

“LABORATORY HANDS” ONCE MORE AND THE POLYTECHNIC SCHOOL OF LISBON (1837-1911)¹

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Abstract

In two previous papers presented at the 6th International Conference on History of Chemistry, held in 2007 at Leuven, and 7th International Conference on History of Chemistry, held in 2009 at Sopron (Hungary) we brought up some facts regarding the identification of the chemistry preparers personality in some teaching institutions in Portugal, namely in the Polytechnic School of Lisbon. In those papers we also endeavoured to distinguish aspects of the professional evolution of the mentioned individuals.

In spite of being basically employed to assist the lecturer and relieve him of the so called minor preparatory tasks, necessary for the practical classes and investigation, the laboratory hand would, when needed, alternate between a mere laboratory assistant helper to practically an assistant lecturer. Yet, it is clear that there was a barrier that prevented the lecturer and the hand –each with a totally independent professional situation– from being mistaken one for the other.

New significant data provided by the intensive research done in documentation from the Polytechnic School archive, as well as in other exterior sources, related to the current CICTSUL project, “Scientists, laboratories and scientific instrumentation in the Polytechnic School of Lisbon” (later to become Faculty of Sciences), lead us to the necessity of delving deep into this issue. Therefore, the present work proposal approaches again the question of that specific professional area –the laboratory hand– and its role in the development of Chemistry teaching in Portugal, using the Polytechnic School of Lisbon as a case study. The objective is to outline more accurately the general points of evolution within the perspective of their work with the Chemistry lecturer, professor or investigator, and thus provide a better understanding of the historic process of Chemistry and its development in the educational institutions of the 19th century.

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Introduction

Despite the reputation of the scientific education institutions to which they were connected, Chemistry Preparers – also known as Laboratory Hands– were almost always absent from the records of its history. However, recent research about the development of chemistry teaching in Portugal has taught us more about them and how they were, or were not, a part of Chemistry tuition. This is what is intended to be addressed in this project, in the specific scenario of the Polytechnic School of Lisbon (1837-1911).

The Polytechnic School was established in January 11th, 1837 to provide scientific expertise in the training of Army and Navy soldiers and had, ever since its establishment, a subject of Chemistry named "6th Subject: General Chemistry and its main applications to the Arts". Later in 1859, another one was created: "Chemical Analysis and Organic Chemistry".

Between the moment of the creation of the School and the creation of the new Chemistry subject, a dramatic event radically changed the physical space allocated for this training project. On April 22nd, 1843, a devastating fire completely destroyed the interior of the old building of the Polytechnic School –the same building where the College of Nobles, abolished on January 4th 1837, once was. The rebuilding of the School would finally take place in 1846. Ten years later, there was a new Chemistry Laboratory at the Polytechnic School.

Before 1843, practical classes for the 6th Subject were performed in a chemistry lab: lacking a purpose built location, the kitchen of the boarding school which preceded the Polytechnic may have been –after some interventions– the interim solution in effect until 1843.

After the great fire, the Chemistry and the Physics class were transferred to the Royal Mint's Chemistry Laboratory. Some equipment that survived the fire was moved from the Polytechnic School to the Royal Mint, and located in the small houses by the Metallurgical Laboratory. In 1851, the Chemistry class was still held at the same Laboratory, headed by Júlio Máximo de Oliveira Pimentel, and with José Alexandre Rodrigues as lab preparer instead of Francisco Cardoso Leal Júnior, who had left around 1847.

With José Alexandre Rodrigues' resignation as lab preparer in 1854, it is certain that the activity of the first two chemistry lab preparers was undertaken in labs, either preceding or exterior to the historical building. It is, in a way, a pre-historical era to the Chemistry Laboratory of the Polytechnic School and its laboratory hands.

1837 to 1859: The Chemistry Laboratory within the one subject system

The development of chemistry and other issues related, such as the history of Chemistry preparers at the Polytechnic, has a primordial factor of analysis in its key subjects: the 6th Subject and Chemical Analysis and Organic Chemistry.

