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RESEARCH ARTICLE

How to build a scientific discipline in the nineteenth century: In search of autonomy for zoology at the Lisbon Polytechnic School (1837–1862)

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Argument
This article discusses the conditions that lead to the autonomy of scientific disciplines by analyzing the case of zoology in the nineteenth century. The specialization of knowledge and its institutionalization in higher education in the nineteenth century were important processes for the autonomy of scientific disciplines, such as zoology. The article argues that autonomy only arises after social and political power is mobilized by specific groups to acquire appropriate conceptual, physical, and institutional spaces for a discipline. This is illustrated through the case study of the Lisbon Polytechnic School, a higher education establishment that was created in 1837, in Portugal. The case shows that autonomy in zoology can arise before the consolidation of a community of experts in the discipline, which may have been a common feature of the discipline in other countries.

Keywords: History of scientific disciplines; institutional history; higher education; natural history museums; Lisbon Polytechnic School

Introduction

In the nineteenth century, scientific activity underwent a fundamental transformation. Scientific disciplines progressively ceased to serve primarily as mere repositories of knowledge and were integrated into systems of knowledge held together by the stabilization of communities of practitioners, the specialization and differentiation of new fields in institutional contexts, and the standardization of forms of scientific publication. Increasing differentiation and cross-competition among different fields within this system of knowledge led to the consolidation of scientific disciplines, and the occupation of new niches in educational institutions. Higher education was particularly important in this context, since it provided some of the few environments in which such differentiation could take place (Stichweh 1992; Stichweh 2001). This article will discuss the necessary conditions for this transition to autonomy by analyzing the process that led to the institutionalization of zoology in a particular school.

In Europe, natural history was institutionalized through the sedimentation of each of its component disciplines, which occurred in different historical periods. Botany was the first, since it was regarded of practical utility for the preparation of medicines, and by the early eighteenth century it was well in place in medical schools. Mineralogy was taught in British and Central European academies and universities late in the same century, having developed in close association with the mining industry (Harwood 2009, 90–3). Zoology, which presented little social or economic utility when compared to the other two, was the last to conquer institutional space as an independent discipline. Though the topic was already being taught in natural history courses at

some British and American universities, as well as in Continental Europe in the early nineteenth century, courses specifically devoted to zoology were almost nonexistent, with the exceptions of the Muséum d'Histoire Naturelle and the University of Paris, as well as the new University of Berlin. Zoology only began to attain noticeable institutional recognition in the 1830s, particularly in medical schools, due to the growing popularity of comparative anatomy, where it remained mostly subsidiary to medical teaching. Amongst German universities, which were more favorable to purely academic pursuits after the Humboldtian reform of 1810, only one third had courses exclusively devoted to zoology by the mid-nineteenth century. Older and prestigious universities, such as Oxford, Cambridge, Harvard, and Yale, established zoology chairs as late as the 1860s, and in the United States most were only created during the last two decades of the nineteenth century (ibid.).

It is significant that some of the first educational institutions in which zoology found true autonomy, such as the University of Berlin and the University of London (later, University College London), had been founded only in the first half of the nineteenth century (ibid.), suggesting that it was easier to find a place for the discipline in new, rather than in older institutions with well-structured disciplinary hierarchies. This paper presents a case study that further supports this claim, showing how zoology found autonomy in Lisbon in a new higher education institution created in 1837, the Lisbon Polytechnic School (LPS). The foundation of a new institution is usually the result of the mobilization of particular groups, who build and use their social power to overcome any social, cultural, and political resistances to their plans. The constitution and development of nineteenth-century scientific institutions as a result of the mobilization of social and political power is still an understudied historiographical topic (Cahan 2003, 291–317), and this article aims to provide a detailed historical analysis of one such process by showing how zoology was able to attain autonomy in the LPS.

The acquisition of autonomy is not a spontaneous process. Not only must disciplines achieve a proper institutional basis, but additional conditions must always be met, and these can be understood as the construction of specific spaces that reinforce the cohesion of a field of knowledge. In the last few decades, various authors have analyzed the multiple meanings and potential of "space" as an analytical category, especially in sociology (Ophir and Shapin 1991; Gieryn 2000). Historical studies of science have furthermore witnessed a "spatial turn," as synthesized in David Livingstone's *Putting Science in its Place* (2003). The term "space" has been utilized to map the rise of different disciplines at different levels, from conceptual territories to the physical spaces occupied by them (Livingstone and Withers 1999, 2005, 2011; Naylor 2005; Powell 2007; Finnegan 2008; Withers 2007, 2009; Livingstone 2010). In this paper, I will argue that autonomy is the result of securing conceptual, physical, and institutional spaces for a given discipline.

The most obvious requirement of the three is the conceptual space, as a discipline must be defined by a set of theories and practices able to produce new and valid knowledge, which is ultimately synthesized in books and specialized articles. However, a conceptual space is nothing without proper institutional and physical spaces. Emerging disciplines compete with existing ones for resources, and may therefore be perceived as threats to the established disciplinary hierarchy. The funds allocated for the maintenance of a discipline are defined in relation to the place it occupies in the often hierarchical knowledge landscape of the institution in which it finds a place. Social and political power must thus be mobilized to construct an institutional space that defines the social role of the discipline, as well as its organization and the financial resources allocated to fulfill that role. At the same time, the discipline must secure its autonomy by occupying physical spaces adapted to its specific needs and practices, which vary according to the type of research and/or teaching conducted at the institution. These conceptual, institutional, and physical spaces are always interlinked and autonomy can only arise if the three are cohesively integrated. Finally, in order to last, autonomy must be patrolled and reinforced by a community of experts, who actively contribute to it with their research and by mobilizing more social prestige. It is when this

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community is able to bring in neophytes and establish some degree of continuity in the practices it conducts that a scientific tradition is established.

Cases such as the institutionalization of zoology at the LPS are particularly relevant to understanding the construction of disciplinary autonomy. Despite earlier attempts at autonomous institutionalization, Lisbon had essentially no tradition of modern zoological studies by the mid-nineteenth century, and the autonomy of zoology and the establishment of a scientific tradition were only achieved after social and political power were diligently mobilized at an unprecedented scale in order to overcome various obstacles. Placing these obstacles in context allows us to more easily discern and analyze the requisites of disciplinary autonomy, which may appear less obvious in the case of institutions that had more funds, physical space, and social prestige. As the history of the institutionalization of zoology at the LPS will show, disciplinary autonomy can be reached even in the absence of a thriving local community of practitioners. A newly gained autonomy can then be used to create this community and ensure continuity in their studies.

Initial attempts at making space for zoology in Portugal

Before 1837, the year that marked the foundation of the LPS, there had already been three major initiatives that could have given autonomy to zoology in Portugal. Probably due to the influence of men favorable to natural philosophy over King José I (1714–77), a Royal Cabinet and a Royal Botanic Garden were annexed to the Ajuda Royal Residence in 1768, so that future Portuguese monarchs could follow the scientific advancements of their century (Brigola 2003, 98–102). In 1772, a natural history cabinet was created at the University of Coimbra, the Kingdom's sole university. This was part of a broad reform of the institution, designed to improve the status of natural philosophy and to implement demonstrative lectures, a relevant innovation in eighteenth-century Europe since most of the European universities at that time essentially retained a medieval structure (Brockliss 2003, 52–56). This encompassing reform was promoted by the Marquess of Pombal (1699–1782), a statesman imbued of the spirit of the Enlightenment who had an enduring influence during the reign of King José I (Brigola 2003, 101–2). Pombal also invited Italian naturalists to lecture on natural philosophy at Coimbra, including Domenico Vandelli (1735–1816), who was first appointed head of the Royal Cabinet and Botanic Garden (ibid., 101–8).

Though Vandelli exchanged correspondence with various European naturalists, including the famous Carl Linnaeus (1707–78), and organized natural history collections at Coimbra and Ajuda according to Linnean classification schemes (Ceríaco 2014, 141–6, 153, 196), both establishments nevertheless retained features of curiosity cabinets. The Coimbra Cabinet still possessed collections of Ancient Roman medallions, statues, and "monstrosities" (Brigola 2003, 138–71), and although there were various specimens displayed in cases at Ajuda, it also had "monstrosities," fish suspended from the ceiling and reptiles fixed to the walls (ibid., 292–316). More importantly, the Cabinets' institutional space was not organized for sustained zoological research. They had no positions for full-time taxonomists, and Vandelli and his disciple Alexandre Rodrigues Ferreira (1756–1815), the only people at Ajuda who were knowledgeable in natural history, were in charge of its administration and were treated as state employees, being recurrently called for a variety of practical requests (Ceríaco 2014, 125–34).

Utilitarian conceptions of knowledge typical of Enlightenment thinking dominated and constituted an obstacle to the autonomy of zoology (Shapin 2003). Important initiatives for the zoological exploration of Portuguese colonies were undertaken from the 1780s to the 1800s, but they had small and insufficiently prepared teams, and the explorers' time was frequently diverted to fill the administrative needs of the colonial governments (Simon 1983). Even the mission to Brazil, which yielded numerous zoological collections and was headed by Ferreira himself, amounted to little, since upon his return his many duties and poor health consumed time that would have been otherwise used to study the specimens (Brigola 2003, 246–81).

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The political instability of the first decades of the nineteenth century in Portugal also compromised these first attempts at making space for zoology in Lisbon. The French incursions in Portugal during the Napoleonic Wars brought the renowned naturalist Étienne Geoffroy de Saint-Hilaire (1772–1844) to the Ajuda Cabinet, and he used his position of power to take specimens unknown to science to the Paris Museum, especially the ones from the Portuguese colonies (Vicente 2003). Vandelli's outspoken pro-French stance led to his expulsion from the country in 1810, after the British regained control of Lisbon (Cardoso 2003). Zoological studies had no continuity because Ferreira, Vandelli's main disciple, died in 1815 and the new director of the Ajuda Cabinet, Félix de Avelar Brotero (1744–1828), was a professional botanist and had only limited knowledge in zoology. Moreover, the collections were by now in disarray because they had been moved various times during the French occupation. Brotero tried to organize them as best he could, but he had no help from a professional zoologist and when the botanist died in 1828, he was replaced by a mere bureaucrat (Ceríaco 2014, 225). The political climate in Portugal was also unfavorable from 1820 to 1834, a period of recurring conflicts between Absolutist and Liberal factions, which introduced much instability and compromised the initiatives of other actors. For example, Manuel José Barjona (1760–1831), a professor at the University of Coimbra who reorganized its natural history cabinet in the 1820s and promoted the collecting of zoological specimens, was expelled from the University on the basis of his Liberal sympathies after the Absolutists took power in 1828 (ibid., 221–4, 247).

