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# THE EUROPEAN EXPERIENCE

A Multi-Perspective History  
of Modern Europe, 1500-2000





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## 4.3.2 Education and Knowledge Transfer in Modern History (ca. 1800–1900)

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### Introduction

Education and knowledge transfer underwent a complex and far-reaching transformation in nineteenth-century Europe. This chapter looks at the characteristics of the dynamics that drove this change, many of which began before and continued after the nineteenth century. It examines the *expansion* of the educational and research field: as the number of schools, universities, and other educational and scientific institutions grew rapidly, the tasks assigned to knowledge increased enormously. New techniques were founded and existing research methods were changed. Furthermore, this chapter describes the new role of the state and its bureaucracy in the research and education sector. States started to understand scientific and educational institutions as part of a coherent system which could be transformed through centralised politics. Education and knowledge transfer were accompanied moreover by a double dynamic of nationalisation and internationalisation, both trends shaping the understanding and interpretation of science and education during the nineteenth century and beyond.

### Expansion

In 1900, the number of history teachers at European universities totalled more than five hundred. This may not seem much by the standards of the early twenty-first century, when Sweden and Norway alone can account for a similar number of university historians. But compared to the situation in

1830, the contrast is marked: only around 150 history professors in total, with countries such as Greece, Spain and Portugal having no history professorships at all. The sharp expansion of history professors can be explained not only by nineteenth-century interests in the past, but also by taking into account the enormous expansion of scientific and scholarly enterprises throughout this period. At the end of the nineteenth century there were simply many more scientists, scholars, professors, and students than at the beginning of the century. Dutch universities, for instance, enrolled only 559 students in 1816, with this number rising to 2816 students in 1900. This growth opened up universities to the wider middle class. In short, educational institutions and their personnel grew dramatically in the nineteenth century.

The nineteenth-century expansion in education and knowledge transfer manifested itself in more ways than sheer numbers. Scientists developed new techniques and working methods which significantly increased the capacity of science to shape and change the world. Medicine, for example, progressed enormously, first in its capacity to diagnose illnesses and later—more importantly from a patient’s perspective—in its ability to cure or prevent them. This was highly publicised work that found fame for scientists such as the German microbiologist Robert Koch (1843–1910), who managed to isolate the bacteria causing anthrax, tuberculosis and cholera, and his French colleague Louis Pasteur, whose vaccines for diseases such as anthrax and rabies dramatically reduced the mortality rate. Pasteur’s work is an impressive example of the transfer of scientific knowledge to society. So-called ‘pasteurisation’—the mild heating of foods such as beer, milk, and wine—improved public health but also led to profound changes in agriculture and industry. In a similar fashion, the ‘second’ industrial revolution was driven by all kinds of scientific, often chemical innovations. One example is the German chemistry professor Justus von Liebig, whose name for generations has been connected to the canned meat, soups, and bouillons that were fabricated using a procedure developed by him, and thus bore his name on the packaging.

Industrial food processing, vaccines and artificial fertilisers are prime examples of the expansion of science into society and industry during the nineteenth century. But the expansion of the sciences also occurred on a global level. Scientists made spectacular travels around the globe, pushing the geographical boundaries of knowledge to map the world further. Charles Darwin’s voyage on the ship *HMS Beagle* from 1831 to 1836, which proved instrumental in the development of his theory of evolution, was just one of many nineteenth-century undertakings to measure land masses and sea depths, or to identify new species of plants and animals. We can additionally speak of the polymath Alexander von Humboldt, who travelled to the Americas and Central Asia, and whose writings had a lasting impact on numerous

scientific disciplines including geography and ethnology. The geographical expansion of science went hand-in-hand with the expansion of European colonial empires. New scientific institutions were set up as a part of the state bureaucracy, or under its protection. The Dutch government, for instance, supported the founding and expansion of the national botanical garden *Buitenzorg* in Bogor—the institution today known as Kebun Raya Bogor. What started as an institution with the taxonomical mission of collecting flora in the vast Dutch colony of Indonesia later turned into a biological laboratory for hands-on research, and a hub for many scientists from around the globe.



Fig. 1: Conrad Martens, *HMS Beagle at Tierra del Fuego* (1832–1836), Public Domain, Wikimedia, [https://en.wikipedia.org/wiki/File:HMS\\_Beagle\\_by\\_Conrad\\_Martens.jpg](https://en.wikipedia.org/wiki/File:HMS_Beagle_by_Conrad_Martens.jpg).

Although science often presented itself in the guise of objectivity and impartiality, its practice and its outcomes were far from neutral or innocent. The world was divided into knowing subjects—Western, white, male scientists—and the rest of the world, which was simply an object for study. Women are one example: for a long time, women could not advance in science because neither were there any positions for them, nor did they have a chance to enter university education. It was only towards the end of the nineteenth century that they gained access to universities. In Belgium, the universities of Brussels, Ghent and Liège opened their doors to female students in the 1880s, while at the Catholic University of Leuven these doors remained closed until 1920. Also objectified by science were the indigenous peoples living in colonial empires; rather than being consulted as possessors of knowledge, they were treated as objects of study. The Dutch scientific enterprise in Indonesia was not only directed at collecting and ordering plants. So-called anthropometrists set out to do the same with the inhabitants of the many islands of the Indonesian

archipelago: they measured their bodies and particularly their skulls in an attempt to arrive at a racial classification of indigenous peoples. Although it turned out to be impossible to establish any sound racial divisions, this scientific work supported the racial ideology underpinning the entire colonial project—another example of how nineteenth-century scientific knowledge shaped society.