Until 1859, Chemistry at the Polytechnic was taught as one subject subdivided into two topics which themselves evolved with time. Initially and according to organic law, the first topic (or 1st part) constituted the elementary course and the second was reserved for the more developed areas of Chemistry. Students at the Polytechnic attended both parts of the 6th Subject or just the second one, according to the degrees they were reading. In the first section, lasting for 4 months, subjects such as cohesion, affinity, nomenclature, atomic theory and isomerism were taught; metals and metalloids and finally, organic chemistry. However, this system of separating Chemistry into an elementary course and a development course was not maintained over time, as can be seen in the programme for 1856/1857, where the 1st part is Inorganic Chemistry and the 2nd is Organic Chemistry.

But since 1840/1841 there was a programme for a practical course under the 6th Subject lecturer's remit: "practical lessons on manipulations". It is legitimate to ponder that this course was initially based on the Chemical Analysis element, present in his 6th Subject programme of 1838: "instruments and reactants –their use; analysis of gas, solid matter, alloys, acid mixtures and rock, organic and mineral water analysis".

It is still unknown how these practical lessons on manipulation worked in the chemistry lab. Later, according to the chemistry lab programme in the academic year of 1856/1857, the practical lab lessons –a given number of preparations and analysis– occurred between October and February as part of the 2nd part of the 6th Subject –Organic Chemistry.

The chemistry lab functioned under the direction of the 6th Subject lecturer. Given that as from July 1853 there was a new lecturer position specifically for Chemistry, since that date through to 1860 there were four people with direct intervention in the chemistry lab: the Director (and 6th Subject lecturer), his substitute, a preparer and an attendant.

The Chemistry Lab and the two subjects of Chemistry (1859 to 1889)

The need to coordinate education at the Polytechnic School with that of the war schools –namely that of the army– was not only a constant priority but also necessary given its position as introductory institution to the army and navy. Even if

the creation of the subjects of Chemical Analysis and Organic Chemistry on the 7th of June 1859 can be regarded as a return of a civilian environment to the School, the fact is that the military impression lasted for a long time. Only in 1869 did the School Head become a civilian post undertaken by a permanent or retired lecturer, whilst previously it had been held by a General or Senior Officer of any of the Scientific Weapons.

According to the Lisbon Polytechnic School's programme, established on the 8th June 1860, the distribution of subjects across the various introductory courses, Army, Navy and for the main degree, Chemistry is only available in the latter. It is in the legal system of 1860 –which was followed for many years with only slight adjustments regarding the Army and Navy Schools– that Organic Chemistry becomes a full part of the “Chemical Analysis and Organic Chemistry” subject where it remains for over 30 years, mainly aimed at surgeons.

However, in 1896 another reorganisation of the Army School led to further changes in the Polytechnic's programme, when Organic Chemistry was established as a requirement for all candidates to Engineering, Weaponry and Civil Engineering, thus gaining a new found importance within the curriculum.

The first lecturer of this subject was Júlio Máximo de Oliveira Pimentel. The curriculum he organized for the subject of Chemical Analysis and Organic Chemistry for the academic year of 1860/1861, consisted of a first part (October to January) of quantitative and qualitative chemical analysis, and a second part (January to July) of organic chemistry. This is another fact that points to the theory that chemical manipulation topics from the 6th Subject through to the single subject system, was in fact a chemical analysis course, operating for a long period with the organic chemistry topics, perhaps because inorganic chemistry was always very extensive and didn't allow for it. Come the moment of the separation of Chemistry into two branches (organic and inorganic), the analysis topics remained attached to organic chemistry to the extent that the subject was called “Chemical Analysis and Organic Chemistry”.

In April 1864, Agostinho Vicente Lourenço became the senior lecturer for this subject after Oliveira Pimentel's retirement. The programme for Organic Chemistry –apart from the generic topics– now presents a special segment dedicated to the development of its specific content. Chemical Analysis also benefits from an expansion here, with the inclusion of urine and blood analysis, toxicological experiments and spectroscopy.

During the 1860's the following group is perceived at the School: the director (a chemistry lecturer), his preparer, two lab preparers (for the 6th Subject and Organic Chemistry), and two attendants (one for Mineral Chemistry and one for Organic Chemistry).

According to Agostinho Vicente Lourenço's own statement, at the end of the 1870's the actual physical organization of the space already depicted a division between organic/inorganic subjects. However, this seems to be true only for the lecturer's work, not the students. In the early 80's the chemistry lab had two separate areas for organic and inorganic chemistry, and each respective lecturer was also director for their particular section. This situation –one lab with two sections– was maintained through the next decade despite some attempts at establishing new labs for chemical analysis and organic chemistry.

