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Scientific Nationalism: A Historical Approach to Nature in Late Nineteenth-Century Hungary

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This chapter approaches various occurrences of scientific nationalism in nineteenth-century Hungary; the term 'scientific nationalism' stands for both nationalism occurring within science and nationalism based on science. The latter form of nationalism, which used science directly for political purposes as an argument and justification for nationalist politics, had gradually become a widespread ideology in Hungary in the second part of the nineteenth century. It was not science, but politics, that was nationalist; however, science could not stay neutral on this central political issue. It developed a national character manifested both in its institutional structure and in its cognitive contents.

The chapter will focus on the nationalist character of Hungarian science, especially on its epistemic nationalism, in the period of the Austro-Hungarian Monarchy. In this case, the term 'epistemic nationalism' denotes nationalism that occurs in the cognitive content of science, and differs from political, institutional, cultural or emotional nationalism in science, a complex social entity. Nationalism can be seen as many things, including flag-waving emotion, a part of personal identity, culture or language, long-standing – almost tribal – traditions and ethnic solidarity. All belong to the notion of 'nationalism' and they all deserve analytical approaches. It could be an important investigation to pinpoint the forms of appearances of all these emotions in science. Some particular phenomena, such as priority debates based on nationality or boasts of national excellence or even superiority in particular fields, have occurred very often in the history of national sciences, as well as in the historiographies of sciences. Here, however, nationalism in the sciences will be analysed in a restricted political, non-emotional framework, as the first section will show.

The term 'science' will primarily be used in reference to the natural sciences, physics, chemistry and biology, disregarding the important historical changes in its meaning.

Epistemic nationalism can exist in science particularly in the form of natural history, which was a dominant – albeit decreasingly so – branch of the natural sciences in Hungary up to the First World War. After a brief introduction to the conceptual approach to scientific nationalism in general, the chapter will typify nationalism and then differentiate between nationalism based on science and non-epistemic scientific nationalism, using the Hungarian example to conclude with the epistemic version of nationalism in Hungarian science.

Nationalism in science

According to Ernest Gellner's widely quoted definition, 'nationalism is primarily a political principle, which holds that the political and the national unit should be congruent'.[1] In other words, the population of one nation, conceived as an ethnic group, should only live within the political boundaries of a nation-state. States should be nationally homogeneous; to give an example not cited by Gellner, Hungarians should live in Hungary not in Romania, Slovakia, etc. and Slovakians should live in Slovakia not in Hungary. The nationalist principle is violated, Gellner continues, if, first, a given state does not include all members of the nation; second, if it includes all members but also people belonging to other nations; and, finally, if it does not include all members of the nation, but includes members of a foreign nation as well. Gellner adds that nationalist sentiment is particularly sensitive in a situation where 'the rulers of the political unit belong to a nation other than that of the majority of the ruled'.[2]

The Hungarian political situation in the nineteenth century can easily be placed into this scheme. The nationalist principle was violated in the way described by Gellner's second point. Hungary included not only Magyars but also members of thirteen national minorities, and the country was ruled by the Habsburgs, who belonged to another nation. Gellner was right: Hungarian nationalist sentiment was very sensitive to this situation. Nationalist sentiment became a main feature of Hungarian high culture for a long time. Directly or indirectly, almost all aspects of culture, including poetry, literature, music, theatre and painting, were imbued with nationalism.

Hungarian nationalist sentiment had two faces. On the one hand, Hungarians had fought against the Habsburgs, their foreign rulers, and this fight was described in heroic, emotional terms. On the other hand, Hungarians ruled all the national minorities living inside their borders, which they despised. Hungarians felt superior to these national minorities, and wanted to assimilate them. National minorities were often represented in Hungarian high culture in an ironic and patronizing, if not cynical and hostile, way. Nationalism, however, in this chapter, is primarily considered to be a political principle, not a sentiment. Science, on the other hand, has

traditionally been thought to be a system of knowledge containing universal laws. According to Mertonian norms, science is universalistic in the way that its truth is evaluated in terms of universal, impersonal criteria, and not on the basis of race, class, gender, religion or nationality.[3]

So does science have anything to do with nationalism? Gellner generated a typology of nationalism based on three factors: the existence of a centralized power, education, and shared culture (essentially high culture). Science is closely related to all of them. Disregarding now both Gellner's otherwise very relevant Austrian-type[4] and John Plamenatz's Eastern-type nationalism,[5] it seems sensible to look for nationalist features in Hungarian science in the same way as it is sensible to look for nationalist features in Hungarian literature or dance. As nationalism is a political principle, nationalist science should be considered as a political actor in realizing the goal of constructing a homogeneous high culture.

