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Armando de Lacerda and the Coimbra Phonetics Laboratory, 1930–1979

Cross-National Mobility and Exchange in a Global Context

▼ **ABSTRACT** This paper is a contribution to the history of experimental phonetics seen from the perspective of the emergence, development, and impact of the experimental phonetics laboratory operating at the University of Coimbra, Portugal, from 1936 to 1979, which was considered by many experts in the mid-20th century as the most advanced in Europe. The history of the laboratory is presented in four sections, discussing: (1) the context of its emergence within the rise of experimental phonetics in Europe, starting in the late 19th century; (2) the training abroad of Armando de Lacerda, its director, and his rise to international leadership as a key concept maker, instrument designer, and institution builder; (3) the role of the laboratory as a central node of a dynamic international network, a pole of attraction for foreign students and researchers for more or less extended stays at its premises (1936–1956); and (4) its decay and downfall in the Portuguese context, contrasted with its role as a hub for the reproduction of expertise globally, from Europe to North and South America and Australia. At the local level, due to a fragile (and increasingly hostile) institutional environment, the

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laboratory was unable to reproduce expertise across scientific generations; at the international level, it acted as the springboard for fruitful careers, and for the establishment of new laboratories that nurtured successive generations of experts.

▼ **KEYWORDS** Asymmetries in a Global World, Armando de Lacerda, Coimbra Experimental Phonetics Laboratory, Phonetics and Politics, Scientific Concepts and Instruments, Coarticulation, Chromograph

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Introduction

Speech recognition and synthesis technology is ubiquitous today and experimental phonetics provides an important basis for the development of these technologies.¹ Speech control systems used in mobile phones, digital dictionaries, websites adapted for users with visual impairments, and distance education are examples of new interfaces for communication between humans and machines that have been developed thanks, to a great degree, to foundational work in the field of experimental phonetics.

In addition to fundamental work in speech analysis and its applications in language teaching, experimental phonetics involves the study of the neurological, physiological, and acoustic-articulatory processes entailed in speech production, as well as the auditory, neuronal, and psychological components of speech perception, and thus lays the scientific foundations for current technological development.² On the basis of this in-depth knowledge of processes of articulatory control, the acquisition of the mother tongue in the early years of infancy, and the pragmatic aspects of natural communication between humans, experimental phonetics also provides the foundations for therapeutic strategies such as treatment of various types of speech impediments, learning strategies and the pragmatic use of the language in autism, as well as strategies for the rehabilitation of sufferers of different types of aphasia.³

Since its inception in the late 19th century, notwithstanding recent developments and technological applications, experimental phonetics has aimed at understanding speech production, speech perception, and speech impairments, as well as dialects and linguistic varieties, with the aid of appropriate apparatuses, and to thereby help to clarify “a fundamental part of our identity, as individuals, as members of larger communities, and as human beings.”⁴ Its goals and evolving methods situated experimental phonetics at the crossroads of the humanities (mostly linguistics), science (mostly physics and specifically acoustics), biomedicine (mostly physiology),

¹ Fant (1984); Kohler (2000).

² Roll (2019); Thomas (2017). For an alternative view, which emphasizes “the role of automatic speech recognition research in the rise of data-driven machine learning as a privileged and pervasive form of computational knowledge,” see Li (2023).

³ Haas (1968).

⁴ Hayward (2013, pp. 32–33).

and technology (mostly instrumentation). It exemplifies what one may call an “in-between discipline” and as such its distinctiveness was conditioned by contingent events behind the choices of its institutional location, methodological options, and laboratory spaces.⁵ Deeply grounded in society, and central to human and national identity, its development was supported by national governments in times of peace and war, with different political regimes appropriating it at times to serve colonial and imperial interests.⁶

At the same time, the overriding importance of such a multi-dimensional in-between discipline stands in stark contrast to the relative lack of knowledge about its history, despite the decades-long interest of historians of science in expanding their research to different scientific disciplines, knowledge spaces and practices, and diverse geographies.

In 1993, the linguist and historian of linguistics E. F. Konrad Koerner stated that unlike linguistics, the emergence and development of the theoretical apparatus, of evolving practices and practitioners, different instruments, and institutional settings of experimental phonetics have been virtually ignored.⁷ Presently, 30 years after Koerner's statement, things have begun to change gradually. International Workshops on the History of Speech Communication Research have been organized biennially since 2015, with their results registered in corresponding proceedings; inventories of phonetics equipment have begun to appear, as happened at the Technical University of Dresden; and books taking stock of the first centenary of experimental phonetics, including the phonetician-turned-historian of science Michael Ashby's dissertation on experimental phonetics in Britain from 1890 to 1940, have offered first assessments of disciplinary evolution in specific national contexts.⁸ But Ashby still subscribes to Koerner's assessment, claiming that: “The history of phonetics is still a relatively undeveloped field, while the historiography of phonetics (that is, the analytical and critical study of histories of phonetics) can barely be said to exist at all.”⁹

Following pioneering work by Viktoria Tkaczyk, historians of science began to connect research on the history of sound and modern acoustics to general questions and debates in the history of science and knowledge, exploring various dimensions of sound at the crossroads of humanities and sciences.¹⁰ Following this trend, a number of studies have been published on the work of the Portuguese phonetician Armando

⁵ See discussion on the in-between nature of quantum chemistry in Gavroglu & Simões (2012). The discussion of experimental phonetics in this paper spans the period in which quantum chemistry was emerging, when questions about its identity were of paramount importance.

⁶ On the introduction of experimental phonetics to Germany for colonial reasons in 1910, see Hoffmann (2022, p. 63); Mehnert, Pétursson, & Hoffmann (2016, pp. 28–35). On the emergence of the discipline in Portugal during the military dictatorship (1926–1933) and the nationalist dictatorship of the Estado Novo (1933–1974), with the financial support of the regime, see Lopes (2022, pp. 97–102).

⁷ Koerner (1993).

⁸ Hoffmann & Trouvain (2015); Vainio, Simko, & Aulanko (2017); Pucher, Trouvain, & Lozo (2019); Volín & Sturm (2021); Lopes, Braun, & Ashby (2022); Mehnert (2012); Hoffmann (2021); Mehnert et al. (2016); Boë & Vilain (2010); Ashby (2016).

⁹ Ashby (2016, p. 24).

¹⁰ Tkaczyk (2023); Li (2023).

de Lacerda, and on the impact of the key concept of co-articulation created by Lacerda and the German phonetician Paul Menzerath at the Institute of Phonetics in Bonn in 1932.¹¹ Other works have analysed the creation of a new research technique called chromography, developed by Lacerda in Bonn in 1932, in the context of the techniques used then in phonetics laboratories.¹² Finally, a profusely illustrated book, based on an extensive collection of photographs and documents, has provided a visual testimony of Armando de Lacerda's scientific work and the Coimbra Experimental Phonetics Laboratory, especially the laboratory's facilities and equipment.¹³

This paper is a contribution to the history of experimental phonetics addressing the emergence, development, and impact of the experimental phonetics laboratory created at the University of Coimbra, Portugal, in 1936 and dismantled in 1979, and considered by many experts in mid-20th century as the most advanced experimental phonetics laboratory in Europe.¹⁴ This is done by contextualizing its emergence within the rise of experimental phonetics in Europe, starting in late 19th century, followed by a discussion of the training abroad of Armando de Lacerda, the laboratory's director, and his rise to international leadership as a key concept maker, instrument designer, and institution builder.¹⁵ The role of the laboratory as a central node of a dynamic international network, a pole of attraction for foreign students and researchers, and their more or less extended stays at its premises (1936–1956), is discussed, as well as the laboratory's decay and downfall in the Portuguese context, in sharp contrast to its role as a hub for the reproduction of expertise globally, from Europe to North and South America and Australia.

The Emergence of Experimental Phonetics

In his doctoral dissertation “Experimental Phonetics in Britain,” Ashby examined the origins of experimental phonetics in the 1890s with the work of Abbé Roussetot (1846–1924) in Paris, starting with his ground-breaking 1891 dissertation, mostly concerned with dialectology, followed by the first volume of his *Principes de phonétique expérimentale* (1897), and the creation of a laboratory of experimental phonetics at the Collège de France in 1898.¹⁶

Similar laboratories soon followed, mostly in Europe. Interest in controlled empirical studies of human behaviour had been growing for some decades, leading to the establishment of the first experimental psychology laboratory by Wilhelm Wundt in Leipzig in 1879, which set in motion an arms race between methodological

¹¹ Braun & Möbius (2022); Lopes & Pereira (2019).

¹² Ashby (2022); Lopes & Brock-Nannestad (2021).

¹³ Lopes (2023).