Aside from the Coimbra and Ajuda Cabinets, a third attempt at gaining more autonomy for zoology in Portugal was only tried after the Absolutists were defeated by the Liberals in a civil war that raged between 1832 and 1834. The victorious Liberal elite began to implement major reforms in order to adapt the country to the new regime, and it was in this new context that the Academy of Sciences of Lisbon, a learned society that had been founded decades before and had never achieved prestige in zoology, seized the opportunity to improve its status in the field. This attitude was motivated by the existence of a natural history course administrated by the Academy of Sciences itself. The course had been inaugurated in 1792 by José Maine (1723–92), a Franciscan of high social standing who was personal confessor to King Pedro III (1717–86). Maine had envisioned a course in natural theology, preferably delivered by the members of his own congregation, and he had established it in the Jesus Convent, where he lived (Carvalho 1981, 123–6). By 1792, Maine had invested his personal assets in the acquisition of natural history collections and books, and entrusted the Academy of Sciences with the administration of both his lecture and his acquisitions (ibid., 28–33). He had been one of the founding members of the Academy back in 1779, and in his view the institution provided the best environment for the preservation of his legacy, inasmuch as it also fulfilled, at that time, a pedagogical function, by providing lectures on mathematics, physics, chemistry, and natural history (ibid., 18–26).

In spite of the weakening of the Academy's pedagogical function in subsequent decades, the Maine Lecture (Aula Mainense), as it was usually called, persisted. In 1835, the academicians decided to restrict the course to zoology—firstly to make use of the zoological collections Maine had left, but also because it was no longer possible for a lecturer to master all branches of natural history (ibid., 84–6). This decision formed part of a strategy to build social prestige in the context of the new political regime. Taking advantage of the Liberal animosity towards the clergy, which led to the expulsion of male religious orders in Portugal and the confiscation of all their assets in 1834, the academicians first requested Maine's former possessions from the government (Anon. 1834), and in 1836 the collections of the Ajuda Cabinet, still in disarray, promising to organize them and constitute a natural history museum that would open to the public (Secretariat of State for Kingdom Affairs 1836a). These moves, which proved successful, were probably inspired by the famous conversion of the aristocratic French Royal Cabinet into the public Paris Museum (Winsor 2008, 61–3).

The early years of the new Liberal regime were thus a period in which the Academy of Sciences was transforming its institutional framework to acquire more prestige by creating a space of higher

autonomy for zoology. However, transferring the collections of the Ajuda Cabinet was not an easy task. The Maine Lecture was then headed by Francisco Assis de Carvalho (1798–1851), a physician educated at the University of Coimbra (Pereira 2005b). After the Liberals took over Lisbon in 1833, he was also appointed as head of the Ajuda Cabinet, but when the war ended in the following year he was suddenly replaced by José Santos do Vale (1772–1854). Santos do Vale was one of the various Portuguese intellectuals favorable to the Liberal cause who had fled the country after the Absolutist coup of 1828, fearing persecution. Following important military victories by the Liberals in 1833, he returned to Portugal and was able to recover his position of Full Professor of Botany and Agriculture at the University of Coimbra (Alves 2005). His contacts within the Liberal elite likely led to his position as head of the Ajuda Cabinet and Botanic Garden, at the expense of the removal of Carvalho (Secretariat of State for Kingdom Affairs 1834, 517). In this context, the Academy's mobilization to extinguish the Ajuda Cabinet and take over its collections in 1836 meant that Carvalho would in practice regain the authority he had lost to Santos do Vale. Moreover, as the Ajuda Botanic Garden was also placed under the Academy's supervision, Santos do Vale would now have to follow its dictates, although he retained his directorship (Secretariat of State for Kingdom Affairs 1836a). The whole case had the bitter taste of retaliation, and Santos do Vale was notoriously angry with the decision. He waged a war against Carvalho, using all means to delay the transfer, such as locking doors and threatening the staff not to give access to the collections (Ceríaco 2014, 234–41).

In 1837, when the LPS was founded, zoology had recently found a new institutional space at the Academy of Sciences, but it was still trying to find stability, as the transfer of the Ajuda Cabinet's collections had not been concluded due to Santos do Vale's opposition (Carvalho 1981, 66–7). Zoology could also count on an additional institutional space at the University of Coimbra, the collections of which had probably by then been reorganized, but still showed severe gaps. In fact, it was so short on vertebrates that printed images had to be used in lectures (Ceríaco 2014, 247–50). Institutional instability and a chronic lack of funds plagued both Coimbra and Lisbon, as a result of which they could boast almost no scientific tradition in zoology to speak of since at least the second half of the eighteenth century.

Making a new institutional space for zoology in Lisbon

As the Academy of Sciences was repositioning itself in the early years of the Portuguese Constitutional Monarchy to achieve scientific prominence, a segment of the Liberal elite mobilized to found a school devoted to the teaching of technoscientific subjects in Lisbon. This school provided a new opportunity for zoology to reach autonomy, although its initial institutional framework did not favor the discipline at all. To understand how this opportunity arose, it is necessary to follow the winding road that led to the foundation of the Lisbon Polytechnic School (LPS).

In 1834, technoscientific training in Portugal was essentially restricted to two types of educational institutions: the University of Coimbra, still the sole Portuguese university, and five military academies that had been founded in the late eighteenth century (Carvalho 2008, 516–8). There were other isolated lectures, such as the Royal Surgery Lectures of Lisbon and Oporto, but these provided training only to medically-related professions (Santos 1985, 88–9). The Liberals understood that they needed to rely on science-based professionals if they wanted to overcome the barriers that blocked the country's path to progress: poorly planned and backward agricultural techniques, and an incipient industry. Modernizing these sectors was essential to compensate for the loss of primacy over Brazilian commerce, as well as the war effort and destruction resulting from the civil war, which contributed to the chronic deficit of Portuguese public finances (Figueiredo 2002, 130–9; Costa *et al.* 2012, 340–9). Some sectors of the ruling elite argued that the existing educational institutions were insufficient for this task. On the one hand, the centuries-old

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University of Coimbra was seen as an institution devoted to speculative inquiry, which gave it a somewhat outdated look; on the other, the existing military academies were too focused on military training and some could only be attended by members of the nobility, thus preserving an *Ancien Régime* structure unacceptable for the Liberals (Santos 1985, 100). The alternative would be to reform the existing institutions, perhaps even to create a new one, which had to be placed in Lisbon, since the Liberals favored the centralization of power in the kingdom's capital.

To introduce significant changes in educational institutions, however, was bound to be a difficult task. The University of Coimbra had controlled the educational landscape of the country for decades (Fernandes 1994, 84–6), and its academics would likely resist every attempt to question their authority and prerogatives. In any case, a faction of the Liberal ruling elite decided to challenge the ascendency of Coimbra on educational matters. Rodrigo da Fonseca Magalhães (1787–1858), who became head of the Ministry of the Kingdom in July 1835, prepared the reorganization of higher education in Portugal by centralizing educational policy in Lisbon (Secretariat of State for Kingdom Affairs 1835a) and appointing a commission to prepare a global reform. The commission proposed the foundation of a new technoscientific school in the capital, the Institute of Mathematical and Physical Sciences (*Instituto de Ciências Físicas e Matemáticas*), which was meant to replace the military academies and isolated lectures in Lisbon and concentrate them in a same institution, while eliminating redundant courses. Among others, a zoology course was established, but the discipline was not fully autonomous because it was taught in conjunction with botany. Although military education remained the main aim of the Institute, it also provided training in civil engineering, pilotage, and commercial activities, as well as a general scientific curricular path that would give access to a doctorate in sciences after presenting an original dissertation (Secretariat of State for Kingdom Affairs 1835b, 1097).

The members of the commission on education used the term "Institute" to designate the new school in an attempt to avoid opposition, as much as possible, from Coimbra's academics. The Institute was presented as a school focused on teaching knowledge for practical ends in order to demarcate it from the more intellectual pursuits associated with the University of Coimbra. Resistance from the University, however, was bound to emerge, since Liberal reforms had already stripped some of its privileges, including autonomy in financial matters (State Treasury 1835, 920). Moreover, Coimbra's academics feared that the foundation of a new school for higher education in Lisbon would attract students away from the more remote city of Coimbra. For these reasons, when the commission required the University to reform itself in light of the new political regime, suggesting for example the suppression of the Faculty of Theology, Coimbra's academics vehemently refused to comply (Senior Faculty of the University of Coimbra 1835).

In reality, the Institute never materialized. It was one of the many plans that fell prey to the political instability of the early Portuguese Constitutional Monarchy. The different Liberal factions were unable to reach a consensus concerning the type of Liberal regime that best suited Portugal, since the leftists did not agree with the moderate Constitution that had been adopted (Bonifácio 2009, 33–9). After the dissolution of Magalhães's government in November 1835, his successor, Luís da Silva Mousinho de Albuquerque (1792–1846), revoked all prior educational reforms, to the dissatisfaction of the Institute's recently appointed professors (Secretariat of State for Kingdom Affairs 1835c). His intention, however, was not to favor the University of Coimbra. He still wanted a bold and encompassing educational reform, but one that rather resulted from a consensus reached by representatives of the main educational institutions of the kingdom, just as Magalhães's predecessor had determined before being replaced, and to subject this far-reaching proposal to parliamentary discussion (Anon. 1836, 57).

Facing Albuquerque's unexpected decision, most members of the initial group of professors of the ephemeral Institute, many of whom lectured at the Royal Navy Academy or the Royal Academy of Fortification, Artillery, and Drawing, decided to act. They joined other Portuguese intellectuals and formed an association, the Society of the Friends of Letters (*Sociedade dos Amigos das Letras*), with the aim of lobbying the government for the maintenance of the Institute

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(Castilho 1836). Upon learning that the government charged another commission with proposing a new educational reform before the end of 1835, they used their influence to ensure that the proposal would incorporate the foundation of a school resembling, as much as possible, the ill-fated Institute.[1] Although the government initially denied their requests, the commission proposed an even bolder reform that Albuquerque was happy to present in Parliament in January 1836. The bill created a "Lisbon Institute" that closely resembled its short-lived predecessor. The main differences were that it proposed the foundation of faculties of mathematics, philosophy, and medicine in Lisbon, as well as schools for primary and higher education in Azores and Madeira. In this plan, zoology would enjoy more autonomy, as a course incorporating it and comparative anatomy would be created at the proposed new Faculty of Philosophy.[2] Albuquerque's reform directly competed with the University of Coimbra, since the new Lisbon Institute could give bachelor and doctoral degrees to its students. However, the bill was so controversial that it was not even discussed in Parliament in the following months, and it ultimately shared the same fate as Magalhães's law. When Albuquerque's government was prematurely dissolved in April 1836, nothing had been decided.