Nationalism based on science

Both faces of Hungarian nationalism, whether related to foreign rulers or to the national minorities, relied on various ideologies to legitimate the endeavour of constructing a homogeneous nation. Science proved to be instrumental, as was shown by the fast growing popularity of Darwinism after 1860. Indeed, Darwin's *The Origin of Species* was published in Britain in 1859, and just a few months later it was reviewed in a Hungarian journal.[6] The author of the review, Ferenc Jánosi, was a military officer, later a high-school teacher, journalist and secretary in the ministry of justice, who had studied law, theology and chemistry. He was everything but a naturalist, but enthusiastic about a breakthrough in his field. The first person to write a book on Darwinian evolution, in 1864, was Jácint Rónay, a Catholic priest, who, after the Revolution and War of Independence of 1848–49, fled from Hungary to Britain (in 1850) and returned seventeen years later.[7] He was not a naturalist, either; neither was Ágost Greguss, a professor of aesthetics, who was the first to speak against Darwinism at the Academy, in 1863.[8] Indeed, Darwinism seemed to be more popular among public intellectuals, and later politicians and sociologists, than among experts of natural history.

Two factors explain this phenomenon. First, from the 1850s, positivist philosophy grew to a dominant position in Hungary as compared with the earlier Hegelian influence. Parallel with the strengthening of positivism, science gained new appreciation in non-scientific circles. Second, Hungarian political, ideological and emotional nationalism gained a new vocabulary and new arguments from Darwinism that became widely known, in particular through the positivist philosopher Herbert Spencer's works.

Darwinism provided a scientific framework for proving Hungarians to be nationally superior to the ethnic minorities such as Slovaks, Romanians or Ruthenians, who were considered to be less successful groups in the struggle

for survival than Hungarians. Many political writers used variants of this argument. For instance, Gusztáv Beksics, publicist, expert of constitutional law and member of parliament, argued for a policy of assimilation, that is, assimilating national minorities instead of facilitating their struggle for autonomy. Beksics claimed that the Hungarian race was superior to the national minorities because Hungarian is not a pure race, rather a mixture of several races, unlike the Romanians, Slovaks and others. To enhance their superiority, Hungarians should mix with these less developed races, resulting in an even stronger Hungarian race and the disappearance of the weak minorities. According to Beksics, assimilating to Hungarians was in the interest of all races living in the Carpathian basin.[9] This kind of logic almost automatically led to a vigorous eugenic movement starting in the first decade of the twentieth century in Hungary.[10]

Biological argumentation was widespread in Hungary in the period of the Austro-Hungarian Monarchy, as in other parts of Europe. Science served as an intellectual basis for nationalist emotions and nationalist politics in a country where the relationship between Magyars and non-Magyar minorities was a central political issue.

Institutional nationalism of science

Although science is generally considered to be an international, transnational, cosmopolitan or universalistic endeavour, it has been organized nationally at least since nation-states existed. Science can be called nationalist as a social entity in a non-epistemic sense if it is declared that the system of scientific institutions is set up and operated in order to promote the interest of the given nation either as a part of its high culture or as an entity that serves the technological and economical progress of the given nation.

To promote the fight against the Habsburg violation of the nationalist principle, a number of scientific institutions were founded in Hungary in the nineteenth century. The example of the Hungarian Academy of Sciences (Magyar Tudományos Akadémia) is telling.

The establishment of a Hungarian scientific society (Magyar Tudós Társaság) was decided by the Hungarian Diet in 1825 on the initiative of Count István Széchenyi, whose intention was to construct a modernized Hungary. Although the scientific society was intended to be financed by private donations without relying on the state budget, the establishment had to be endorsed by the Habsburg Emperor, who was also King of Hungary.[11] The Hungarian Academy of Sciences has always been a learned society, although, according to the historian James McClellan, learned societies were typically established in the eighteenth century, while the nineteenth century was the time when specialized scientific societies were formed. Such a scientific society was the Geological Society, founded in London in

1807, which aimed at bringing together the professionals working in the field of geology. A learned society, like the *Académie française*, established in the seventeenth century, covered diverse subjects, such as language, philosophy, literature, the fine arts, history, medicine, agriculture, economics and the sciences. It was a social and cultural enterprise incorporated by and within the Ancien Régime.[12]

Indeed, the Hungarian Academy of Sciences belonged to a group of national institutions established in the nineteenth century, such as the National Theatre or the National Museum. Similar institutions in Western Europe served to represent the central power of the state, sometimes embodied by an emperor: Napoleon, for instance. In Hungary, however, they represented the revolt against the central power, the Austrian rulers. In keeping with Gellner's nationalist principle, these institutions, by emphasizing their homogeneously national character, served as tools in the fight against foreign rulers. One of the most important battlefields was the demand to use the Hungarian language in all areas of Hungarian culture.