¹⁴ For an example, see Bever (1953, p. 248); Lopes & Pereira (2019). On the importance of constructing the biography of laboratories, see Gooday (2008).

¹⁵ While Tkaczyk (2023) puts the emphasis on conceptual clarification more than on novel instruments, Lacerda's case is an instantiation of the entanglement between these two dimensions.

¹⁶ Ashby (2016).

affordances and the study of new scientific questions.¹⁷ Other German institutions took up experimental psychology, followed by other European countries and the United States. Alongside advancements in acoustics and physiology, the empirical study of speech processes became a widespread field of research building off on the mutually reinforcing loop of interactions between scientific curiosity, emerging methods in experimental psychophysics, and available technological advancements in the early 20th century.¹⁸ The interest for phonetics grew rapidly, and by 1916 the estimated number of phonetics laboratories worldwide was “something more than twenty-five ... most of which are in Europe.”¹⁹ Recently, the phoneticians and engineers Dieter Mehnert, Magnús Pétursson, and Rüdiger Hoffmann identified the first 21 European universities with important phonetics institutes (see Table 1).

Specific objectives characterized experimental phonetics from the end of the 19th century to the mid-20th century: on the one hand, to help in the treatment of patients with speech disorders, especially deafness, and on the other, to facilitate the teaching of foreign languages.²⁰

For the physicist Edward Gick Richardson, correctly positioning the mouth to produce specific sounds is done by instinct and imitation, so that the science of phonetics aims at understanding this process and at aiding people in the acquisition of speech competences. This is especially evident when speakers are mastering a foreign language with new sounds. It is done by discovering the positions and movements of the mouth in speech: “These positions are found by probing instruments, when the system is set to produce the given sounds, and records or models are made. The pupil then endeavours to mould the mouth into the same shape.”²¹ For Daniel Jones, Britain's first professor of phonetics, in 1921, it was the job of the phonetician to provide the learner of a foreign language with precise instructions to acquire the ability to perform all kinds of difficult movements with the tongue and other parts of the speech-mechanism.²²

Addressing speech and voice problems was also one of the practical goals of the emerging experimental phonetic studies in the late 1800s. Educated clinical efforts to help patients with harsh voice or phonation issues, as well as deviant articulations or stuttering, had to be anchored on the new, available knowledge of acoustic-articulatory phonetics—a challenge that Hermann Gutzmann (1865–1922) took seriously, leading him to establish phoniatics in the early 1900s as a new, independent discipline combining experimental phonetics with medicine.²³

17 Titchener (1921); Farr (1983).

18 Boring (1928); Tkaczyk (2023).

19 Ashby (2016, p. 183).

20 Mehnert et al. (2016, p. 16); Ashby (2016, pp. 183–184).

21 Richardson (1935), in Ashby (2016, p. 198).

22 Jones (1917, p. 96).

23 Kuczkowski, Cieszynska, Plichta, Tretiakow, & Stodulski (2015); Diehl, Lotto, & Holt (2004); Oguz, Hess, & Klein (2015).

Table 1. European countries, phonetics institutes, and phoneticians (late 19th century to early 20th century)

| COUNTRY | INSTITUTE | PHONETICIAN(S) |
|--|--|--|
| France | Paris Grenoble | Pierre-Jean Rousselot (1846–1924); Étienne-Jules Marey (1830–1904) Antonin Duraffour (1879–1956); Théodore Rosset (1877–1961) |
| The Netherlands | Amsterdam Utrecht | Louise Kaiser (1891–1973) Hendrik Zwaardemaker (1857–1930) |
| Denmark | Copenhagen | Otto Jespersen (1860–1943) |
| Austro-Hungarian Empire/ Czechoslovakia | Prague | Josef Chlumský (1871–1939); Bohuslav Hála (1894–1970); Milan Romportl (1921–1982); Přemysl Janota (1926–2008) |
| United Kingdom | London Edinburgh | Sir Richard Paget (1869–1955) David Abercrombie (1909–1992) |
| Austro-Hungarian Empire/ Hungary | Budapest | Gyula Laziczus (1896–1957) |
| Sweden | Stockholm | Ernst A. Meyer (1873–1953) |
| Italy | Milan Bologna | Agostino Gemelli (1878–1959) Guglielmo Bilancioni (1881–1935) |
| Russian Empire/Soviet Union | Saint Petersburg/ Leningrad | Lev Vladimirovich Shcherba (1880–1944) |
| Austria | Vienna | Edward Wheeler Scripture (1864–1945) |
| Spain | Barcelona | Pere Barnils (1882–1933) |
| German Empire/Germany | Marburg Leipzig Bonn Cologne Hamburg | Wilhelm Viëtor (1850–1918) Eduard Georg Sievers (1850–1932) Paul Menzerath (1883–1954) Eberhard Zwirner (1899–1984) Carl Meinhof (1857–1944); Otto Dempwolff (1871–1938); Giulio Panconcelli-Calzia (1878–1966); Wilhelm Heinitz (1883–1963); Otto von Essen (1898–1983) Carl Stumpf (1848–1936); Hermann Gutzmann Sr. (1865–1922); Franz Wethlo (1877–1960); Georg Zöppel (1892–1963) |

Adapted from Mehnert, Pétursson, & Hoffmann (2016, pp. 8–9, 56).

Additionally, the interest in dialectology, the study of regional variations in speech communication, which followed Rousselot's original motivation, brought to experimental phonetics an extra dimension: the colonial and imperial one. The Phonetics Laboratory of the Hamburg Colonial Institute was created in 1910 in response to the demands of Carl Meinhof, who had held the first chair of African Studies in the German Empire at the same institute since 1909. It aimed to provide a scientific description and improved understanding of the languages spoken in the German colonies, as well as better education and training for German colonial officials, missionaries, and traders.²⁴

Among laboratory instruments and techniques, two predominated during this period: kymography and palatography, both cumbersome techniques with imperfect results. Phonetician Göran Hammarström described kymography in the following terms (see Figure 1):

The kymograph showed the wave as a line traced by a stylus on sooted paper. The stylus also showed the airflow to some extent. It jumped up at the plosive phase of stop consonants. Most work concerned the duration of vowels and consonants To make the stylus produce a good trace, or a trace at all, one had to say the sounds into the funnel held in front of the mouth in an unnaturally loud and clear way, which somewhat limits the adequacy of the results.²⁵

In these early days, the results were satisfactory overall. The quality of the kymograph was evaluated by looking at it. If it did not look accurate, it was discarded. Post-hoc evaluation was strongly dependent on the preconceptions of the phonetician regarding a specific sound, such that good kymograms could also be discarded. Furthermore, there was little regard for the difficulty of delimiting sounds that were co-articulated or that changed gradually from one into the other.

For the study of articulation, palatography was the most used and best-known technique. For Hammarström:

One obtained pictures of where the tongue touches the palate in two ways. Either the palate was sprayed with carbon dust and the tongue removed it where it touched the palate, or the tongue was painted with black liquid and made an imprint on the palate. One could use a mirror and a camera to obtain a picture of the imprint.²⁶

An alternative method required the manufacture of an artificial palate of thin flexible metal. It was inserted into the mouth and an imprint was made on it, then the artificial palate was removed and the imprint was drawn. Additionally, the form of the lips could be easily photographed, and x-ray pictures could be taken of the typical articulatory position of a vowel or a consonant, or even an x-ray film could be taken of

²⁴ Hoffmann (2022, p. 63); Mehnert et al. (2016, pp. 28–35).

²⁵ Hammarström (unpublished notes), in Lopes & Brock-Nannestad (2021, p. 94).

²⁶ Hammarström (unpublished notes), in Lopes & Brock-Nannestad (2021, p. 94).