1889 to 1890: The Chemistry lab in practical context of the 6th Subject

The presentation of the educational programme of Chemistry classes at the Polytechnic would not be complete without addressing a significant moment of its existence: the creation of a practical subject for the 6th Subject, by José Julio Bettencourt Rodrigues back in 1885. At this point he presented to the School Board various proposals striving to improve the teaching of Mineral Chemistry.

In Bettencourt's understanding, the chemistry lab needed a complete overhaul. It also needed an increase in staff. He suggested a substitute Chemistry lecturer due to there being over 100 students attending the 6th Subject, and the resulting need for multiple forms. He also defended the need for a technician, besides the lecturer. This new technician was named “Assistant Chemist to the 6th Subject” –at times also referred to as the Head of Practical Work– and had as a primary objective the facilitation of the practical course (experimental chemistry) which José Julio Rodrigues wanted to establish at the School.

In the lecturer's proposal, the preparer chemist should be “an experienced practitioner, read in the best chemical practical processes, with vast lab experience and versed in chemical analysis and knowledgeable in Chemistry as a whole”. It was through Roberto Duarte Silva's recommendation (at the time the professor of Analytical Chemistry at the Central School of Arts and Manufacturing in Paris) that Bettencourt Rodrigues found the right person: Charles Lepierre, recent graduate in chemical engineering from the Municipal School for Industrial Physics and Chemistry in Paris, where Roberto Duarte Silva also taught.

According to information sought from Charles Lepierre himself, the practical 6th Subject began in 1888-1889 in a lab which meanwhile was subject to major reformation. In the next academic year, 1889-1890, according to the Mineral Chemistry Lab programme which came into circulation, the practical subject was an elective subject, but with influence on

the final grade, which basically worked in accordance with terms proposed back in 1885. Given Charles Lepierre's departure, the second year of the course was not achieved with the same collaborator.

During the period in which the 6th Subject practical course was active, the Chemistry lab at the Polytechnic belonged to its students, who occupied all the available space, including the galleries. It is thought that this may have been the cause for the lack of lab space for the Chemical Analysis practical course, hence motivating the search for a new lab location in the *campus*. It seems that (and delving slightly into the next topic) there was no practical course for the 6th Subject in the third year. José Julio Rodrigues was absent from the Polytechnic School, and Eduardo Burnay, recently transferred as substitute chemistry lecturer, assumed the role based on his wide experience as interim lecturer.

The last decade of the 19th century

As the last decade of the 19th century began, there was only one chemistry lab and only one director. The year 1883 opens a new chapter in the institution's history with the passing of the two Heads of both Chemistry subjects, and the consequent entrance of new lecturers in 1896: two army officials, Aquiles Machado for the 6th Subject and Tomas Cabreira for the Chemical Analysis and Organic Chemistry. Under the guidance of Aquiles Machado, the practical element gains new demands and contributes alongside assiduity to a heavier portion of the final grade. Meanwhile, a December 1893 decree appoints a new chemistry lab preparer who is believed to assume a supporting role in the tuition of the subject of Chemical Analysis and Organic Chemistry. En route to the 20th century, with no increased headcount in the Faculty and with an insignificant increase in lab staff, the School accumulates hardships in furthering practical teaching.

The search for solutions to this problem sets lab preparers –it is believed that for the first time– in a position to openly assume Faculty functions: “explaining subjects and topics exposed in the theoretical classes” within the remit of the practical class. This evolution is especially significant given the historical divide between lecturers and lab preparers: the latter were not allowed to teach, nor regarded as tutors, until then.

Chemistry Lab Preparers in the Polytechnic School (1837-1862)

The chemistry lab preparers were chemistry lab employees. In their job description, teaching was not to be found, hence they should not be regarded as candidates to, or successors of a professor.

The first lab preparers –those active between 1837 and 1861, and between Francisco Mendes Cardoso Leal Júnior, and Manuel Vicente de Jesus– may be incorporated into First Class Pharmacists, a hierarchy assumed between peers (there were two classes, although they were not contemplated by law), to distinguish between those who graduated from a Pharmacy degree and those who were eligible through work experience to sit the admission exam. Although legally both classes were eligible for admission, only First Class Pharmacists were allowed to access certain functions such as First Operator of the Lusitanian Pharmaceutical Society (certified to perform official analysis), and that of lab preparers in Higher Education.