### State Control, Bureaucratisation and Professionalisation

In the nineteenth century, a growing *bureaucratisation* of secondary and tertiary education became apparent. Governments in many countries established centralised state administrations that could address general challenges in science, education, and culture. In an early example of a centralised educational system, the so-called *Studienhofkommission* was established in 1760 in the countries of the Habsburg Monarchy, serving as the main state body for all schools, priest houses, universities and academies. The *Studienhofkommission* merged into the *Ministerium des öffentlichen Unterrichtes*, established in 1848. Another example is the French *Ministère de l'Instruction publique*, founded in 1828. Such administrations were intended to allow the government to coordinate and reform educational activities in general, particularly in higher education. This trend was evident even in federally organised states like the German Reich. In 1898, Friedrich Althoff, Ministerial Director in the Prussian *Kultusministerium*, suggested bringing together senior officials from regional state ministries to form a higher education conference of the German Reich. Althoff's initiative led to a permanent body that met regularly and can be seen as the forerunner of today's *Kultusministerkonferenz* (Standing Conference of Ministers of Education and Cultural Affairs). Even with its federal structure, the German Reich attempted to ensure that the nation-state would be able to act in the education sector.

The example of Habsburg Central Europe shows a serious attempt at centralised coordination in research and education, with varying results on the local level. The idea of general schooling was conceived as early as the late eighteenth century, though the results fell short of expectations. Schooling improved a great deal during the century and illiteracy decreased considerably as a result, but there were significant differences between the regions and nationalities of the empire. Whereas the Czech Lands already boasted an impressive schooling system in the 1820s, illiteracy levels in Galicia remained extremely high even in the 1870s. Despite such setbacks, it remained the concern of the state in most parts of Europe to steer science and education systematically.

The state-oriented character of education and culture was also reflected in the increasing dependence of academy and university staff on financing from their government. While professors in the early modern period were usually financed by money paid by their students to attend lectures, between the eighteenth and early twentieth centuries the state took over this task for the most part. In many European countries, professors and lecturers became civil servants, and many universities were transformed into state universities. The state-orientation of science and education can also be seen in the founding of national associations of school and university representatives, which acted as interest groups. At the turn of the nineteenth and twentieth centuries, the first national conferences of rectors were established in Western European countries. These included the Netherlands, with its Rectors' College founded in 1898, and Switzerland, with its University Rectors' Conference founded in 1904.

In the sciences and humanities, a *differentiation* of disciplines began to emerge. While the medieval universities typically had only four faculties—theology, medicine, law, and philosophy—a broad system of subjects developed in the course of the nineteenth (and twentieth) century which led to the establishment of new faculties and institutes. One example among many was the establishment of new disciplinary university degrees, such as the history degree, which replaced the more generic philosophy degree in Belgium in 1890. An increasing demand for more practical subjects such as engineering and chemistry resulted in the establishment of new natural and technical science faculties. In a similar move, the more policy-oriented social sciences faculties complemented the older humanities. Separate natural science and technology colleges emerged, alongside specific schools for subjects such as mining and agriculture, which over time were integrated into existing universities or upgraded to full universities.

The *differentiation* and *professionalisation* of research fields was accompanied by a restructuring process within the universities. New positions were created, and the number of teaching staff expanded. Besides professors and students, positions were established for lecturers, research assistants, administrators, and coordinators. The ideal of the university as a community of equal scholars was often replaced by the hierarchical university, in which full professors, known in the German-speaking world as 'Ordinarius' and in the English-speaking world as 'Don', held a dominant position.

As a result of professionalisation, the ideal image of a humanist scholar wearing his gown was replaced by the model of an expert professor in a white lab coat. Rather than individualistic, artist-like figures, academics became experts and members of a scientific community doing collective work. Objective measures for scientific achievement were established, and specialised



reviews became the guardians, or ‘police’, of the disciplines by acknowledging those scholars who acted according to these rules and excluding those who did not. Professionalisation also changed how certain scholars regarded their larger community, the nation. Historians from Central Europe, for instance, tended to act less as ‘fathers of the nation’ and saw themselves more as part of a scientific community that respected scientific standards, even if this meant sometimes challenging the prevailing ideology in their own nation. In the late nineteenth century, Czech philologists and historians exposed Václav Hanka’s forged medieval manuscripts (supposedly discovered in the early nineteenth century), which up to that point were seen as proof of a highly developed early Czech literature; many considered the exposure of these documents to be an act of treason.

### (Inter)nationalisation

During the nineteenth century, a double dynamic can be identified in the institutions of knowledge transfer: teaching and research were regarded as primary instruments in the *national* integration process, while in the meantime, *transnational* and *international* networking were subject to previously unknown dynamics.