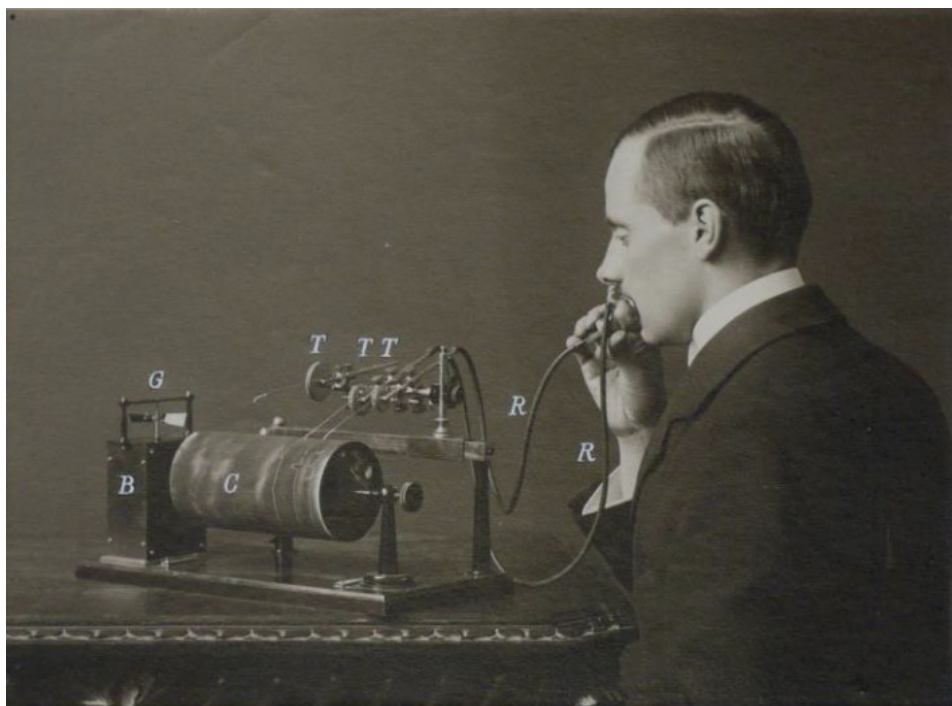


Figure 1. A kymograph being used by Daniel Jones. From “Experimental Phonetics at University College London before World War I” by M. Ashby (2015, p. 121), *Proceedings of the First International Workshop on the History of Speech Communication Research*, Dresden, Germany: Technische Universität Dresden Press. Reproduced with permission.

the articulation of segments of speech. The negative effects of x-rays on bodies were still barely known.²⁷ However, all these innovative techniques were limited to the few phonetics laboratories able to acquire adequate instruments.

Armando de Lacerda and the Coimbra Phonetics Laboratory: A Central Node with Novel Instruments and Key Concepts

It is in this context that the establishment and agenda of the Coimbra Phonetics Laboratory should be assessed. From the 1930s, chromography—an innovative technique invented by the laboratory's director, Armando de Lacerda—rendered kymography obsolete. International networks of circulation, together with national support for research, account for the training of Lacerda abroad and the regime's financial support of the new laboratory.

²⁷ Hammarström (unpublished notes), in Lopes & Brock-Nannestad (2021, p. 94).

Training Abroad with the Regime's Support: A Designer of Instruments and Key Concepts Was Born

The origins of the laboratory go back to 1929, when the Portuguese Junta de Educação Nacional (National Education Board) was set up by the military dictatorship (1926–1933). It remained operational during the early years of the Estado Novo (1933–1974), an authoritarian, nationalist, and conservative regime, to be succeeded by Instituto para a Alta Cultura (Institute for High Culture) after 1936. The National Education Board was the first institution in Portugal created with the aim of planning and funding research.²⁸

In 1930, Armando de Lacerda, a recent graduate in Germanic philology, applied to the Board for a scholarship to undergo specialist training in experimental phonetics in Germany. No clear explanation for the choice of Germany was given. However, Luís Cardim, one of his professors during his undergraduate degree, seconded his application. Cardim argued that his intellectual capabilities as well as previous undergraduate experimental work in phonetics at the University of Porto made him fit to profit from specialized training at the well-equipped and well-oriented German laboratories, especially in Hamburg.²⁹ His request was granted, allowing him to stay abroad for nearly 3 years. Lacerda aimed to specialize in dialectology, specifically in the scientific study of the Portuguese language as well as the languages, dialects, and speech varieties of the African colonies of the Portuguese empire. This proposal found a responsive audience in the Board and could be easily accommodated within the nationalist agenda of the regime. Indeed, it was probably a strategic choice by Lacerda to attract the interest and funding of the dictatorial regime. In fact, 3 years later, the direct interest of the president of the Council of Ministers, Oliveira Salazar, materialized in his support for the founding of the University of Coimbra Experimental Phonetics Laboratory in 1936.³⁰

From November 1930 to August 1933, Lacerda underwent specialist training at the Phonetics Laboratory of the University of Hamburg under the guidance of Giulio Panconcelli-Calzia, and later at the Phonetics Institute of the University of Bonn under the supervision of Paul Menzerath. From the beginning of his specialist training, he focused on the limitations of the kymographic method. His and Menzerath's aim was to solve one of the crucial problems of general phonetics: the influence contiguous sounds exerted on each other in the chain of speech. While reciprocal influence was considered by several phoneticians to exist between consecutive sounds, they lacked the apparatus to evaluate hypotheses regarding the nature of such an influence.

²⁸ Lopes & Pereira (2022). The assertion that the Estado Novo fostered scientific research, created study centres, and pursued an active science policy was made by Simões & Diogo (2020).

²⁹ L. Cardim [Advice] (1930, Aug. 12), Caixa 1337, Ficheiro 3, Documento 1, Arquivo Camões, I. P., Lisbon, Portugal (hereafter ACL)

³⁰ A. de Lacerda to O. Salazar [Letter] (1938, Jun. 3), D, D, 1–1, Arquivo Oliveira Salazar (Arquivo Nacional da Torre do Tombo), Lisbon, Portugal; “Ministério da Educação Nacional: Decreto-lei n. 26994” (1936). On the nationalist agenda of the Estado Novo, see Gonçalves (2018).

Lacerda's understanding of the nature of the problem, and his creativity in developing new instruments, resulted in the invention of two devices, the polychromograph and the labiograph inscriber. They were the first instruments to enable recording of the mutual effects of sequential sounds in speech.³¹

Regarded as a forerunner of the inkjet oscillograph, the polychromograph was built in 1932 at the workshops of the University of Bonn's Institute of Phonetics, under Lacerda's supervision (see Figure 2). The new instrument had a mouthpiece and recorded speech sounds and mouth movements on a strip of paper with a fine jet of ink, thus resolving the problem of stylus friction in the kymograph. Its construction was funded by the Portuguese state, which granted Lacerda 11,000 *escudos* (worth circa 12,300 euros in 2022) on the express condition that the instrument was later used at the experimental phonetics laboratory to be established in Portugal.³²

Presented at the First International Congress of Phonetic Sciences, held in Amsterdam in 1932, its advantages over the kymograph were undeniable, marking the introduction of chromography as a new research technique. Already in the academic year 1932–1933, Menzerath invited Lacerda to teach an introductory course in chromography at the institute, so that doctoral candidates at the University of Bonn could apply the technique on phenomena of pitch variation in English and Chinese.³³

With the oral labiograph inscriber harnessed to Menzerath's kymograph, both Lacerda and Menzerath were able to carry out pioneering studies on the co-articulation and segmentation of speech sounds in 1933 at the University of Bonn, considered at the time to be the most important phonetics laboratory in Germany. They were summarized in the co-authored book *Koartikulation, Steuerung und Lautabgrenzung* (*Co-articulation, Articulatory Control, and Speech Sound Segmentation*) published in 1933 (see Figure 3).³⁴

The book introduced “the design, recording, and analysis of a dataset using the most advanced version of the kymograph”:

[The authors] recorded seven signals (upper and lower lip, jaw, oral and nasal airstream, laryngeal activity, and a temporal reference signal from a 100 Hz tuning fork) representing entire utterances in two languages, German and Portuguese. The utterances were constructed to cover specific sequences of speech sounds (for instance $V_1 P_{lab} V_2$) and their underlying articulatory gestures, which were found to be smooth and continuous and specific to the concrete sequence—reminiscent of Sven Öhman's later, equally seminal, work on VCV co-articulation in Swedish.³⁵

31 Head (2000).

32 Lopes (2023, p. 35); “Índice de Preços no Consumidor” (n.d.), Núcleo de Estatísticas de Preços no Consumidor, Departamento de Contas Nacionais, Instituto Nacional de Estatística, Lisbon, Portugal. See also Ashby (2022, pp. 43–47).

33 Hammarström (2012, p. 90); Lopes (2023, pp. 72–75).

34 Menzerath & Lacerda (1933). A digitized and searchable PDF document of the book is available on Saarland University's “Phonetics Resources” webpage.

35 Braun & Möbius (2022, p. 22).



Figure 2. Armando de Lacerda (left) and Paul Menzerath (right) using the polychromograph at the Bonn Phonetics Institute (1932). Reproduced with permission from Arquivo Familiar Paulo de Lacerda, Porto, Portugal.