A few months later, after the "September Revolution" (*Revolução de Setembro*), a coup d'état led by a leftist Liberal faction, it seemed that Coimbra's academics had won. By taking advantage of the fact that parliamentary activity had been temporarily suspended until the leftists finished an alternative and less moderate Constitution, Passos Manuel (1801–62), the new Minister of the Kingdom, passed an educational reform that had been prepared by José Alexandre de Campos (1794–1850), then vice-president of the University of Coimbra (Silva 1993, 98–104; Mesquita 2002, 353). In all probability, Campos favored the new ruling faction, which would explain his appointment, but it is also possible that Passos Manuel wanted to avoid further conflicts with the University. The educational reform was broad and had innovative elements, but it was quite modest regarding Portuguese higher education, despite allowing a greater autonomy for zoology at Coimbra, with a specific course dedicated to it, along with comparative anatomy and physiology. Campos strengthened his institution by restoring its authority over Portuguese educational policies and postponing the foundation of schools for higher education in Lisbon and Oporto indefinitely (Secretariat of State for Kingdom Affairs 1836b).

The founding of the Lisbon Polytechnic School

The professors of the ephemeral Institutes, however, were determined to continue fighting. They found a new opportunity in November 1836, following a governmental reshuffle that placed the leftist viscount of Sá da Bandeira (1795–1876) as head of the executive branch (Marques 2002, 598). Bandeira was an army commander who had become famous for leading Liberal armies on several occasions, between 1820 and 1834. After a failed coup d'état in 1820, he was forced into exile and lived in Paris for some years before returning to Portugal. During this period, he attended courses in institutions such as the Paris Museum and the Conservatoire National des Arts et Métiers, complementing his training in military engineering (Soriano 1888, 55). Bandeira had an interest in science and technology and agreed with the creation of a modern school devoted to the teaching of these fields in Lisbon. But how could he implement it if his colleague Passos had just enacted a reform that reinforced Coimbra's ascendency?

Bandeira and the some of the professors of the ill-fated Institutes, who were also military men, devised an ingenious strategy to block the opposition from Coimbra. They argued for the need to better coordinate the existing military academies and transform their outdated *Ancien Régime*

[1]Kingdom of Portugal, *Diario da Camara dos Senhores Deputados da Nação Portugueza. Volume II*, Chamber of Deputies, 30 January 1836, 294–295 (Public Instruction Commission).

[2]Higher Education Studies of the City of Lisbon Bill 1836 (Kingdom of Portugal). Reprinted transcript in *Diario da Camara dos Senhores Deputados da Nação Portugueza. Volume II*, 26 January 1836, 224–229.

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structure by replacing them with new schools. The fact that these were military academies is most relevant, because it allowed Bandeira to place them under the direct jurisdiction of the War Ministry, which he headed, and not of the Ministry of the Kingdom, still headed by Coimbra's apparent supporter Passos. In fact, Bandeira did not need to create new faculties in Lisbon, only technoscientific schools, thus avoiding any overlaps with the educational territory claimed by the University of Coimbra. Moreover, such a decision was entirely within the limits of the law, since Campos's educational reform expressly stated that "the Schools for Higher Education will be placed in the Cities of Lisbon, Oporto and Coimbra" (Secretariat of State for Kingdom Affairs 1836b, 1369), although he had no intention of creating them.[3]

Bandeira formed a commission of like-minded individuals to prepare a reform of military education in Portugal, composed of two professors of the ephemeral Institutes and one of Bandeira's brothers (Secretariat of State for War Affairs 1837e). He chose the military engineer José Feliciano da Silva Costa (1797–1866) to head the commission (ibid.) because he had studied at the École des Ponts et Chaussés while in exile (Matos 2013) and therefore had direct contact with the prestigious French polytechnic system, which Bandeira wanted to use as an institutional model.[4] Established during the revolutionary period in France, the polytechnic system was subsequently modified by Napoleon to form a system of elite schools, the *grandes écoles*, with the aim of educating future leaders who would hold the most relevant military and civil service positions. Students began their training at the general École Polytechnique, and then specialized in one of the applied training schools (*écoles d'application*), such as the École de l'Artillerie et du Génie, the École des Mines, or the École des Ponts et Chaussées (Fox and Weisz 1980, 1–3; Alder 2010, 304–10).

Like its French counterpart, the Lisbon Polytechnic School (LPS) was planned as the centerpiece of a future Portuguese polytechnic system, with the main function of providing students with preparatory scientific instruction prior to their enrolment in the new Army and Navy Schools, the two most important Portuguese applied training schools to be created. In order to avoid any possible interference, Bandeira adopted Passos's strategy: he published the founding law of the LPS with its respective statutes while Parliament was still closed (Secretariat of State for War Affairs 1837b, 70–1). The following day, he appointed Silva Costa, the head of the commission, to the LPS directorship (Secretariat of State for War Affairs 1837d). It was in the newborn LPS that zoology ultimately found more autonomy in Lisbon.

The fact that a zoology course was included in an essentially military school might seem odd at first glance. Four out of five curricular paths in the LPS gave access to a military career, and the school's knowledge hierarchy kept the primacy of mathematics over other fields, a distinctive feature it shared with the French École Polytechnique (Belhoste 2003). The presence of a zoology course is explained by the broader educational role that was from the beginning assigned to the LPS. In 1836, Portugal had few and poorly organized educational institutions, and an illiteracy rate close to 90% (Mesquita 2002, 376). The first systematized attempt to amend this situation had been made in Campos's 1836 reform, which regulated primary schools and created secondary schools, but it was far from being implemented across the country. Due to these limitations, Bandeira and his supporters included a broad range of subjects in the LPS curriculum, in the hope that they could also provide a preliminary technoscientific education to students destined for non-military professions, such as medicine, pharmacy, and veterinary medicine, a feature that distinguishes the LPS institutional framework from its French counterpart. Additionally, the LPS

[3]This and other translations from Portuguese to English were carried out by the author of this article. It should be noted that in the period under consideration the terms "schools" (escolas) and "universities" (universidades) were not synonymous. The words "schools" and "institutes" (institutos) were used to designate technical educational institutions, in opposition to "universities," which had a primarily academic mission. Such linguistic distinctions illustrate how Portuguese educational institutions were conceived to either favor the cultivation of theoretical knowledge or the study of its applications.

[4]The French polytechnic system served as an inspiration in the foundation of similar educational institutions in Greece, Spain, Belgium, even the United States (Macedo 2012).

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served as a means to promote general instruction in technoscientific fields, and one of its curricula incorporated all the subjects taught at the school, which included physics, chemistry, astronomy, mineralogy and geology, botany, and political economy, in addition to zoology (Secretariat of State for War Affairs 1837b, 70–1).[5]

The zoology course was essentially created to complement the instruction of medicine students at the new Medical and Surgical School of Lisbon (*Escola Médico-Cirúrgica de Lisboa*), another of the institutions that Campos's educational reform had created. It now trained physician-surgeons, pharmacists, and midwives, instead of only surgeons as it had when it was the Royal Surgery Lecture. As in other European institutions, zoology at the LPS was subsidiary to medicine and was taught in combination with comparative anatomy and physiology (Harwood 2009, 91–3). It therefore becomes clear that, although the French polytechnic system was used as an institutional model in Portugal, it was not passively received but rather adapted to serve the needs of the Portuguese context (Carolino and Mota 2013).

The foundation of the LPS as essentially a military school under the aegis of the War Ministry was not only an effective strategy for avoiding opposition from Coimbra's academics, it also directly benefitted the military profession to which Bandeira and his supporters belonged. The foundation of the LPS has therefore to be also understood as a result of the mobilization of a professional group to maintain its power in society (Macedo 2012, 52–62). During the nineteenth century, the military corps of various countries deployed strategies, such as the monopolization of technoscientific teaching, in order to maintain their social influence in an age in which the Vienna system had brought the decline of military conflicts (Schroeder 2000, 158–62). If the military elites failed to demonstrate their social importance in times of peace, they would likely lose the social privileges they had enjoyed for centuries. The military recognized that reinforcing the transmission of technoscientific knowledge in their education was essential to the industrial development and administrative reforms that modern Liberal states required (Mann 2012, 419–43). Bandeira explicitly addressed this concern in the preamble to the LPS founding law by stating that "a learned Army [educated in the polytechnic system] can yet be considered from another public, and general, utility standpoint. Composed of large numbers of individuals and scattered across all the parts of the country, such an army can serve as a powerful means of civilization" (Secretariat of State for War Affairs 1837b, 70–1). This was another reason for the incorporation of botany, as well as mineralogy and geology courses, in the preparatory scientific education of general staff officers and military engineers. The broader the knowledge they possessed, the more tasks they could undertake in positions of power, such as in geological and botanical surveys of the country.

The LPS was thus not only created, but actually dominated by the militaries that supported Bandeira's vision for the Portuguese army. They believed that they alone possessed the necessary discipline, organizational skills, and technoscientific knowledge necessary to implement Liberal reforms, and they wanted to ensure that no other professional groups could challenge them (Diogo 2013). For this reason, Bandeira and his supporters resisted the idea of founding an applied training school for the training of civil engineers, who would likely compete with their military counterparts for the same jobs. As the LPS Director put it some years later, despite the fact that he himself had been trained in the École des Ponts et Chausées, "maintaining in our country two corps of Engineers [military and civil] is impractical" (Records of the LPS Council, book 2, 160). This was another important difference relative to the French polytechnic system.

Although the LPS institutional framework was different from the one planned for the ephemeral Institutes, both shared fundamental features. Like the Institutes, the LPS replaced various academies and courses scattered across Lisbon, centralized technoscientific teaching in a single institution, and was primarily created to serve students who wanted a career as engineers or

[5]The LPS also had a drawing course and another that provided an introduction to natural history. The latter was subdivided in three parts (mineralogy and geology, botany, and zoology) and taught to all freshmen by the professors of the corresponding chairs.