Nationalisation in education was reflected in, among other things, the growing importance of state agencies and their financial resources for educational and scientific institutions; as well as in the nationalised rhetoric of teachers, lecturers and rectors. Many elites and intellectuals that contributed to the awakening of their nations saw knowledge transfer and scientific research as essential elements in the process of national integration. A main concern was the cultivation, improvement, and in some cases quasi-invention of a national language. Learned societies and academies often fulfilled these tasks, although in theory they were dedicated to all scientific disciplines. Several of these institutions were established in Habsburg Central Europe during the first half of the century, their profile and standard largely determined by their respective national community’s social development and position in the empire. In Hungary, the Academy of Sciences was founded in 1825, in Bohemia it was the National Museum that fulfilled the same role. For smaller, Slavic national communities, the Serb *Matica*, founded in 1826 in Pest, can serve as an example. In the countryside, reading societies were created in order to fight an enemy of the national ideal, one that was more acrimonious than the censorship of the imperial state: indifference.

Instruction in the mother tongue was a central aim in many parts of Europe. In primary schools, this was often achieved. But the matter was especially pressing in universities, which were responsible for educating secondary



school teachers who in turn were in the position to influence future elites. One of many steps for nationalising universities was the creation of an individual department for the language in question. In Habsburg Central Europe, conflicts erupted frequently when an originally German-language university was to be nationalised. The most infamous case was that of the Charles University of Prague, where a large German minority strived to prevent the 'czechisation' of the oldest German university. After violent conflicts erupted between Czech and German students, a compromise was reached in 1882, according to which the university was divided into a German and a Czech part, both of which could keep the historical name.

Museums were also lined up in service of national integration. Their new task was to strengthen the community by elaborating the connection between its past, present, and future. In Central Europe, national museums gained special political significance and were eminent institutions of guarding and using the national language, particularly in Prague and in Pest (where the oldest national museum was established in 1802).

Nevertheless, besides the undeniably strong tendency of nationalisation, the connections, crossings, and mutual influences between nations are also apparent in this period. One major expression of the internationalisation of sciences and humanities in the nineteenth century was the dynamism of international congresses. They were often encouraged by the organisation of universal exhibitions, starting in 1851, and sometimes echoed major economic debates on a European scale, as evidenced by the Brussels Congress on Literary and Artistic Property (1858). From 1878 onwards, international congresses multiplied and contributed to the international structuring of scientific communities, concerning both human and natural sciences. The internationalisation of the research sphere also led in part to a *standardisation* of instruments and methods, especially in the social, natural, and technical sciences. These instruments and methods were often promoted by international institutes, such as the International Statistical Institute founded in 1885 and the International Bureau of Weights and Measures established in 1875. Standardised instruments and methods simplified the traceability of knowledge and its practical application beyond national borders.

International exchange was also important for emblematic figures of nationalist movements who maintained contacts across national borders. For example, one of the founding fathers of the Czech national revival, Josef Dobrovský, was in close contact with Ferenc Széchenyi, founder of the Hungarian National Museum, where the former conducted important research. The same is true for academies that regularly honoured famous scholars from rival nations. The transfer of scientific practices was not necessarily hindered by political differences. For example, the German model of research university

and its system of seminars were introduced in Austria during the 1850s, in the midst of the *kleindeutsch-großdeutsch* rivalry. Reviews, even though their primary task was to promote national science and literature, were also sites of cultural transfer: it was through these reviews that French literature influenced the famous Viennese Modernism, which in turn (also via literary reviews) spread among the South Slav writers of the Habsburg Empire.

## Conclusion

The development of education in the nineteenth century was marked by several paradoxes. Its expansion at the primary, secondary and higher levels was accompanied by a large number of social, geographical and gender inequalities. Moreover, while the dynamic of knowledge construction was largely transnational, education remained anchored in national political structures that were developing alongside it. The humanities were lined up in the service of the nation-state, yet professionalisation brought about ideas in certain disciplines which could contradict nationalist goals. Another tension within education was economic in nature: while the scientific disciplines were gradually aspiring to their autonomy and thus defended an ethos of objectivity and impartiality, they remained strongly influenced by economic interests. In addition to the universities, which were becoming increasingly differentiated, non-university research institutes were established, alongside research and development departments in private companies. New sectors of industry were fostered through the combination of research and industrial production. Research findings in natural sciences such as physics and chemistry were put to economic use on a large scale. The expanding state-financed education systems thus became increasingly important for nation, society, and economy. Education was both the result of prosperity, and its prerequisite. Recorded from the middle of the century onwards, this educational progress was one of the drivers of the second industrial revolution. The development of education thus reinforced an ideology of universal progress, but it also enabled new forms of domination which meant that, in practice, large groups such as women or colonised subjects remained excluded from this progress.

## Discussion questions

1. What were the reasons and consequences of the expansion of university education in nineteenth-century Europe?
2. What role did nationalism play in the development of education and knowledge transfer in the nineteenth century?

3. In which ways do European universities today differ from those in the nineteenth century?

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