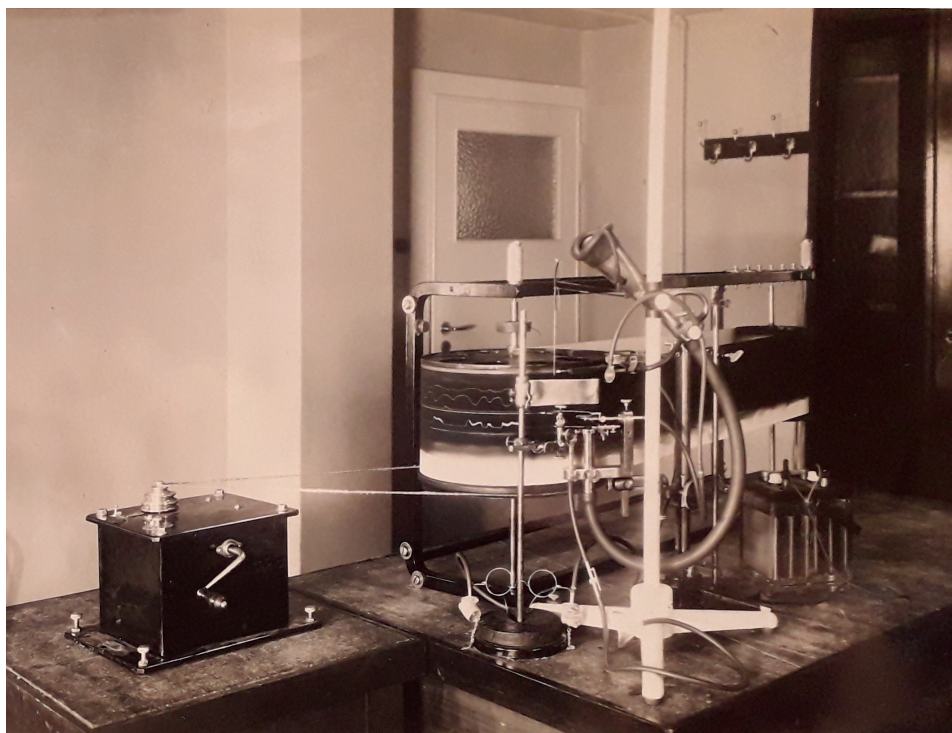


Figure 3. The Lacerda oral labiograph inscriber (front) harnessed to the Menzerath's kymograph (back) at the Bonn Phonetics Institute (1933). Reproduced with permission from Caixa 1287, Ficheiro 1, Documento 4, Arquivo Camões, I. P., Lisbon, Portugal.

The key concept of co-articulation was coined by Menzerath and Lacerda to capture their crucial insight that articulatory patterns are the result of “a marvellous, goal-oriented harmony of interweaving gestures,” to the point that it is impossible, or rather arbitrary, to decide where to locate the boundary between two adjacent, co-articulated speech sounds.³⁶

Highly praised at the time of its publication by Edward Wheeler Scripture, president of the International Society of Experimental Phonetics, it remains a reference work to this day. Due to its publication in German and the lack of an English translation, it is quite possible that not many people have read it. But this book is

³⁶ Braun & Möbius (2022, p. 22). Since the articulation of speech sound engages the whole vocal tract, any produced speech sound is inevitably coloured by the vocal tract's previous articulatory configuration as well as by the speaker's articulatory preparations to produce the next intended sound. In running speech this typically creates fuzzy acoustic and articulatory transitions to and from adjacent sounds—a crucial phonetic phenomenon captured by Menzerath and Lacerda's notion of co-articulation. In the real world, while co-articulation raises practical problems for phoneticians attempting to objectively segment utterances in idealized phonemic sequences, it plays a crucial role in enhancing the efficiency of speech communication by providing the listener with valuable anticipatory information on the speaker's articulatory intentions.

probably one of the most frequently cited works in phonetics: “Its message, though, is omnipresent, and the findings nowadays are part of the basic knowledge about human speech production.”³⁷

The Experimental Phonetics Laboratory, 1936–1956: Pole of Attraction at the European Periphery

The consolidation of Lacerda's international prestige ran parallel to negotiations with the National Education Board regarding the establishment of an experimental phonetics laboratory in Portugal. The hope was to attract researchers from abroad.³⁸ Having been granted another scholarship from the Board from October 1933 to December 1936, Lacerda returned to Portugal in the summer of 1933 with the express purpose of setting up such a laboratory.³⁹

In March 1934, the director of the Faculty of Arts and Humanities of the University Coimbra, the literature specialist and writer Eugénio de Castro e Almeida, expressed to the Board his willingness to house the first Portuguese laboratory of experimental phonetics, backed by the professors of Classical, Romance, and Germanic philology, and the decision of the faculty council to grant two rooms for its premises.⁴⁰

It took 3 years after Lacerda's return for the laboratory to materialize. The reason for this extended timespan was probably the awkward status of Lacerda at the Faculty of Arts and Humanities in 1934, as he was not accorded a position equivalent to a professor or researcher, but instead was officially identified as a student. Additionally, the reduced value of his scholarship stipend did not allow Lacerda to dedicate himself exclusively to the installation of the laboratory.⁴¹ On September 10, 1936, in accordance with the provisions of Decree-Law No. 26,994, the Experimental Phonetics Laboratory of the Faculty of Arts and Humanities at the University of Coimbra was finally established (Figure 4). It was funded by the Institute for High Culture, the Board's successor, as already mentioned. Lacerda's salary was equivalent to that of an assistant professor. The only permanent staff-member was Lacerda, who applied to the Institute for High Culture for annual funding to pay temporary part-time technical assistants.⁴²

³⁷ Braun & Möbius (2022, p. 17).

³⁸ A. de Lacerda to S. Raposo [Letter] (1932, Apr. 12), Caixa 1337, Ficheiro 3, Documento 47, ACL.

³⁹ A. de Lacerda to S. Raposo [Letter] (1933, May 12), Caixa 1337, Ficheiro 3, Documento 91; A. de Lacerda to Presidente da Junta de Educação Nacional [Letter] (1933, Jun. 12), Caixa 1337, Ficheiro 3, Documento 96; A. de Lacerda to S. Raposo [Letter] (1933, Sept. 26), Caixa 1337, Ficheiro 3, Documento 104; Junta de Educação Nacional to A. de Lacerda [Letter] (1936, Jun. 24), Caixa 0488, Ficheiro 10, Documento 3, ACL.

⁴⁰ E. C. Almeida to S. Raposo [Letter] (1934, Mar. 10), Caixa 1287, Ficheiro 1, Documento 5, ACL.

⁴¹ Nunes, Pereira, Lopes, & Salgueiro (2022, p. 325); A. de Lacerda to L. Pinto [Letter] (1934, Aug. 6), Caixa 0537, Ficheiro 8, Documento 7, ACL.

⁴² “Ministério da Educação Nacional: Decreto-lei n. 26994” (1936). [Records of Coimbra Phonetics Laboratory] (1936–1956), Caixa 1268, Ficheiro 1; [Records of Coimbra Phonetics Laboratory] (1949–1955), Caixa 1321, Ficheiro 2, ACL.



Figure 4. A laboratory workroom of the University of Coimbra Experimental Phonetics Laboratory (1937). Below left is the polychromograph. Reproduced with permission from Museu da Ciência da Universidade de Coimbra, Coimbra, Portugal.

Essentially dedicated to the scientific study of the Portuguese language, the laboratory made “sound recordings for the study of Portuguese diction, using educated and uneducated people as test subjects” and “collective spoken recordings in Portuguese for the subjective evaluation of oral diction,” and conducted “research on tonal inflection in Portuguese with the aid of chromographic registers,” as well as research on the “characteristics of Portuguese intonation.”⁴³ The laboratory also provided support for the teaching of Portuguese phonetics by offering free courses throughout the year, summer courses, and special courses for foreigners, and in the 1950s was dedicated to applying studies of phonetics to the teaching of hearing impaired.⁴⁴

Lacerda's scientific agenda was complemented by actions to raise the visibility of the laboratory both nationally and abroad. Besides delivering talks at the Faculty of Arts and Humanities of the University of Coimbra, where the laboratory was housed, he gave lectures at the neighbouring Laboratory of Physics of the Faculty of Sciences of the same university, at the invitation of its head, Mário Augusto da Silva, which featured slides and sound recordings made at the laboratory. Beyond Coimbra, Lacerda spoke at the Liga Portuguesa de Profilaxia Social (Portuguese League of Social

⁴³ *Resumo da Actividade Científica e Cultural em 1937–1939* (1939, pp. 5–6).

⁴⁴ *Resumo da Actividade Científica e Cultural em 1937–1939* (1939, pp. 5, 7–10); Lacerda & Gonçalves (1955).