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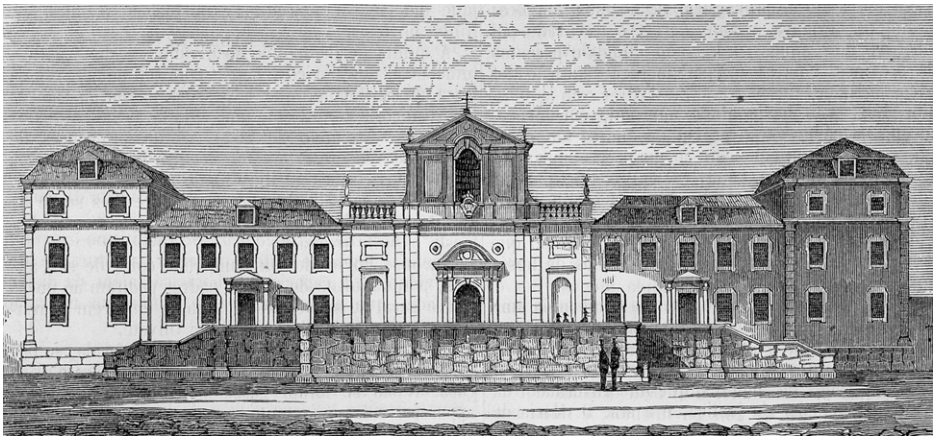

Figure 1. Main façade of the Royal College of Nobles of Lisbon, in 1837 (Anon. 1863a, 245). This woodcut print from the weekly newspaper *Archivo Pittoresco* illustrates an article that reported the completion of the new premises of the LPS around 1863 and narrated its history. The LPS and the Army School were both housed in this building in 1837. As the image shows, it still possessed some spaces, such as a church (central part), that were fundamental when the building served as a Jesuit novitiate in the seventeenth century. Reproduced by permission of the Lisbon Newspaper Library.

military officers. The few distinctions between both institutions had to do with the absence of a curricular path in trade and of more specialized courses in military tactics, which were ascribed to the Army and Navy Schools.

Carving out a place for zoology in the Lisbon Polytechnic School

Creating an institutional framework was only the first step to turn the LPS into reality. Zoology could never gain full autonomy if the School had no concrete physical spaces in which its practices could take place, as the example of the ephemeral Institutes showed. Bandeira and his supporters had a ready solution for the spatial needs of the LPS: to occupy the building of the recently extinct Royal College of Nobles of Lisbon (Real Colégio dos Nobres de Lisboa) (see figure 1). This institution had been created in the eighteenth century as an early reform enacted by the Marquess of Pombal, who favored natural philosophy, as previously discussed. Influenced by the utilitarian spirit of the Enlightenment, Pombal established a new school designed to provide young aristocrats from the social elite with a modern scientific education, in preparation for holding the highest military, commercial, and administrative posts in their kingdom. This plan, however, failed miserably because students and their families showed little interest in natural philosophy (Brigola 2003, 102–3). The College of Nobles was still functioning in 1836, albeit with courses essentially devoted to the humanities, which contradicted Pombal's initial intent (Santos 1985, 72–3). Moreover, it discriminated against students based on social class, and the Liberal Bandeira was pleased to determine its extinction. The decision to close the College of Nobles had more to it than just continuing Liberal reforms: it was part of a well-thought plan. Bandeira struck the final blow a week prior to the foundation of the LPS (Secretariat of State for War Affairs 1837a), thus clearing the space for the accommodation of the new institution. One month after the foundation of the LPS, its initial group of professors was already meeting to discuss concrete steps to fully realize their vision for the School (Records of the LPS Council, book 1, 1).

Although the polytechnic system was used as an institutional framework, there was continuity in educational practices with the military academies that had been active in Portugal in earlier decades. Almost all of the seven initial LPS professors were military men, who had held professorships in military educational institutions, especially the now extinct Royal Navy

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Academy, and had studied at the Faculties of Mathematics and Philosophy in the University of Coimbra (Secretariat of State for War Affairs 1837f). They not only had a shared understanding of how to organize a school, but also common educational practices rooted in a tradition of higher technoscientific institutions in Portugal, which already separated preparatory from advanced training (Carolino 2012). The LPS professors agreed that the institutional framework of the existing military academies could be better articulated and adapted to the requirements of the new Liberal regime. Furthermore, all of them had been appointed to the ephemeral Institute, and most had actively lobbied for a broad educational reform as members of the Society of the Friends of Letters, being personalities with some social standing in their community. These men occupied the core LPS disciplines in the fields of mathematics and physics and devised exams to rigorously evaluate candidates for the remaining professorships in chemistry, natural history and political economy (Records of the LPS Council, book 1, 34–5v).

Ensuring that a zoology chair would be competently organized, however, was not an easy task. The scarcity of specialists in zoology, as well as in other scientific fields, was characteristic, but by no means exclusive to Portugal. In the first half of the nineteenth century, there were few jobs for specialists in such fields in most European countries. Students striving for a higher education were mostly interested in taking up a position in law, military, theology, or medicine. From the second half of the eighteenth century onwards, progressive industrialization and the systematic extraction of economically relevant natural resources allowed for the creation of a limited number of positions for technoscientific experts (Allen 2009, 15–21). During the first half of the nineteenth century, Portugal was, as it had always been, a predominantly rural country (Lains 2003, 126–7), with little industrial development and limited natural resources. Moreover, there was hardly any tradition of zoological research in academies and higher education, as previously explained. For these reasons, it is no surprise that most Portuguese students at the University of Coimbra studied law, which also prepared them for a career in administration or in politics (Mesquita 2002, 400–1).

At first, opinions diverged. Some LPS professors argued that foreign specialists should be appointed to lecture zoology, as well as the remaining chairs. These specialists should stay provisionally for some years in order to instruct their Portuguese successors, so that these would attain the proficiency level required by a higher education institution. Other LPS professors thought they should first evaluate any existing candidates, and only hire foreign professors if strictly necessary, since they were in scarce supply and their salaries had to be much higher (Records of the LPS Council, book 1, 8v–12). After weighing the pros and cons, the LPS professors decided to provisionally hire a Portuguese candidate to lecture the zoology course, to avoid further delays in the organization of the discipline (ibid., 66–7v). Francisco Xavier de Almeida (c.1806–1845), a medicine graduate from the University of Coimbra (University of Coimbra 1835, 14), was then appointed in late 1837. Although he was not a specialist in zoology, he was nevertheless familiar with the discipline and with comparative anatomy and physiology, both of which he had studied in Coimbra. Since the educational reform of 1772, all students who aspired to enroll in the Faculty of Medicine were required to first take various courses in the Faculties of Mathematics and Philosophy, including zoology (Mesquita 2002, 393–6).

Finding a zoology professor as fast as possible was important not only for educational purposes, but also for establishing the physical presence of the discipline at the LPS, inasmuch as none of its rooms was yet adapted for zoological practices. Although the LPS statutes created a natural history cabinet with the aim of harboring collections that could be used in practical demonstrations to complement theoretical exposition, it still had neither specimens nor rooms for their preparation and exhibition. The building that now served the LPS had originally been erected in the seventeenth century to host a Jesuit novitiate, and when this religious order was expelled from Portugal in the mid-eighteenth century and the building was seized for the new College of Nobles, it had only been adapted to the teaching of scientific courses on mathematics, physics, and astronomy (Carvalho 2008, 445–7). A Herculean effort would therefore be needed

to give zoology a proper place, a task that now rested on Almeida's shoulders (Records of the LPS council, book 1, 137–8).

In early 1838, Almeida presented a plan to the LPS council. The premises selected for the zoological gallery and the specimens' preparation had to be extensively remodeled, as the building still possessed too many somber divisions tailored for the long periods of study and introspection required from Jesuit novices. These two rooms needed to be transformed into well-lit and ventilated spaces suitable for the manipulation and exhibition of specimens. A third room, earmarked for the preparation of whole-body skeletons of animals, also needed some, albeit minor, improvements. In addition, all premises had to be equipped with instruments for the manipulation of specimens (Plan for renovations to the LPS rooms dedicated to zoology by Almeida, 12 January 1838, Box 1679, AHMUL-EPL).

Almeida also knew that he needed help to assemble zoological collections. For that reason, by the beginning of the 1838 academic year, and following his official appointment to the LPS Chair of Zoology, he designed a plan that would simultaneously also help him increase the discipline's academic prestige (Records of the LPS Council, book 1, 129v). Since the LPS statutes allowed for the incorporation of any scientific institutions relevant to its teaching, Almeida, together with his colleagues, required from the government the transfer to the LPS of the museum of natural history that was being formed at the Academy of Sciences (ibid., 145–9v). As previously noted, the academicians had been taking advantage of the changes instituted by the Liberals to gain ascendancy in zoology in recent years, strengthening their association to the Maine Lecture. They were therefore not amenable to giving up such important conquests and moved to block the transfer, which did not take place (Secretary Book 1B, 141–6v).

Fighting for space: Between internal challenges and external pressures

The academicians' attitude towards keeping their natural history collections was motivated by another strong reason: these collections were crucial to justify the institution's recently conquered spaces and thus strengthen its autonomy. Since Maine's bequest and his Lecture were still located in the Jesus Convent in 1834, as he had determined, and his religious order had been recently expelled as a result of the first Liberal reforms, the academicians had successfully persuaded the government to relocate the Academy to the building of the former Convent (Anon. 1834). This was an important resolution because, after several decades of existence, the academy had still not found an appropriate space, having already moved six times (Carvalho 1981, 55–7). Following this first clever move, the Academy's Museum had continued to expand by incorporating the remaining collections of the Royal Cabinet, as well as other zoological specimens that had been confiscated from various convents, always by invoking the pedagogical requirements of the Maine Lecture (ibid., 60).

Although the Academy's zoological collections were not entirely organized by 1838, they now comprised thousands of specimens, and these occupied much space. The vastness of the collections provided leverage for the academicians to claim additional rooms in the ancient Jesus Convent, and some of them had even been renovated for that purpose. These collections also acted as a barrier to the expansion of other institutions that shared the space of the Convent with the Academy of Sciences, such as the barracks of the National Guard, which used the cloister to carry out military exercises (ibid., 61). The academicians knew that if they lost their collections to the LPS, the Academy would lose prestige, as well as an important argument for claiming more space. Moreover, the Maine Lecture would become a purely theoretical and outdated course, which would risk its own existence.

