet (G 843) used in FARADAY's experiment to study the rotation of the polarization plane. Also, pole heads for other uses.

5. Activities of the Museum of UPB

In the "POLITEHNICA" Museum, where the remains of the DUCRETET Collection are

preserved now, some pieces of the Collection are used for live experimental demonstrations offered to classes of school pupils. Occasionally, some pieces are displayed at HSCI events, in schools.

The Museum of University "POLITEHNICA" plays today an important role in Informal Science Education, in developing Science literacy and in Civic education of its visitors, the Museum officers going to schools and exhibiting at different conferences, contributing to make Physics more appealing and socially relevant to young generations and not only.

6. Conclusion and suggestions for further work

A large number of collections of physics laboratory equipment with great scientific and historical value exist all over the world in museums universities and research institutions. Its scientific and pedagogical value should be explored by universities schools and educators.

We suggest the Hands-on Science Network, with the contribution of pupils, students, teachers, professors, museums and equipment companies, to organise and keep:

- a *repertory of museums of sciences* open to live classes,
- a *repertory* of remains of valuable laboratory *collections*, particularly of those having received important prizes along their history, and to organize, periodically,
- *contests* of pupils and students for finding and

restoring old pieces of physics' laboratory equipment.

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