Prophylaxis) in Porto and at the Faculty of Arts and Humanities of the University of Lisbon.⁴⁵

Lacerda's relationship with the Estado Novo was complex. At the 1940 Congress of the History of Portuguese Scientific Activity in Lisbon, part of the regime's imposing bicentenary celebrations of Portuguese nationality, Lacerda's presence re-asserted the consonance of his research agenda with the dictatorial regime. There, Lacerda proclaimed that his laboratory housed the “most modern chromographic systems,” a declaration that was seconded by Henry Carter, professor at Northwestern University in Illinois, USA, following his visit in the summer of 1939.⁴⁶

Lacerda was also vice-president and acting president of Coimbra City Council in 1940–1941, and as such was part of the administrative structure of the regime. His political leanings were unclear: the political police, who kept him under surveillance, asserted that he dedicated himself first and foremost to science and did not seem to advocate any “specific political stance,” and “recogniz[ed] that he held no activities against the regime.” They considered him utterly “intelligent, dynamic and morally upright.”⁴⁷ But in the 1950s, in his studies on Portuguese regional dialects, Lacerda had no qualms about publishing photographs highlighting poverty in rural areas, particularly images of barefoot children. He did so in the *Revista do Laboratório de Fonética Experimental da Faculdade de Letras da Universidade de Coimbra*, which he founded and edited from 1952 onwards, in this way escaping media censorship.⁴⁸ Lacerda was certainly a socially concerned scientist, but he was primarily focused on creating and maintaining a laboratory with an international presence. This goal explains his numerous requests for meetings, support, and funding from the President of the Council of Ministers, Oliveira Salazar, as well as from the Ministers of National Education and Public Works.

From 1937 to 1939, Lacerda strengthened ties with similar institutions abroad, in Europe and in the United States. He presented research results at the Third International Congress of Phonetic Sciences in Ghent in 1938; he visited the new facilities at the Institute of Phonetics at the University of Bonn and the Department of Phonetics at the University of London; he was invited by professors Diedrich Westermann and Eberhard Zwirner of the University of Berlin to join the scientific editorial committee of the journal *Archiv für vergleichende Phonetik*; he sent text recordings to the Bonn Institute of Phonetics, the British Council, and Harvard University; he established relations with Harvard to secure English-language publication of research conducted at the Coimbra Phonetics Laboratory; and he was invited by the British Council to carry out scientific work at University College London, although this was hindered

45 *Resumo da Actividade Científica e Cultural em 1937–1939* (1939, pp. 4–6); Armando de Lacerda giving the lecture “Nos Domínios do Som” at the Liga Portuguesa de Profilaxia Social [Photo] (1939), Fundo Armando de Lacerda, Arquivo Familiar Paulo de Lacerda, Porto, Portugal.

46 Lacerda (1940). The chromograph was developed in Coimbra after the polychromograph and is distinguished by its use of only one channel for the speech waveform: Lopes & Brock-Nannestad (2021, p. 102); Carter (1941).

47 PIDE files on Armando de Lacerda (1950, Jul 14; 1953, Jan. 20), DEL C, PI 5277, NT4499, Arquivo da PIDE/DGS (Arquivo Nacional da Torre do Tombo), Lisbon, Portugal.

48 Lacerda (1954).

by the outbreak of World War II.⁴⁹ Later, Lacerda helped to establish new phonetic laboratories: in São Salvador da Bahia in 1956–1957, and in Rio de Janeiro at the Colégio Pedro II in 1957–1958.

Lacerda's outward wanderings were complemented by inward movement of foreign researchers seeking specialist training at his laboratory. Through international mobility and exchange, the laboratory asserted its evolving expertise and increased its attractiveness in the discipline. Internships for scientists from abroad started in 1937 and continued throughout World War II, albeit on a reduced scale, with two Spanish, one French, and one Italian researcher working at the laboratory during the period from 1941 to 1945; numbers increased after the end of the war, extending until roughly 1956 (see Table 2).

The laboratory's role in providing specialist training for researchers coming from all over the world was especially highlighted by the request for funding Lacerda submitted to the president of the Institute for High Culture in 1952. He openly recognized the support of the National Education Board in his training and rise to leadership, as acknowledged by experts in research “centres abroad, in Spain, France, Germany, Norway, Sweden and the United States.” But he insisted that the laboratory's leading role in the international landscape should also be gauged by its capability to attract foreign researchers, enhanced by the support of foreign agencies for joint publications co-authored with foreign researchers. Such was the case of the well-known Spanish Consejo Superior de Investigaciones Científicas.⁵⁰

The new premises of the laboratory were certainly an extra source of attraction for foreign scholars. The Faculty of Arts and Humanities had moved to another building in 1951, and the laboratory was given 10 spacious rooms on the second floor (Figure 5), including:

rooms for laboratory work, a microphone capture chamber for recording sounds, a classroom and audition room, a sound library and documentation archive, a sound archive of Portuguese regional speaking, a library and reading room, a management office and a dependency for storing miscellaneous material.⁵¹

49 *Resumo da Actividade Científica e Cultural em 1937–1939* (1939, pp. 14–15).

50 Report by A. de Lacerda (1952, Dec. 18), Caixa 1321, Ficheiro 2, Documento 36, ACL.

51 Lacerda (1952, p. 136).

Table 2. Training of foreign researchers at the Coimbra Phonetics Laboratory (1936–1956)

| NAME | ACADEMIC POST/ AFFILIATION | COUNTRY | LENGTH OF WORK EXPERIENCE (YEAR) | FUNDING INSTITUTION |
|--------------------------------|--|----------|---|---|
| António Badia Margarit | Assistant Professor, University of Barcelona | Spain | 1 month (1945) | Consejo Superior de Investigaciones Científicas |
| Francis Millet Rogers | PhD student, Harvard University | USA | 4 months (1939) | Harvard University |
| Francisco da Silveira Bueno | Professor, University of São Paulo | Brazil | 1 month (1952?) | ? |
| Göran Hammarström | University of Uppsala | Sweden | 20 months (1950; 1951– 1952; 1954) | Instituto para a Alta Cultura; University of Uppsala |
| J. H. Uldall | Professor, University of Edinburgh | Scotland | ? months (1955–1956?) | ? |
| John M. Parker | University of Cambridge | England | ? months (1955–1956) | Instituto de Alta Cultura |
| Leif Sletsjöe | University of Oslo | Norway | 7 months (1948) | Instituto para a Alta Cultura |
| Manolo Companys | University of Toulouse | France | 3 months (1954?; 1955) | Centre National de la Recherche Scientifique; Instituto de Alta Cultura |
| María Josefa Canellada | Consejo Superior de Investigaciones Científicas | Spain | ? months (1941–1942) | Consejo Superior de Investigaciones Científicas |
| Nelson Rossi | Professor, University of São Salvador da Bahia | Brazil | 3 months (1954–1955) | Campanha Nacional de Aperfeiçoamento de Pessoal de Nível Superior |
| Paul Pohl | University of Bonn | Germany | ? months (1937–1938) | Instituto para a Alta Cultura |
| Peter D. Strevens | Head of Phonetics Department, Gold Coast University College | Ghana | 2 months (1955) | University of London |
| Pierre Amado | The Sorbonne | France | 48 months (1941–1945) | Instituto para a Alta Cultura |
| Sue Nogueira | Teacher, Prefeitura do Distrito Federal do Rio de Janeiro | Brazil | 8 months (1955; 1956) | Instituto de Alta Cultura |

| NAME | ACADEMIC POST/ AFFILIATION | COUNTRY | LENGTH OF WORK EXPERIENCE (YEAR) | FUNDING INSTITUTION |
|----------------|---|---------|---|------------------------|
| Vincenzo Cocco | Lecturer, Catholic University of Sacro Cuore, Milan | Italy | 15 months? (1942–1943) | ? |

Sources: [Individual researcher files and laboratory activity reports] (1936–1956), Caixa 0300, Ficheiro 7; Caixa 0414, Ficheiro 20; Caixa 0499, Ficheiro 1; Caixa 0550, Ficheiro 1; Caixa 0785, Ficheiro 7; Caixa 0836, Ficheiro 11; Caixa 1319, Ficheiro 3; Caixa 1320, Ficheiro 16; Caixa 1321, Ficheiro 2; Caixa 1446, Ficheiro 7, Arquivo Camões, I. P., Lisbon, Portugal. Caixa 123, Ficheiro Professor Armando Soeiro Moreira de Lacerda, Arquivo da Universidade de Coimbra, Portugal.

Note. The “Country” column indicates the country of the researcher’s academic affiliation. The “Length of work experience (year)” column indicates the total period of work experience in months and the year in which it took place. In 1952, the Instituto para a Alta Cultura was renamed the Instituto de Alta Cultura.



Figure 5. Two rooms of the University of Coimbra Experimental Phonetics Laboratory in the new premises of the Faculty of Arts and Humanities at the University of Coimbra (1952). At the centre “an endless paper strip emerges from a horizontal projection chromographic recorder.” From “Laboratório de Fonética Experimental da Faculdade de Letras da Universidade de Coimbra” by A. de Lacerda (1952, pp. 136–148), *Revista do Laboratório de Fonética Experimental da Faculdade de Letras da Universidade de Coimbra*, 1. Reproduced with permission.