For the LPS professors, especially Almeida, the Maine Lecture was a source of anxiety because it also competed directly against his zoology course. The global educational reform of 1836, which favored the University of Coimbra, determined that the students of the new Medical and Surgical

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School of Lisbon had to attend preparatory lectures on chemistry, botany, and zoology, but it did not provide further specifications (Secretariat of State for Kingdom Affairs 1836b, 1369). The students were consequently free to choose any institution to complete the introductory training. This meant that both the Academy and the LPS were competing for the same zoology students, but in practice the LPS was on the losing side because students found its course too demanding and preferred the Maine Lecture instead (Secretary Book 2B, 9), even against the recommendations of the Director of the Medical and Surgical School of Lisbon (Correspondence from the Director of the Medical and Surgical School of Lisbon to the LPS Director, 27 June 1838, Box 1588, AHMUL-EPL). In 1838, the Maine Lecture was thus in a better position than the incipient zoology course at the LPS. In an attempt to further consolidate the institutional link of the collections to the Academy, its members defined a set of regulations for conservation and public display, thus formally creating the Academy Museum (Secretary Book 4B, 89v–92v).

The LPS, however, was also subject to some internal challenges. The Army School, the first and most important applied training school of the Portuguese polytechnic system, which had been created only one day after the foundation of the LPS, had also been placed in the building of the former College of Nobles (Secretariat of State for War Affairs 1837c). Each had been ascribed their respective spaces, but what started as a logical and useful pairing developed into a rivalry in a few years. In 1842, the professors of the Army School were already trying to interfere with the functioning of the LPS by proposing simplifications, such as the suppression of courses on botany, and mineralogy and geology from the preparatory curriculum for general staff officers and engineers, probably in response to complaints from the students. The LPS professors firmly rejected any proposals that restricted the range of subject matter they wanted the future military officers to command, so that they could monopolize technoscientific positions in the State apparatus (Records of the LPS Council, book 2, 155–7v). The Army School professors also demanded the allocation of the land surrounding the building to practical courses, a decision that would compromise the planting of a future botanical garden, an important element for the botany course (ibid., 212v–5).

In its first years, the LPS therefore struggled to keep its autonomy against attacks to both its institutional and physical spaces. In this context, zoology was in a particularly difficult situation. Not only was its status in the LPS low in relation to the more dominant mathematics and physics departments, but its teaching was also essentially restricted to medical students, who, in addition, represented a small fraction of the School's student population. The LPS zoology course had to compete over students with the Maine Lecture, and the pressure from the Army School restricted the space available for the expansion and consequent consolidation of autonomy within the LPS. Almeida, however, managed to claim and organize spaces for zoology, and its status improved with the steady, albeit slow accumulation of new zoological specimens. In 1843, however, a dramatic occurrence changed the course of events. A violent fire destroyed the building where the LPS and the Army School were housed, throwing both schools into uncertain territory.

Resolving instability and neutralizing competition

On 22 April 1843, a fire raged out of control and spread through the LPS building. The joint efforts of many people helped to minimize the damage by saving most of the scientific collections and books from the flames, but the building was practically destroyed.[6] This single event threatened the existence of the LPS as a whole, as well as the Army School, and jeopardized the initial efforts to establish zoology as an autonomous discipline. Without appropriate physical spaces, courses simply could not be taught.

[6]Kingdom of Portugal, *Diario da Camara dos Deputados. Volume 4.º*, Chamber of Deputies, 24 April 1843, 268–269 (José Maria Grande).

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The search for new spaces that ensued was no easy task. Unlike the Army School, which was rapidly relocated to the former Rilhafoles Convent, where the Royal Military College was functioning (Anon. 1843), the LPS courses had requirements that could hardly be met by a single building, since it had to be properly equipped for astronomical observations, physics and chemistry demonstrations, and the study of natural history collections. Given the proximity to the Royal Mint, one of the few institutions in Lisbon that had an appropriate laboratory, chemistry and other courses, including zoology, were moved to its premises, despite the scarcity of available space to conveniently house them all (Correspondence from the LPS Director to the War Ministry, 6 September 1853, Box 1800, AHMUL-EPL). The LPS teaching staff understood that this had to be a temporary situation, since larger and well-equipped spaces were mandatory if the school was to survive. They thus requested funds to erect a new building, for which they obtained a loan from the government (Records of the LPS Council, book 2, 220). In spite of this partial success, governmental intentions still caused some apprehension. The government insisted on housing the Army School in the same building, but the loan was unlikely to cover the needs of the LPS alone. As the LPS professors soon realized the close connection between institutional and spatial autonomy, they planned to bring their reasons to the attention of government officials with diligence and diplomacy when the time was right (ibid., 225v–32v).

In this context, zoology was among the LPS courses in the most difficult position. No appropriate spaces were assigned to it and the funds for the expansion of its collections were mostly redirected to the reconstruction of the School's building. It was clear that its autonomy was in danger (Correspondence from the LPS Director to the War Ministry, 15 January 1849, Box 1814, AHMUL-EPL). To make things worse, Almeida died in early 1845, leaving zoology with no successor, as the professor of mineralogy and geology temporarily took over Almeida's functions until a new candidate was found. The political instability of those years further contributed to delaying the reconstruction of the LPS building and prolonged its precarious situation. The different Liberal factions seemed unable to find a common basis, and not even the approval of a new constitution, in 1838, settled the quarrels. Governments were typically in power for short periods, and coups d'état were frequent. The reconstruction of the LPS building therefore went through successive delays, which were worsened by the diversion of funds for a civil war that went on among competing Liberal factions from 1846 to 1847 (Marques 2002, 606–12). The LPS professors, however, were not inclined to give up the fight. They therefore tried a more forceful approach to neutralize the direct rival of the zoology course: the Maine Lecture.

The lives of many Portuguese had been marked by years of political conflict between Liberals and Absolutists. As noted above, after a coup d'état temporarily restored Absolutist rule in Portugal in 1828, many Liberals had gone into exile fearing retaliation, and later joined Liberal armies in the civil war that lasted from 1832 to 1834 (Vargues and Torgal 1993, 76). They shared a commitment to the transformation of the country, and once the Liberals had seized power in 1834, many entered politics in the hope of contributing to the political and social reform of the country.

One such Liberal was José Maria Grande (1799–1857), a physician trained at the University of Coimbra and the first professor of botany at the LPS. He had attained prominent social status by serving as a military commander during the Liberal Wars, and was elected Member of Parliament in 1839. Grande was involved in the discussion and preparation of bills on various subjects in subsequent years (Pereira 2005c), and as part of a commission on education in 1842, he acted to shut down the Maine Lecture for good. Grande introduced the requirement for medicine students to attend preparatory science courses only at the University of Coimbra or the LPS.[7] His aim was clear: to drain the Maine Lecture, which catered primarily to medical students (Carvalho 1981, 91–2). Without them, it would be a matter of time until the Lecture was closed down and the

[7]Improvement of Education at the Medical and Surgical Schools of Lisbon and Oporto Bill 1842. Reprinted transcript in *Diario da Camara dos Deputados. Volume 3.º*, 10 September 1842, 155–156.

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natural history collections were relocated to the LPS. The LPS professors thus made use of their political influence to gain ascendency over zoology in Lisbon.

Grande's alteration was incorporated in a vaster educational reform in 1844 (Secretariat of State for Kingdom Affairs 1844, 1110), but its implementation was much delayed due to political instability (Mesquita 2002, 388–7). After the end of the war, in 1847, as the reform was finally about to be implemented and bound to severely affect the Maine Lecture, Carvalho, who was still Maine Professor of Zoology and had successfully blocked his rival Santos do Vale, made a last attempt to rescue it from the LPS. He sent a representation directly to the government demanding the closure of the LPS zoology course and its replacement by the Maine Lecture (Copy of correspondence from Carvalho to the War Ministry, June 1847, Box 1679, AHMUL-EPL). Carvalho's initiative came at the worst possible moment, since the LPS zoology course lacked a proper space, a specialist in charge, and sufficient collections. In spite of all these problems, the integration of the course in an institutional space that was fiercely defended by its teaching staff ultimately saved it. The provisional zoology professor rebutted Carvalho's claims and demanded instead the closure of the Maine Lecture, accusing its lecturer of mismanagement of the Academy's zoological collections. Such accusations were actually more than plain insults. The collections of the Academy Museum had expanded too rapidly, with no corresponding budgetary increase. In 1847, they occupied around eight rooms and their conservation requirements were completely beyond the assigned funds. Moreover, it could hardly be called a proper museum of natural history, since it only had paid positions for technical staff and not a single one for a professional taxonomist. This inadequate institutional configuration led to the loss of various specimens, which appeared to be the result of sheer incompetence or negligence (Correspondence from the LPS professor of mineralogy and geology to the LPS council, 18 June 1847, Box 1679, AHMUL-EPL).

Thanks to the timely intervention of the LPS professors, their own institution emerged victorious. As had been expected, the implementation of the educational reform marked the end of the Maine Lecture. In 1847, only one student enrolled in the course, and in the following year there were none. The academicians responded by changing the scope of the Lecture, turning it into a general course covering a wide range of scientific subjects, aimed towards secondary education students (Carvalho 1981, 91–3).

The LPS professors could not let the existence of the zoology course, or any other, be questioned in the future, and soon opened a position for a new lecturer in zoology. Carvalho sent an application and despite all of the animosity against him at the LPS, he was ultimately appointed (Records of the LPS Council, book 4, 10). This apparently strange outcome can be understood as part of a strategy to neutralize rival voices. By bringing their opponent into the School, the LPS professors could monitor Carvalho's moves and block them before they had more serious consequences. Of course, the coexistence of all was problematic. Shortly after his appointment, Carvalho tried to relocate the zoology chair, which still lacked a space of its own, to the Academy of Sciences. The proposal was vehemently opposed by his LPS colleagues, who instead requested access to the zoological collections kept in the Academy Museum, which Carvalho obviously did not allow (ibid., 13–4). In 1848 he made a second attempt, but to no avail (ibid., 43–4). Isolated at the LPS, Carvalho's opinions were always drowned out by the majority formed by the remaining professorial body, and it was clear that he had lost his battle.

The unpleasant atmosphere at the LPS due to Carvalho's presence, however, did not last long. He died three years later, and his death put an end to the animosity that had strained the relationship between the LPS and the Academy of Sciences. In fact, the situation took a complete turn in the following year. The institutional framework of the Academy of Sciences was reorganized by the end of 1851 by the government (Ministry of the Kingdom 1851, 1291–92), which appointed a commission to prepare new statutes and, more importantly, to elect new members. The LPS was clearly favored, since five of the eight members of the commission were professors there (Ministry of the Kingdom 1852, 53), and they mobilized to fill the vacant positions with as many colleagues as possible in subsequent years, especially in the Mathematics

and the Natural History Sections. The situation is quite striking, as the LPS had no professors as effective members of the Academy in May 1851 (Academia Real 1851, 92). In this context, it is easy to understand how the LPS professors were able to temporarily relocate before the end of 1852 not only the zoology, but also the astronomy, and the mineralogy and geology courses, to the former Jesus Convent, where the Academy still stood (Records of the LPS Council, book 5, 26).