They were, consequently, savvy chemical analysts especially with regards to water quality, chemical, fiscal and judicial matters, such as product adulteration and poisoning suspicion, as well as those with terms of Chemical relevance. These were the ones who accompanied the teaching of the 6th Subject of Chemistry at the Polytechnic, the paradigm of unique subject tuition.

But this continuity must have been disturbed with the new subject of Chemical Analysis and Organic Chemistry, since the discomfort of the Pharmacists regarding this new branch (Organic Chemistry) was evident, given that it was not a part of their own education. This was still the case in 1868, as Pharmacists claimed attendance to Chemical Analysis and Organic Chemistry from the Polytechnic or the University of Coimbra to be mandatory for admission of 2nd class candidates, and as a foundation course for eligibility for the Pharmacy degree, alongside the 6th Subject, which was already required.

Organic Chemistry and the Lab Preparers of the Polytechnic School

The moment of creation of a new Chemistry subject –“Chemical Analysis and Organic Chemistry”– and the appointment of a new senior lecturer in 1859 was critical for the institution. Agostinho Vicente Lourenço was a Chemist from Goa that had travelled to France, England, Germany and made contact with several renowned chemists abroad. Some years after the creation of this new subject, many foreign collaborators started working in the Chemistry lab. These were known as the “German lab preparers” although their nationality wasn't yet totally confirmed. It is believed that because pharmaceutical students stopped reading Chemical Analysis and Organic Chemistry, this might have influenced the recruitment in this sector and induced demand abroad due to the lack of domestic response.

From 1862/63 and for more than ten years, the presence of these collaborators is perceivable. They came to collaborate with Organic Chemistry and normally stayed in that position for a short period of time. Emilio Dias, an industrial chemist, was the only Portuguese lab preparer in this group.

Well into the second half of the 19th century however, and given the development of technical fields where Chemistry was an important subject, such as agronomy or industrial chemistry, new areas of growth were constantly revealing themselves across the nation, resulting in the increased probability of admission of a chemistry lab preparer at the Polytechnic. This was the case of César Justino de Lima Alves, named lab preparer in 1893, provisional chemistry demonstrator in 1898 and finally instituted as permanent demonstrator in 1900. As an agronomy graduate appointed according to article 99 of the 28th July 1886 decree, he was able to leave the country for two years to attend practical courses of Chemical Analysis in French and German labs at the expense of the Portuguese state. It was after his internship between 1890 and 1892 at the Agricultural Chemistry lab from the Agronomy Institute of Paris, within the Department of Agriculture and under the chemist Achilles Müntz as well as the Orth in Berlin, that Lima Alves arrived at the position of lab preparer at the Polytechnic. His exposure to chemistry practices applied to the context of agriculture must have given this agronomist special characteristics for the Chemical Analysis and Organic Chemistry course. César Justino da Lima Alves was nominated interim professor at the Superior Institute of Agronomy in 1911, becoming its Director between 1915 and 1916.

Having progressed from a lab preparer to a demonstrator, and then further to assistant lecturer, alongside with the progress and perspective the new Century had brought, this personality will bridge the gap through to the 20th century and undertake some of the most relevant developments in the role and expectations around lab preparers.

The transition into the 20th century: becoming the School of Science

Until the creation of the University of Lisbon (March 1911) and the consequent evolution into the School of Science, the subjects made available at the institution allowed for degrees of Chemistry, Inorganic Chemistry, Organic Chemistry and Chemical Analysis. This way a match was made between the institution's offer, and the demand for diversified education and related scientific grants (army and navy officials, surgeons, pharmacists, agronomists and vets) sought through the Polytechnic School over the years.

However, in 1911, with the University reform, important introductions and updates were made to the reigning programme of varied subjects of chemistry, namely the Biological and Physio-Chemistry programs which were so widely accepted. Lab preparers still remained even after the creation of the School of Science and those who qualified under the Polytechnic School were granted access to the Faculty as first assistants (César Justino da Lima Alves, nominated in 1893 as lab preparer) or second assistants (João Rocha, nominated in 1900 as lab preparer and assistant analyst of the Chemistry lab). António Dionísio Garras, Eurico Humberto Tavares Moreira, Daniel da Conceição Torres or Álvaro Pacheco de Teves, amongst others, are the new generation of "post Polytechnic School lab preparers" awaiting to be discovered and labelled.

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