The Experimental Phonetics Laboratory, 1956–1979: Decay and Downfall in the Portuguese Context

During the 1950s, chromographs, which had brought Lacerda's laboratory to world-wide prominence for two decades, were rendered obsolete by the invention and development of the sound spectrograph. Built in the USA during World War II, it was “developed as a secret device which could be used to produce ‘voice prints’ of the German and Japanese radio operators and thus to identify them” in order to trace the routes of enemy submarines.⁵²

In the same way that the first phase of experimental phonetics unfolded in the context of different political regimes and resonated with imperial and colonial interests, the second phase took shape in the context of war and reaffirmed the strong entanglement of experimental phonetics, politics, and society.

Lacerda was well aware that expensive sound spectrographs represented a significant improvement over his chromograph. So, in 1950 and 1951, he visited the University of Wisconsin–Madison to work with the renowned phonetician Martin Joos and familiarize himself with the device's operation, then to acquire one for his laboratory and reclaim its preeminent position among the world's experimental phonetic laboratories. But the Institute for High Culture failed to provide funding for the sound spectrograph. As a result, and struggling to secure suitable financial resources, from the late 1950s onwards the Coimbra Phonetics Laboratory lost its central position in the network of international phonetics laboratories and gradually ceased to attract foreign researchers.⁵³

This setback occurred concomitantly with a long overdue victory for Lacerda. He had campaigned since the establishment of his laboratory for the creation of a professorship of general phonetics associated with philology courses at the Faculty of Arts and Humanities of the University of Coimbra, and was finally appointed as its first chair 20 years later, in 1957. From that point, his time was split between teaching duties and research, both locally and abroad.⁵⁴ In 1960–1961, Lacerda lectured at the University of Wisconsin–Madison, where he was invited by the Luso-Brazilian Center to organize a phonetics unit for the teaching of Portuguese, and in 1964–1965 at Queens College of the City University of New York.⁵⁵

Finally, at the local level, the persistent inability of the Coimbra Phonetics Laboratory to attract Portuguese researchers put Lacerda's succession in jeopardy. António Almeida, an assistant at the laboratory from 1966 to 1968, was regarded by Lacerda as the next head of the laboratory. Almeida furthered his phonetic studies at the University of Marburg, in Germany, from 1968 to 1970. From 1970 to 1974, Almeida was a reader of Portuguese at the Ruhr University Bochum, and from 1974 to 1979

⁵² Braun (2021, p. 51).

⁵³ [Records of Coimbra Phonetics Laboratory] (1949–1955), Caixa 1321, Ficheiro 2, ACL.

⁵⁴ [Records of Coimbra Phonetics Laboratory] (1955–1966), Caixa 1320, Ficheiro 16; [Records of Coimbra Phonetics Laboratory] (1949–1955), Caixa 1321, Ficheiro 2, ACL.

⁵⁵ A. M. Rosa to A. Gouvêa [Letter] (1963, Feb. 13), Caixa 0761, Ficheiro 5, Documento 2; [Records of Coimbra Phonetics Laboratory] (1955–1966), Caixa 1320, Ficheiro 16, ACL.

he was a research assistant to Georg Heike at the Institute of Phonetics of Cologne University, where he obtained a doctorate in 1979.

Neither Lacerda nor Almeida were able to prevent the gradual dismantling of the laboratory following Lacerda's retirement in 1972, nor the failure to hire Almeida as its head in 1979. This was the year in which the laboratory was closed, after years of increasing suffocation. A silent and distressed witness to this process, in 1974 Lacerda confided in his former disciple and long-time friend Francis M. Rogers, from Harvard:

Having reached the maximum working age and thus having been forced to retire, I am taking the opportunity to confide in you, as a lifelong friend: there is no one available to take on my role at the laboratory and they have begun to cut the facilities, gradually commandeering laboratory rooms for other uses: today one room, weeks later another, and so on. Thus, it has ended up occupying little more than a single room, where I stored all the equipment I was able to. I can tell you that what I have witnessed with my own eyes has affected me deeply, though I have not told anyone about this and have tried to conceal my feelings of dismay: it is profoundly hurtful that all that has been achieved, the result of so much hard work, has been either undone or ignored Now I am retired, at the age of nearly 72, I can no longer fight to preserve the existence of the laboratory. Nonetheless, I still have a flicker of hope that it may survive and thus not be consigned to oblivion.⁵⁶

Locally, despite Lacerda's leadership capacities and international visibility, generational continuation could not be secured due to a fragile institutional context.⁵⁷ Lacerda's position at the Faculty of Arts and Humanities, which housed his laboratory, was always unstable: he was not initially hired as a faculty professor, but was enrolled as a student, and subsequently ranked as a member of the "technical, administrative, auxiliary and minor staff," together with groundskeepers, janitors, and the faculty's porter, among others; he did experimental work when most faculty members did not, some even considering it altogether uncongenial to a humanities institution; in the laboratory's golden years, his ability to secure many spaces and resources may have been a source of institutional distrust; his international visibility and recognition was unsurpassed, causing some discomfort among faculty members; the government had direct influence over the emergence of the laboratory, illustrating how the nationalist regime sought to appropriate Lacerda's agenda; the support of national funding

⁵⁶ A. de Lacerda to F. Rogers [Letter] (1974, Aug. 7), in Lopes (2023, p. 138). In a way, Lacerda's hope that his laboratory would somehow survive did partially come to pass. In 1979, with the creation of a phonetics laboratory in the Faculty of Arts and Humanities of the University of Lisbon, some of Lacerda's instruments were moved from Coimbra to Lisbon. Later, in 2020, a small permanent exhibition was inaugurated at the Phonetics Laboratory in Lisbon. Other instruments and documents survived but were only rediscovered recently. The polychromograph and the chromograph were probably rescued by the physicist Mário Silva, director of the National Museum of Science and Technics, and are presently under held by the Science Museum of the University of Coimbra. A fraction of the library and archives of the laboratory were recently identified at the Central Library of the Faculty of Arts and Humanities and have begun to undergo preservation.

⁵⁷ Simões (2019).

agencies was essential but did not last, as they were unable or unwilling to secure maximum profit for their investment.⁵⁸

For more than 40 years, the laboratory had been a research oasis, able to attract many foreign researchers for extended sojourns at its facilities. The particularities of the laboratory stemmed from the leadership characteristics of its head and the scientific networks of circulation from which he profited, as much as they benefited from his expertise. On the one hand, the creation and rise of the laboratory forces one to seriously consider circulation as a creative process that is not limited to encounters and exchanges at specific nodes.⁵⁹ On the other hand, the laboratory's ephemeral life calls attention to the asymmetries that are an integral part of networks and circulatory mechanisms. Their effects are never homogenizing, but rather ways to alter power relationships among actors. While Lacerda was certainly a respected leader, and recognized as such by the international community, he was not able to attain a similar status in his local context, and therefore his laboratory failed to outlast its founder.

But even the meaning of being ephemeral calls for reconsideration. The laboratory's life at the local and national context is only one side of the coin. Seen from a global, not a local perspective, the laboratory's life and Lacerda's actions endured past the laboratory's dismantling and Lacerda's retirement. There appeared several renowned phonetic laboratories and researchers in Sweden, Brazil and the United States which followed in Lacerda's footsteps. As his offspring, they outlasted him. This case study calls for an analysis privileging a global approach while not forgetful of the ebbs and flows of asymmetrical relationships.

The Experimental Phonetics Laboratory, 1936–1979: Successful Circulation and Reproduction of Expertise from Portugal to Sweden, Brazil, and the United States

Sue Nogueira, one of the researchers who stayed at the Coimbra Phonetics Laboratory, had no reservations about asserting that the laboratory represented “an extremely important milestone in one's professional career.”⁶⁰ Indeed, the laboratory provided the means for scientists to keep abreast of the latest developments, while conferring prestige on those who worked there. Many of those who spent time at Coimbra rose to prominence, such as the Swedish Göran Hammarström, the Brazilian Nelson Rossi, and the American Francis Millet Rogers.

Hammarström, a PhD student at the University of Uppsala, chose Lacerda's laboratory to carry out research for his dissertation in the early 1950s. A philologist interested in studying Portuguese, particularly dialectology, as part of his research work, Hammarström collected phonetic material in the Algarve, the southernmost

⁵⁸ Lopes (2023, pp. 133–139).

⁵⁹ Gavroglu et al. (2008); Secord (2004); Roberts (2009); Raposo, Simões, Patiniotis, & Bertomeu-Sánchez (2014); Hauswedell, Körner, & Tiedau (2019); Diogo & Simões (in press).