Carvalho's death also opened the way for José Vicente Barbosa du Bocage (1823–1907), a medicine graduate from the University of Coimbra and former Substitute Professor of Zoology at the LPS (Pereira 2005a), who was now responsible for the zoology course and was eager to boost the prestige of the discipline. The Maine Lecture's institutional framework, in turn, was also reorganized in order to further serve the goals of the LPS professors. The LPS mineralogy and geology professor was chosen as Carvalho's successor, and suggested the substitution of the LPS short introductory course on natural history, which up until then had been mandatory for the School's freshmen, by the Maine Lecture (Secretary Book 36B, 155v). By simultaneously creating a natural history admissions exam for the LPS, he ensured that the Maine Lecture was used to elevate the prerequisites of the LPS candidates. When a governmental reform of secondary education formally incorporated this proposal in 1854 (Ministry of the Kingdom 1854, 1067), the fate of the two institutions was finally sealed. The Maine Lecture was made subservient to the LPS zoology course, which now defined the pace of the discipline in Lisbon.

Physical, institutional, and conceptual rearrangements

By the early 1850s, additional changes had taken place. The Army School was permanently relocated to the Bemposta Palace in 1850, and the competition with the LPS over physical space ended (Army Headquarters 1850, 1473). The reconstruction of the premises of the LPS, planned to rise above the few remaining parts of the destroyed building, had a new impetus from 1851 onwards, benefitting from a period of political stability after the resolution of the major disagreements between the different Liberal factions (Sardica 2001, 101–3). By the end of 1852, the first three rooms of the new building were almost finished and the LPS professors were looking ahead with optimism (Records of the LPS Council, book 5, 27).

Bocage, the new zoology professor, had great expectations for his discipline. He did not want it simply to regain the physical spaces it had lost, but to attain a higher status in the knowledge hierarchy of the LPS—one that would ultimately enable him to pursue a career as a naturalist. To this end he needed not only physical spaces appropriate to zoological research, but also an institutional framework. The problem was that the LPS had been planned as a teaching institution, leaving pure academic pursuits to the University of Coimbra. However, the relocation of the Army School left more space available in the new building, which also raised the expectations of other LPS professors. By 1854, Bocage was not the only one to hope that the LPS would attain a new institutional structure more favorable to research activity.

Sparing no resources to build up spaces that could serve both teaching and research, what had been initially thought of as a reconstruction became rather the foundation of an essentially new space. The project of the new LPS was outlined by its Director and Don Luís Muriel (?–?), the Spanish professor in charge of a course on drawing. Muriel supervised the construction until around 1853, when he was replaced by the French architect Pierre-Joseph Pézerat (1800–72) (Anon. 1863b, 271). The fact that the architectural plans were originally outlined by high profile LPS members is relevant, since no one else knew how best to tailor the building to meet scientific requirements and ambitions. They redefined the original architecture of the building in a neoclassical style and secularized it by converting the former church into the School's main hall, in accordance with the ideology of the new Liberal regime (compare figures 2 and 3 with figure 1). They also built large lecture rooms to accommodate students in great numbers. The most impressive space in this new building was the chemistry laboratory, which, in 1890, was still

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Figure 2. Main façade of the new building of the Lisbon Polytechnic School, c. 1863 (LPS main façade 1:100, UL217, Drawing Collection, AHMUL-EPL). The reconstruction following the 1843 fire introduced changes to the original building (compare with figure 1). The most evident modification was the conversion of the former church into the School's main hall. The architectural consistency of the whole was given by the roof, which established continuity between the School's different wings. These were complemented with other neoclassic elements: a pediment, supported by two strong columns, and a stone staircase leading to the main entrance. Reproduced by permission of the University of Lisbon/Museum of Natural History and Science.

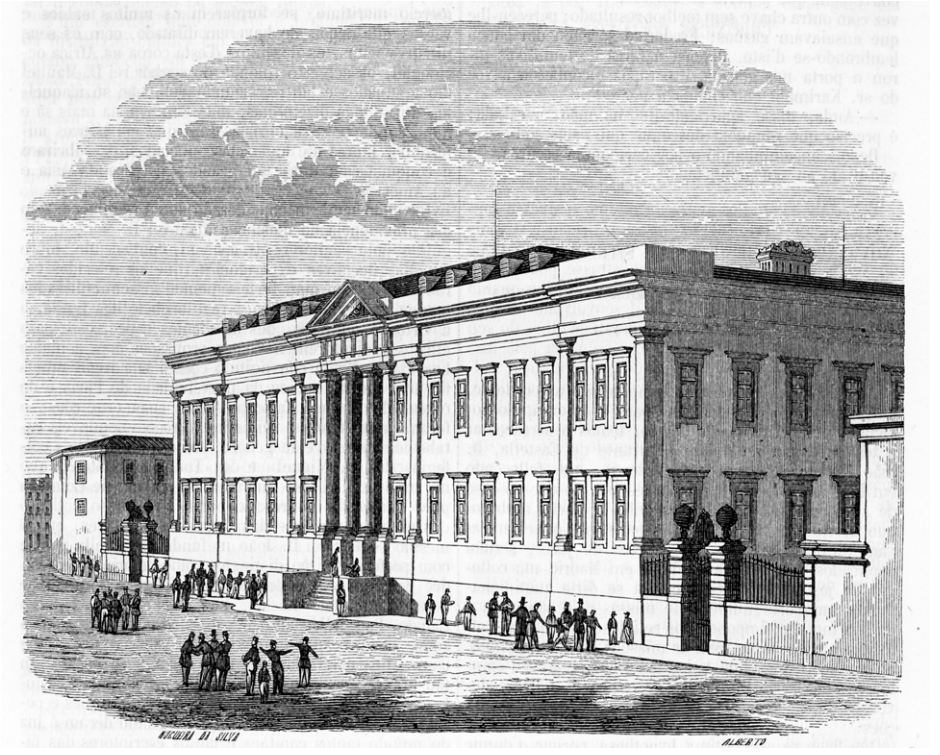

Figure 3. Street view of the main façade of the new building of the Lisbon Polytechnic School, c. 1863 (Anon. 1863b, 269). As this woodcut print shows, the new building was hefty and imposing. Also quite visible is the considerable height of the ground floor, which resulted from the elimination of the former stone stairway of the College of Nobles (compare with figure 1). This architectural solution was somewhat inelegant: stone stairs were built in front of the façade of what had been the College's church, which had to be receded, and the two columns contributed to narrow the entrance. Reproduced by permission of the Lisbon Newspaper Library.

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considered to be among the best of its kind in Europe by the prestigious chemist August Wilhelm von Hoffmann (1818–92) (Anon. 1891).

As new spaces were finished, the LPS courses progressively left their improvised premises in various institutions to occupy the new ones. The School's left wing was finished first, and in 1854 its chemistry laboratory was already being used, followed, the year after, by its physics cabinet (Booklet of the solemn session for awarding prizes to the best LPS students, 17 November 1857, Box 1583, AHMUL-EPL). New spaces were assigned to different disciplines according to their position in the LPS disciplinary hierarchy, and since zoology had a low status, it was one of the last to conquer a space of its own.

Before the zoology courses were relocated to the new LPS building, Bocage strove to consolidate its disciplinary autonomy. Like his colleagues and predecessors, he wanted to have the Academy's Museum transferred to the LPS, but this time because of the institutional space it defined rather than its zoological content. Devoid of competent management for years, the collections had deteriorated and dozens of specimens had already been lost (Secretary Book 4B, 173v–4). Bocage wished to reform the Academy's Museum and use it to legitimize zoological research by inscribing, as one of its missions, the study of Portuguese fauna, which were still essentially unexplored. He was thus trying to adjust the institutional framework of the LPS zoology course so that the discipline could attain a higher degree of autonomy.

In 1854, a new request was made to transfer the Academy's Museum to the LPS, this time instigated by Bocage. The context had now completely changed: competition from the Maine Lecture had been neutralized, and the new LPS building would soon have more suitable rooms for the accommodation of zoological collections than the Academy. Moreover, the appointment of several LPS professors to the Academy in recent years had expanded their influence over it, especially in the Natural History Section, in which they occupied five of its seven permanent positions (Grande and Coelho 1856). Everything seemed set for the LPS takeover. Bocage's request was sent to the academicians for deliberation and a commission was formed, with the viscount of Vila Maior, Júlio Máximo de Oliveira Pimentel (1809–84), LPS chemistry professor, and Alexandre Herculano (1810–77), a renowned Portuguese historian, novelist, and public figure who served as the Academy's vice-president. Although Pimentel predictably supported Bocage's request, since it would boost the prestige of their school, Herculano resisted it, fearing that it could be read as a failure of the Academy to protect its patrimony, which could endanger the institution's existence. Herculano persuaded most academicians to deny Bocage's request, which was ultimately voted down (Secretary Book 31B, 58v, 60). Once again, the Academy's Museum had eluded the LPS professors.

Although Bocage could not seize the Academy's Museum in 1854, an important decision for the future of his discipline was taken in the following year. As the new LPS building continued to expand and its new left wing became fully allocated to other disciplines higher in the School's disciplinary hierarchy, Bocage thought it was time to secure spaces in the remaining right wing to permanently house zoology lectures, as well as research, which he was committed to developing, and his request was granted (Records of the LPS Council, book 5, 77–8). This was a turning point in the consolidation of zoology's autonomy within the LPS. In 1856, while some of the right wing's rooms were finished in the upper floor and seemed prepared to house natural history collections, Pimentel suggested another attempt at seizing the Academy's Museum. This time he argued that the request should be made directly to the government, which had the authority to override any institutional resistance (ibid., 104).

Pimentel's initiative came at the right moment. Following a governmental reshuffle in January, Bandeira was again in charge of the War Ministry, which supervised the LPS. Eager to support the institution he had helped to create, he presented a bill in Parliament that not only enforced the transfer of the Academy's Museum to the LPS, but also moderately increased its budget. The

commission that analyzed Bandeira's bill threatened to dissolve the Museum and simply incorporate its collections in the LPS natural history cabinet, but this action was fortunately prevented thanks to the timely intervention of Guilherme Dias Pegado (1803–85), another LPS professor who was simultaneously Member of Parliament.[8] As a result, the transfer of the Academy's Museum to the LPS was finally decreed on 9 March 1858. In fact, it was institutionally integrated with the School by absorbing the collections of the LPS natural history cabinet and ascribing each to the museum's newly formed Zoological and Mineralogical Sections, as well as by determining that the full professors of the respective LPS courses would always head them (Ministry of the Kingdom 1858, 361).

At the same time that Bocage was mobilizing to acquire proper institutional and physical spaces for zoology, he also reorganized the discipline by constructing a new conceptual space for it. Contrary to his predecessor Carvalho, who praised Buffon's "transcendent and creative genius" and believed in a Lamarckian transformation of organic forms (Dissertation presented by Carvalho for the position of LPS Full Professor of Zoology, 3 February 1848, Box 1585, AHMUL-EPL), Bocage resisted speculative drifts and rather aligned with a Cuvierian attention to observable evidence, criticizing transcendental anatomy and its supporters (Dissertation presented by Bocage for the position of LPS Substitute Professor of Zoology, 17 June 1848, Box 1585, AHMUL-EPL). Although grand generalizations are usually absent from his studies, some passages imply that he was a creationist (Bocage 1862, 9), which explains why he organized his zoology course from a functionalist perspective, emphasizing how anatomy and physiology converged to preserve both the existence of each organism and the stability of species, thus favoring fixist views (Bocage 1857). Taxonomical classification schemes followed updated versions of the four Cuvierian types, such as the ones presented in the works of Henri Milne-Edwards (1852), and privileged the study of vertebrates, not just because it was useful for the preparatory instruction of students of the Medical and Surgical School of Lisbon, but also since vertebrates were regarded the most important type. In the following years, Bocage acquired books from other authors, such as Richard Owen's *Lectures on Comparative Anatomy and Physiology of the Invertebrate Animals* (Correspondence from Bocage to the LPS Director, 21 June 1858, Box 1679, AHMUL-EPL), but he continued to favor Francophone naturalists in his teaching (Bocage 1861).

Since the zoological collections at Bocage's disposal were still quite limited, he could only deliver theoretical lectures, which he then tried to modernize by using the modest LPS funds available to him. He ordered the anatomical models developed and commercialized by the French physician Louis Auzoux (1797–1880)—a relatively recent innovation in the representation of human and animal anatomy that combined cheap materials, lightness, intuitive use, and attention to detail (Maerker 2015). Many of these models had the additional advantage of allowing users to disassemble them into their components, thus simulating dissections that could be performed countless times without the inconvenience of obtaining and preserving proper specimens. Around 1858, Bocage appears to have acquired a complete anatomical model of a beetle, as well as others representing different stages of the embryological development of a bird, and of the comparative anatomy of the inner ear of various vertebrates (Correspondence from Bocage to the LPS Director, 13 August 1856, Box 1679, AHMUL-EPL; Correspondence from Bocage to the LPS Substitute Director, 17 December 1856, Box 1679, AHMUL-EPL). The intellectual proximity to the work of French naturalists is one among many examples of the enormous influence of French culture in Portugal during the Constitutional Monarchy.

[8]Kingdom of Portugal, *Diario da Camara dos Deputados*, Chamber of Deputies, 8 January 1858, 47–48 (Guilherme Dias Pegado).

Consolidating the autonomy of zoology

By mid-1858, the status of zoology at the LPS had undergone dramatic changes. It now had a new conceptual structure, permanent teaching facilities in the new building, and a museum of natural history. Though its collections remained unimpressive and insufficiently studied, and zoology remained tied to medicine, Bocage's discipline could now attain a higher degree of autonomy because there was plenty of room to organize research. A comparison between the spaces assigned to zoology and to the other fields in the new building is telling. Although zoology was low in the LPS disciplinary hierarchy, it was the field of knowledge with the highest number of rooms at its disposal—a total of twelve, mostly located on the first floor (Blueprint of the first floor of the LPS new building, G1, Pt7, 451, ANBA). In fact, the right half of the new building's first floor was almost entirely taken over by zoology. Chemistry had the largest and most prestigious rooms for its amphitheater and laboratory, but it did not have as many premises as zoology and mineralogy together, the latter being generally located below the zoology rooms (Blueprint of the ground floor of the LPS new building, G1, Pt7, 450, ANBA). The right half of the new LPS building was thus arranged to receive the new LPS museum of natural history, and the prevalence of zoology can only be explained by Bocage's skillful intervention to strengthen the status of his discipline.

The museum, however, was not immediately relocated in 1858. When the transition to the LPS was decreed, it lacked an identity and trained staff, two problems that had plagued it while under the supervision of the Academy of Sciences. In fact, the museum only had technical staff with insufficient qualifications for their job and not a single position for a taxonomist (Secretary Book 29B, 49v). Bocage was determined to change this state of affairs by reconfiguring the entire structure of the institution, so he planned a mission to natural history museums across Europe in 1859 in order to learn the best practices firsthand. He also saw it as a good opportunity to link himself and his nascent museum to the existing European network of natural history institutions and experts, thus creating the conditions that would strengthen the discipline at home and foster its autonomy by participating in practices of exchanging specimens and ideas. A third aim would be to buy collections and books more cheaply by directly negotiating with foreign firms. The LPS professors and the government supported Bocage's plan and he embarked upon a five-month trip (Records of the LPS council, book 5, 160–1, 164).

During his long trip, Bocage visited various natural history museums across Europe, introducing himself to their directors, such as Mariano de la Paz Graells (1809–98) in Madrid, Bernard du Bus de Gisignies (1808–74) in Belgium, and Hermann Schlegel (1804–84) in Leiden, as well as the professors of natural history Laureano Pérez Arcas (1824–94) at the University of Madrid, Guillaume Philippe Schimper (1808–80) at the University of Strasbourg, and Jan van der Hoeven (1801–68) at the University of Leiden. He also made contact with naturalists who had private collections, such as Patricio María Paz y Membiela (1808–74) in Madrid, and the Verreaux family in Paris, who commercialized zoological specimens (Bocage 1860). As a way to get senior naturalists interested, Bocage brought with him the promise of exchanging specimens of the Portuguese fauna, including its distant colonial territories in Africa, Asia, and Oceania. It was an enticing proposal, since even museums that left him impressed by their zoological riches, such the ones in London, Leiden, Strasbourg, and Frankfurt, were almost devoid of specimens found in Portuguese territories. In the official report of his mission, Bocage also hints that he was not well received by all naturalists he encountered. In particular, the British Museum (Natural History) is conspicuously absent from his impressions, even though he visited it and held it in high regard. After all, Bocage was a young aspiring naturalist from a poorly known country with almost no credentials, and he must have felt at times dismissed or underestimated. On other occasions his reception was a matter of bad timing. When he visited the Paris Museum, almost all of the professors were out on summer holidays, so he could only directly interact with the Museum's naturalists, such as Jacques Pucheran (1817–95), Émile Blanchard (1819–1900), and Louis Charles Kiener (1799–1881) (ibid.).

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In addition to studying the museums' spatial and institutional organization, Bocage also acquired specimens to form the nucleus of his nascent establishment in Lisbon. He focused on expanding the more numerous collections of shells, birds, and mammals at home, preferring to build prestige from a solid basis instead of having only a few representatives from all animal classes (ibid.). But Bocage also had a special plan to acquire considerable numbers of specimens from the Paris Museum. Like other Portuguese intellectuals, he was aware of Saint-Hilaire's plundering of the Ajuda Cabinet during the Napoleonic invasions, as previously discussed. The collections were, of course, never returned, and were now seen as property of the Paris Museum, since they had been studied by its naturalists (ibid.). Bocage regretted this loss for Portuguese zoology, but simultaneously agreed that the scientific study of the specimens ultimately legitimized their possession, especially because if they had stayed in Lisbon they would have surely been ruined like many of those that had remained in the Ajuda Cabinet. Nevertheless, he could use this episode to demand some type of compensation from the rich collections in the Paris Museum's storage rooms. He made use of official channels, and upon receiving authorization from the Portuguese government he contacted viscount Paiva (1819–68), Portugal's Plenipotentiary Minister in Paris, and submitted a formal plea to the Ministry of Public Instruction, which was in charge of the Paris Museum (ibid.). He cleverly framed it as a reasonable request to appease what now appeared as a distant yet real diplomatic conflict, and he was successful. Although Bocage was not able to ship specimens during his stay because the professors were out, his persistence and diplomatic support led him to receive collections in the following year from Auguste Duméril (1812–70), the professor of reptile and fish zoology, and Isidore Geoffroy Saint-Hilaire (1805–61), the professor of mammal and bird zoology, whose father had sacked the Ajuda Cabinet (Bocage 1862, 69–71). On a second mission to Paris in 1860, Bocage completed his request by contacting Henri Milne-Edwards (1800–85), the professor of crustacean, arachnid, and insect zoology at the Museum, who gave him a collection of more than 1,000 specimens (ibid.).

Bocage furthermore used his long trip to buy pedagogical materials with which he could modernize the teaching of zoology at the LPS. Since he could soon count upon the collections sent by the Paris Museum, he focused instead on comparative anatomy and physiology, acquiring preparations of mammal crania and complete skeletons of various mammals and birds, "exploded" Beauchêne crania of different vertebrate classes and the exoskeleton of a large coleopteran for the study of their components, and plaster models representing anatomical characteristics then assigned to different human races. Bocage also brought Auzoux models of the human female reproductive system and the early stages of embryological development in higher vertebrates (Bocage 1860). With only one preparator assigned to zoology, the best option was to acquire as many fully mounted models as the funds allowed. Bocage also wanted to introduce students to microscopy, so he bought about sixty permanent slide preparations of histology, small invertebrates, and microscopic animals (ibid.).[9]

Bocage's trip was the defining moment for the autonomy of zoology at the LPS, reshaping both teaching and research. In the following years, as the models and collections arrived in Lisbon, Bocage used them to modernize teaching with demonstrations. Thanks to the wealth of information he gathered across Europe, he was also able to design a new institutional framework for the nascent Lisbon museum. At that moment, the LPS Museum was an incomplete institution, since it only had positions for a director and a preparator in each of its Zoological and Mineralogical Sections, and no full-time naturalists (Ministry of the Kingdom 1858, 361). Bocage was aware of the unwillingness of the Portuguese government to spend large funds on positions for research, especially in a school that was founded for technoscientific training, so he envisioned a natural history museum that had as reference not its London or Parisian counterparts, but the

[9]The Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência) has inherited the LPS patrimony. However, it was not possible to relate existing collections to nineteenth-century practices of teaching and research in zoology because most of them were lost due to a violent fire in 1978 (Almaça and Neves 1987), and the surviving pedagogical materials, most notably the Auzoux models, are in dire need of restoration.