⁶⁰ Lopes (2023, p. 67).

region of Portugal, under the supervision of Lacerda, which he supplemented with tests conducted at the laboratory.⁶¹

Upon his return to Uppsala from “sunny Portugal,” his studies at a “Portuguese phonetics laboratory” under the leadership of Lacerda of “worldwide reputation” were reported on August 22, 1952 in the Swedish national newspaper *Svenska Dagbladet*. It specified that “he attended to the making of the first tape recordings for the creation of an archive of dialects covering all the provinces of Portugal.”⁶²

His stay formed the basis for a paper that became Hammarström's PhD dissertation, defended at the University of Uppsala in 1953. Other papers bore the laboratory's imprint, and Hammarström hoped that Lacerda considered the Coimbra Phonetics Laboratory as the symbolic author of his PhD dissertation.⁶³ According to Rogers, professor of Romance languages and literatures at Harvard University, by benefiting from the “superbly installed and very well equipped Laboratory of Experimental Phonetics” at the University of Coimbra and the mentorship of the “Laboratory's genial director, Dr. Armando de Lacerda,” Hammarström produced a “masterly thesis,” whose academic impact was immediate, resulting in his appointment to an assistant professorship at the University of Uppsala.⁶⁴ Immediately afterwards, in 1955, Hammarström founded the Department of Phonetics at the University of Uppsala.

The importance of researching at the Coimbra Phonetics Laboratory for his career progression in academia is evident in the opinion that Georges Straka, head of the Institute of Phonetics of the University of Strasbourg, expressed to the head of the Faculty of Arts and Humanities of the University of Uppsala in 1957: “The findings he [Hammarström] has obtained exceed by far those achieved by previous researchers and this is due to the excellent chromographic method used by Mr. Hammarström [in Coimbra].”⁶⁵

Later, in 1965, by invitation from Monash University, Hammarström became the first professor of linguistics in Australia.⁶⁶ His daughter Marika Hammarström recently stated that her father's research at the Coimbra Phonetics Laboratory was crucial to this invitation: “Had he never worked under Lacerda, his work may have remained in Sweden and I would not be Australian.”⁶⁷

The case of Nelson Rossi, professor at the University of São Salvador da Bahia, highlights the importance of the Coimbra Experimental Phonetics Laboratory in the development of phonetic and dialectological research in Brazil. His specialist training at the Coimbra laboratory from 1954–1955 was funded by the Brazilian government

61 [Individual researcher file] (1949–1954), Caixa 0785, Ficheiro 7, ACL.

62 “Portuguese Dialects Preserved on Tape” (1952, Aug. 22), *Svenska Dagbladet*, Caixa 0785, Ficheiro 7, Documento 31, ACL.

63 Hammarström (1953, p. 6).

64 Rogers (1955, pp. 284–285, 292); [Individual researcher file] (1949–1954), Caixa 0785, Ficheiro 7, ACL.

65 Report by G. Straka (1957, Feb. 15), in Lopes (2022, p. 104).

66 G. Hammarström to H. Broadhead [Letter] (1975, Jun. 4), MON 630, 1984/74, Monash University Archives, Melbourne, Australia.

67 Marika Hammarström (2023, Jul. 13), personal email to the first author, published with her permission.

through the Campanha Nacional de Aperfeiçoamento de Pessoal de Nível Superior (CAPES; National Campaign for the Training of Higher Education Personnel) and led to his appointment as the first head of the Experimental Phonetics Laboratory at the University of São Salvador da Bahia.⁶⁸ As already mentioned, Lacerda was behind its creation. Invited by the rector of the University of São Salvador da Bahia, Edgard Santos, in 1956–1957, Lacerda laid the groundwork for what came to be the first experimental phonetics laboratory in South America.

Among other equipment, the São Salvador da Bahia Phonetics Laboratory acquired three instruments developed by Lacerda: “a horizontal projection electrochromograph (translator of analysable graphs); a Lacerda tonometry triangle to determine tone line and levels; and the tonometry table for conjugation with the triangle (devices for graph analysis).”⁶⁹

The laboratory was designed to achieve three main objectives: to make sound recordings, to carry out analysis and measurements, and to set up a sound archive “of speakers of Salvador and localities in the interior of Bahia, as well as other states in Brazil and elocutions of foreign speakers.”⁷⁰ Measurement and analysis were carried out by means of chromography and tonometry, both techniques developed by Lacerda and used at the Coimbra Phonetics Laboratory.⁷¹

A major achievement of the laboratory was the publication of the first linguistic atlas of Brazil, *Atlas Prévio dos Falares Baianos*, produced in 1960–1963 by Rossi and collaborators, and based on the appropriation of Lacerda-Hammarström's phonetic transcription. This atlas had an overwhelming impact on the development of dialectology in Brazil, by fostering the emergence of linguistic atlases in other states. Such was the case of the *Atlas Lingüístico de Sergipe*, also carried out by the team from Universidade Federal da Bahia, completed in 1973 but published in 1987; as well as the *Esboço de um Atlas Lingüístico de Minas Gerais* (1977), the *Atlas Lingüístico da Paraíba* (1984), the *Atlas Lingüístico do Paraná* (1994), and the *Atlas Lingüístico de Sergipe II* (2005).⁷²

In addition to advancing phonetics and dialectology in Brazil, the Coimbra Phonetics Laboratory also promoted the teaching of Romance languages and literature at Harvard University. In 1978, Rogers became the first holder of the first chair of Portuguese studies created in the United States—the Nancy Clark Smith Professorship of the Language and Literature of Portugal—not surprisingly in a state with strong immigration from Portugal, including the Azores islands and Portuguese-speaking countries. Rogers himself was the grandson of Azoreans who had emigrated to

68 Cardoso (1994).

69 Mota & Oliveira (2022, p. 113); see also [Records of Coimbra Phonetics Laboratory] (1955–1966), Caixa 1320, Ficheiro 16, ACL; Caixa 123, Ficheiro Professor Armando Soeiro Moreira de Lacerda, Arquivo da Universidade de Coimbra, Portugal. It should be noted that the triangular method was previously invented by Ernst Alfred Meyer.

70 Mota & Oliveira (2022, p. 113).

71 Cardoso (1994, p. 118).

72 Mota & Oliveira (2022, p. 115).

the United States around the middle of the 19th century.⁷³ His successful career unfolded at Harvard from 1945 to 1981, and was founded on his stay at the Coimbra laboratory.

On a Sheldon Traveling Fellowship from Harvard in 1938–1939, Rogers was encouraged by his mentor George Zipf to conduct research for his PhD at the Coimbra Phonetics Laboratory. Regarding Portugal as part of “the ‘exotic’ remainder of the world,” Rogers took nonetheless Zipf’s advice seriously.⁷⁴ In his memoirs, he recollected:

Zipf greatly encouraged me in my Ph.D. project of studying the pronunciation of Portuguese in the Atlantic islands. Through him I learned of the book by Paul Menzerath and Armando de Lacerda titled *Koartikulation, Steuerung und Lautabgrenzung*. Indeed, Zipf was so impressed by Lacerda that he insisted on my seeking him out once I was in Portugal.⁷⁵

His 4 months at the Coimbra Phonetics Laboratory in 1939 under the supervision of Lacerda resulted in the publication of a co-authored paper building on Roger’s extensive research in Portuguese pronunciation, both at Harvard and in the field, and his willingness to write a “definitive treatise” on the subject, “a synopsis of which would be the first part of my thesis.” But as he recollected: “Unfortunately, I found that task to be far from easy. Too many problems arose which needed experimental solution. Thus, I went to Lacerda with a list of fourteen questions. During my stay, we solved exactly one of them.”⁷⁶

Its “experimental solution” depended on the chromograph, Lacerda’s invention, which did not exist at Harvard (Figure 6).⁷⁷ The description of their method and results was “somewhat breathlessly” titled “Sons Dependentes da Fricativa Palatal Áfona, em Português,” and was published in the Coimbra journal *Biblos* in 1939. The article was critically reviewed in the journals *Language* and *Hispanic Review*. Due to the importance of their results, Lacerda immediately made a request to Eberhard Zwirner to publish its English translation in the *Archiv für vergleichende Phonetik*, an effective way to increase its global readership.⁷⁸

Besides research, Rogers’s innovative courses on foreign languages were also influenced by Lacerda’s methods and instruments. As he recollected: “In my course ‘General Linguistics and the Romance Languages: Theory and Application’ ... I also incorporated the experimental phonetics I had learned of old, and I emphasized the contributions of Armando de Lacerda.”⁷⁹ But his teaching influence went far beyond specialist courses. He managed to make Portuguese studies part of the General

⁷³ Bichakjian (1981, p. 1).

⁷⁴ Rogers (1992, p. 124). The image of a rural, picturesque, and isolated nation was promoted by the dictatorial regime of the Estado Novo: Melo (2001).