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more modest ones at Strasbourg and Madrid, which he had visited (Report on the present state of the Zoological Section of the LPS Museum by Bocage, 14 August 1860, Box 1679, AHMUL-EPL). Of course, he did not wait for any governmental decision and was already ordering books on taxonomy months before his trip, to help him reorganize the part of the Academy Museum's collections that he was able to save from decay. Since Bocage was not a specialist in taxonomy and had only received training as a physician, he focused on the collections of mammals and birds, vertebrates that shared more anatomical and physiological similarities with humans (List of books ordered by Bocage, 21 June 1858, Box 1679, AHMUL-EPL).

Taking advantage of a legal disposition reinforced by the government, which required the heads of scientific establishments to send annual reports (Directorate-General of Public Instruction 1859, 43), Bocage proposed a bolder reform of the institutional framework of the LPS Museum in 1860. Like any civilized European capital, he argued, Lisbon should have a public museum of natural history that, first and foremost, displayed an accurate picture of the country's fauna. Since the zoological riches of Portugal were as yet poorly studied, the museum would have to inscribe zoological expeditions in its statutes, and assign a considerable part of its budget to such missions. The search for specimens should also be a duty of the Portuguese colonial administrations in remote territories, and contribute to the nation's imperial identity. Bocage used this nationalist rhetoric to justify the doubling of the LPS Museum's budget, and the creation of two paid positions for full-time naturalists who could help him with taxonomical studies (Report on the present state of the Zoological Section of the LPS Museum by Bocage, 14 August 1860, Box 1679, AHMUL-EPL). Of course, the LPS Museum required more than two naturalists, but Bocage took a cautious approach and decided to postpone additional demands for a later date.

Despite the usual reluctance of politicians to invest in academic pursuits, the then current government did embrace the proposal. In fact, it even supported a second trip abroad by Bocage in 1860, this time to Paris, so that he could buy more zoological collections (Correspondence from the Directorate-General of Public Instruction to the LPS Director, 20 August 1860, Box 1679, AHMUL-EPL). The plans of the zoology professor probably benefitted from the transfer of the LPS to the Ministry of the Kingdom and its placing under the recently formed Directorate-General of Public Instruction, with its dedicated budget (Ministry of the Kingdom 1859, 905). This change reinforced the autonomy meanwhile achieved by the LPS, which had been founded within the War Ministry simply to avoid the grip of the University of Coimbra, as previously discussed. The law that confirmed this change was another clear challenge to the ascendency of Coimbra on educational matters, since it simultaneously centralized educational policy in Lisbon by eliminating the body at Coimbra that continued to define it in previous years. This time there was no significant opposition, since the social prestige of the LPS and its professors was already recognized.

In 1861, only one year after Bocage had sent his report, the Minister of the Kingdom himself, the Marquess of Loulé (1804–75), submitted a bill to Parliament that accepted the professor's budgetary demands. More importantly, Loulé even presented the renewed institution as a national museum, a prestigious title that signaled the desire to make it a symbol of the nation by fostering the study of the Portuguese fauna.[10] Loulé headed the then ruling Historical Party (Partido Histórico), of which Bandeira was a renowned member and currently War Minister (Marques 2004, 483), and it is plausible to think that the latter actively supported the decision.

Loulé's bill was discussed and approved in less than two months (Directorate-General of Public Instruction 1861, 2619). By November 1861, the government submitted to the LPS council the project of the statutes of the new National Museum of Lisbon (Correspondence from the Directorate-General of Public Instruction to the LPS Director, 11 November 1861, Box 1679, AHMUL-EPL). Contrary to Bocage's request, only one paid position for a naturalist was created in the Zoological Section, but he could work with that and later expand the staff. The statutes gave

[10]Reform of the Lisbon Polytechnic School's Museum of Natural History Bill 1861 (Kingdom of Portugal). Reprinted transcript in *Diario de Lisboa*, 17 July 1861, 1813.

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the museum a new institutional framework, thus legitimizing sustained zoological research. After some minor changes by the LPS council, the statutes were submitted to the government and the new museum was officially born in January 1862 (Directorate-General of Public Instruction 1862, 177).

In subsequent years, the new LPS premises were completed and the zoological and mineralogical collections were transferred to appropriate rooms, as were the lectures on zoology and the remaining courses. Additional spaces were also allocated for the classification and preparation of animal specimens for display. As zoology had finally found proper conceptual, physical, and institutional spaces, it was finally able to secure disciplinary autonomy in Lisbon, allowing Bocage to build a career of international relevance (Gamito-Marques 2018a) and a small community of zoologists (Gamito-Marques 2022). In fact, his scientific career later led him to occupy important political and diplomatic offices (Gamito-Marques 2018b, 2020).

Concluding remarks: Autonomy before a specialized community?

Zoology only achieved autonomy as a field of inquiry in Lisbon in the second half of the nineteenth century. The Ajuda Cabinet and the Maine Lecture, both founded in the second half of the eighteenth century, and the Academy's Museum, which was organized around the late 1830s, never presented the conjunction of conceptual, institutional, and physical spaces necessary for autonomy to emerge. In fact, the same can be said of the Coimbra Cabinet, at least until the 1820s, but more studies are needed to evaluate the status of zoology at Coimbra during the following decades. A common thread among all these establishments is the absence of paid positions for full-time researchers, an important factor which indicates that institutional frameworks—regardless of the content of their rhetoric—did not value research or provide it with sufficient funding. The Ajuda Cabinet and Maine Lecture were probably understood as primarily recreational and pedagogical by their founders, and these limitations also affected the Coimbra Cabinet, which was placed in an academic context. In any case, the people who came to be in charge of these institutions until the mid-nineteenth century were either not interested or simply not able to mobilize the necessary social and political power to build spaces for sustained zoological research. Bocage was the first to achieve it, but only after ten years of mobilization following his assumption of responsibility for the LPS zoology course in 1851, and thanks to the support he enjoyed from his colleagues, who actively mobilized in defense of the institution.

The attainment of autonomy by zoology at the LPS was the result of the successful mobilization of social and political power by particular groups. At first, the professors of the prestigious military academies in Lisbon joined other intellectuals and formed an association, the Society of the Friends of Letters, which acted as a lobby group. They vied for the creation of a new technoscientific school in Lisbon and prepared a plan that was never approved, but they were able to find a powerful political ally in Bandeira, who ultimately realized their plans by presenting the new school as part of an emerging polytechnic system in Portugal.

Once part of the LPS, the initial nucleus of professors, who already had experience as lecturers, especially in the (by then extinct) Navy Academy, blocked the attempts of the Army School to downgrade LPS curricula and conquer physical spaces coveted by the LPS, and built their social and political power by occupying positions as members of the Academy of Sciences and of Parliament. They were able to temporarily relocate some LPS courses to the Academy's building before the LPS premises were reconstructed, following a violent fire in 1843, thus protecting their institution in a critical moment of its history. The LPS professors who also served as Members of Parliament advanced reforms that neutralized competition from the Maine Lecture, and that ultimately put the LPS in charge of the Academy Museum, so that Bocage could reorganize it. The LPS professors also sent periodic requests to the various governments, securing funds directed at the reconstruction of the destroyed LPS building.

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This mobilization benefited zoology greatly in the late 1850s, since governmental grants allowed Bocage to make extensive travels across Europe in order to learn the best practices from various natural history museums, connect with specialists, and buy collections that formed the nucleus of an emerging museum. Although Bocage had limited experience as a zoologist at that time, he was nevertheless able to present himself as an authority in the field and persuade the government to invest in the zoological exploration of the kingdom. This aim became ultimately inscribed in the institutional framework of the Zoological Section of the new National Museum of Lisbon, upon its foundation in 1862. The combination of an institutional space more favorable to zoological research, with plenty of renewed physical spaces available in the LPS, and the funds to buy the necessary books, collections and pedagogical materials to organize the discipline, allowed Bocage to build its autonomy in the context of the LPS.

The case discussed in this article also reveals another interesting point: that zoology achieved autonomy in Lisbon in the absence of a consolidated local community of zoologists. This markedly contrasts with the examples of France and Britain. When the first course in zoology was founded in 1808 at the new Faculty of Sciences of the University of Paris, the Paris Museum had already been a vibrant institution for zoological research for more than a decade (Winsor 2008, 60–3). For this reason, it is hardly surprising that the first zoology professor at the Faculty, Étienne Geoffroy Saint-Hilaire, was chosen from among the Paris Museum's naturalists (Aragon 2018). In Britain, when the first chair in zoology and comparative anatomy was created in 1826 at the new University of London, it was occupied by Robert Grant (1793–1874), who was an accomplished zoologist by then, like Saint-Hilaire, whose lectures he had attended at the Paris Museum (Browne 1995, 75–6). Although the British Museum (Natural History) did not give zoology the autonomy that it enjoyed at the Paris Museum, Britain had communities of zoologists and a variety of scientific associations that fostered zoological studies, such as the Wernerian Natural History Society, the Linnean Society of London, and the Plinian Society (ibid.). No comparable associations existed in Portugal in that period, and the Academy of Sciences of Lisbon only began to recover from a period of limited activity after the Liberals came to power in 1834. In this sense, institutionalization in higher education in Portugal was a condition for the attainment of autonomy in zoology rather than a consequence, and it is possible that other fields of knowledge may have followed the same pattern. Of course, such a path is as valid as any other, but it should be noted that the absence of a specialized community that goes beyond the boundaries of higher education institutions may lead disciplines to be excessively dependent on those institutions and, hence, more vulnerable to changes in their institutional and physical spaces.

The Portuguese case for zoology in the nineteenth century presents similarities with, for example, the Spanish case. Although the foundation of a natural history museum in Madrid took place in 1815, and lectures on zoology were initiated there two years later, the discipline only gained autonomy after the appointment of Graells to its directorship in 1837 (Aragon and Villena 2010, 489–93). Like Bocage, Graells was predominantly influenced by French naturalists and had a central role in zoology in his country in the nineteenth century. In 1845, he became a professor at the new University of Madrid, which also incorporated the Madrid Museum (ibid., 493–9). More studies of the changing status of zoology in Spain and in other contexts are needed to determine whether autonomy emerged before or after the consolidation of a community of practitioners, and the categories of conceptual, institutional, and physical spaces discussed in this article may be useful tools in such a task.

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