⁷⁵ Rogers (1992, p. 142).

⁷⁶ Rogers (1992, pp. 160–161).

⁷⁷ Lacerda & Rogers (1939, pp. 259–282).

⁷⁸ A. de Lacerda to E. Zwirner [Letter] (1939, May 29), Biblioteca do Laboratório de Fonética, Faculdade de Letras de Coimbra, Coimbra, Portugal. This publication did not materialize.

⁷⁹ Rogers (1992, p. 314).

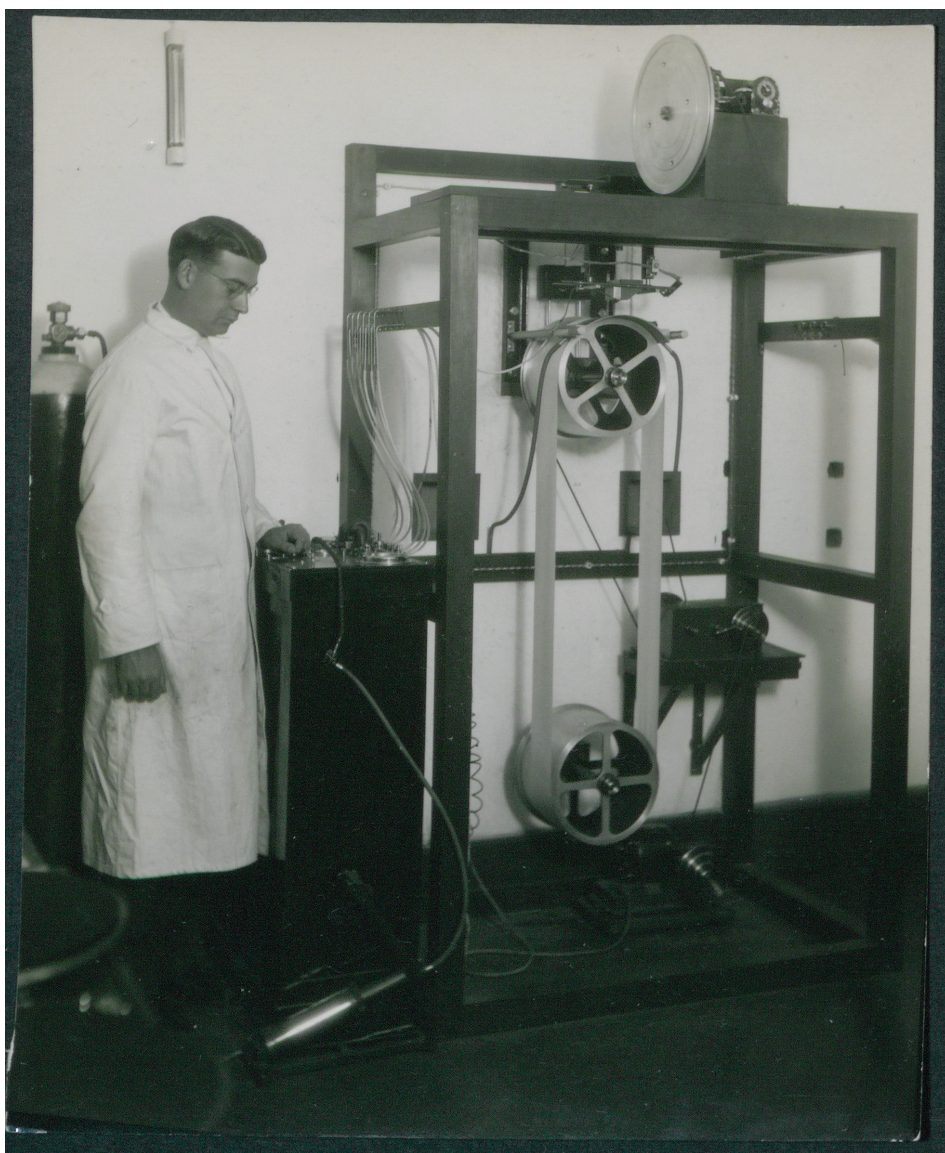


Figure 6. Francis M. Rogers (Harvard University) using the chromograph at the Coimbra Phonetics Laboratory (1939). Reproduced with permission from Biblioteca Alonso Zamora Vicente, Cáceres, Spain.

Education program. Portuguese lessons used experimental phonetics. Knowledge about speech recording methods acquired from Lacerda at the Coimbra Phonetics Laboratory enabled Rogers to introduce “all the new-fangled linguistics” into his “elementary Portuguese-language course.” He was convinced that the scientific description of sounds and demonstration of dialectal varieties facilitated students’ learning of Portuguese. From 1960 onwards he “updated and upgraded this course with a view to conferring great prestige within Harvard on the language of Camões, Mendes Pinto,

and countless outstanding Brazilian authors.” He managed to turn Portuguese studies into a very popular field at Harvard: “The undergraduate rumour mill frequently reported to me that the two most prestigious languages for Harvard College students to study were Arabic and Portuguese!”⁸⁰

Despite initial preconceptions by some participants and historians alike as to the “exoticism” of Portugal as a locus for scientific research, or as one of the “laggard” South European countries, this sort of general statement must be critically evaluated and modelled by in-depth case studies supported by reflections on the specific conditions that fostered or hindered scientific research.⁸¹

The role of the Experimental Phonetics Laboratory of Coimbra in moulding the careers of Hammarström, Rossi, and Rogers was crucial to the establishment of phonetic laboratories, phonetic chairs, teaching courses, and the publication of the first linguistic atlases in places such as South and North America, the Scandinavian countries, and Australia. Its impact was certainly global. It had begun in the same way, as the result of a confluence of personal idiosyncrasies, local circumstances, including support for research, and international networks of expertise. As the historian of science Lissa Roberts has noted, “Science ... has no privileged place of origin: it is a constantly developing consequence of circulation.”⁸²

Conclusion

In-between disciplines are privileged vantage points to assess contingencies in disciplinary development, and disciplinary (re-)arrangements, at the same time enabling to point to potential knowledge associations. The development of an in-between discipline at Lacerda's phonetic experimental laboratory is such an instance. Trained in philology, Lacerda shifted to experimental phonetics due to its strategic role in understanding speech in living speakers of diverse languages, in social status, and in geopolitical backgrounds. The laboratory's placement in the Faculty of Arts and Humanities at Coimbra materialized the tensions of an emerging discipline born at the crossroads of the humanities, science, biomedicine, and technology, and of an expert practitioner equally competent in conceptual development, laboratory and field work, and the conception and use of novel instruments.

This case study further illustrates that local histories cannot be adequately told in isolation. Lacerda's laboratory depended on the availability of spaces and personnel in an unstable institutional network in Coimbra, as well as on the government's support. His scientific agenda found a responsive chord in the nationalistic and colonialist agenda of the regime. Lacerda's was not just a local history, but also a global one. It profited from the circulation of experts, students, instruments, and practices. It

80 Rogers (1992, pp. 314–315). Information about the use of experimental phonetics learned from Lacerda in Francis M. Rogers's Portuguese classes was shared by his daughter Sheila Rogers Ackerlind (2018, Mar. 19), personal email to the first author.

81 The expression “laggard” is used by Cahan (2020, pp. 404–406).

82 Roberts (2009, p. 25).

benefited from Lacerda's stays abroad as much as from the many researchers who sought specialist training in his laboratory, to be afterwards implemented in localities around the world, in Europe, America, Africa, and Oceania.

The entanglements between local and global as constitutive elements in the construction of Lacerda's laboratory reveal the extent to which this case study defies entrenched dichotomies such as local and global, central and peripheral, successful and ineffective. The history of this laboratory depended on its networked connections, extended and dynamic, exemplified in the various sections and sub-sections of this paper. But it also stresses that the result was not one of levelling out the initial heterogeneities, but one that reconfigured asymmetries of power, both nationally and internationally: at the local level, due to a fragile (and increasingly hostile) institutional environment, it was unable to reproduce expertise across scientific generations; at the international level, it acted as the springboard for fruitful careers, and for the establishment of new laboratories that nurtured successive generations of experts.⁸³

Finally, this case study also signals to historians of science the importance of disciplines such as the history of linguistics. At a meta level, it invites us to think about our *métier*, duties, and responsibilities as historians of science, to understand why specific case studies are chosen and others omitted: is it the result of ingrained unacknowledged preconceptions or of simple unawareness? Or is it the case that history of science is still not a global discipline, despite heading in this direction? Paraphrasing Roberts, in the same way that science is a constantly developing consequence of circulation, so should be the history of science profession.⁸⁴

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⁸³ Diogo & Simões (in press).

⁸⁴ Roberts (2009, p. 25).

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