The Academy's statutes set it a double goal: the cultivation of the Hungarian language, and the cultivation and popularization of science. Its work began in six sections: linguistics, philosophy, history, mathematics, law, and natural sciences, which showed the learned-society character of the Academy. All its activity, which started in 1831, was intended to be carried out in Hungarian.[13]

Hungarian scientific language, however, was still under construction as part of a movement, called language renewal, aiming to form the so-called peasant language into a usable Hungarian language for the purpose of high culture. Accordingly, for instance, chemistry attempted to change all foreign words to new Hungarian ones that were constructed by rules based on the suggestions of various authors. Even common words such as 'material' (*anyag*), 'nitrogen' (*légeny*), 'oxygen' (*éleny*), 'mercury' (*higany*) and 'reaction' (*egyesülés*), along with expressions like 'sphere' (*gömb*) and 'gravitation' (*nehézkedés*), received Hungarian names. Some of them survived but most of them died out. Throughout the nineteenth century, the Academy resounded with loud debates about what was the 'correct' scientific language. Finally, the chemistry community compromised and agreed to use some Latin-based expressions such as 'oxygen', 'oxides' and 'reaction', mixed with Hungarian words.

The issue of language was crucial in nationalist struggles. Teaching of the Hungarian language was gradually introduced in Budapest University after 1830, when a law was issued in Vienna that permitted the official use of national languages in the Empire. A memorandum, dated 1841, allowed the introduction of Hungarian as a language of instruction at the university. In fact, some subjects had already been taught in Hungarian in the faculties of law and medicine, but in certain areas of law Hungarian words were still missing because the administration used Latin or German expressions.

The same problems occurred at the faculty of theology and philosophy. Physics, heraldry, philosophy and mathematics, for instance, were taught in Latin, while other subjects were taught in Hungarian. Under neo-absolutism, between 1849 and 1860, the most important subjects had to be taught in German, too, resulting in a mixed-language education. In 1860, Franz Joseph ordered the reintroduction of Hungarian at the University. After this, mixed-language instruction gradually changed to Hungarian.[14]

The complexity of the issue can be exemplified by the case of chemistry. The first chemistry lecture for university students was given by Károly Nendtvich, a member of the Academy, during the 1848 revolution. Nendtvich, originally a surgeon, later a naturalist and botanist, was a prominent member of a political and cultural reform group with fervent nationalist emotions. He published about the importance of science and fought for the reform of the Hungarian language, mainly the language of chemistry. He was appointed to full professor in 1848. After the revolution he was dismissed from the university, but he was allowed to return to his former position at the Polytechnic (Joseph Polytechnicum, then called Joseph Industrieschule) in 1850. Here he became full professor in 1857. After the Austro-Hungarian 'Compromise' (*'Ausgleich'*) in 1867, the Polytechnic was reformed to become the Palatine Joseph Technical University (Királyi József Műegyetem) in 1871. The university got its name from Palatine Joseph (Joseph Anton Johann von Österreich/József nádor (1776–1847)), a Habsburg archduke. Nendtvich served as rector of the university in 1873/74 and retained his full professor tenure until his retirement in 1882. Nendtvich had travelled widely in various foreign countries, including Germany, France, Belgium, Britain and North America, about the last of which he published a travel book.[15] In his old age, in 1889, he took a long trip to Italy, Tunis, Algeria and Spain. He also produced important and successful chemistry textbooks. After his retirement from the university, he participated in the activities of the early Hungarian anti-Semitic movement and published a book about the 'Jewish problem'.[16]

Epistemic nationalism

The study of the nationalist principle in the institutional system of science, including scientific language, considers science to be a social entity, disregarding its function of producing scientific knowledge. An intricate question is whether the product, knowledge, can be nationalistic in the sense of the nationalist principle. In other words: whether scientific knowledge can serve the particular goal of building or constructing a homogeneous nation, instead of serving the whole of mankind as the universalistic attitude would require.

Hungarian science was dominated by a natural-historical approach until the 1920s, instead of the universalistic natural-philosophical approach.

The latter follows the Aristotelian pattern of explaining phenomena from first principles by logical means. The vast amount of historical and theoretical literature discusses the best examples of this tradition: cases of Kepler, Galileo, Newton, Maxwell, Einstein and others. Natural history has been less appreciated by theoretically inclined historians, although Michel Foucault in philosophy and the huge industry of historical studies of evolution seems to attract a growing interest in natural history.[17] Natural history does not seek demonstrative truths, but rather describes nature, collects objects, like plants, animals and minerals, makes pictures of them, maps their locations, catalogues them, and constructs systems that help the practitioners to arrange their objects into an order – once, but today perhaps no longer thought to simulate the order that was given to the nature by God.

With a few exceptions, the two traditions are treated today as two separate worlds: researchers follow either the natural-philosophical-oriented tradition or the natural-historical one. Peter Galison, a historian of physics and one of the few who sees the connection between the two traditions, writes that there was a 'split in science itself between an abstract, reductionist approach to the physical world and a natural historical approach that authors from Goethe to Maxwell had dubbed the "morphological" sciences.'[18] He adds that 'Opposing the "one-sided" working of abstract science lay another ideal of investigation, embodied in the morphological sciences.'[19] Galison noticed an intimate relationship between natural history and art: 'painters and poets tried to capture the power of storms and grand scale of forests, cliffs and waterfalls. And both artists and scientists recognized a tension between the rationalizing, lawlike image of nature proffered by the natural philosophers and the irreducible, often spiritual aspect of nature presented by their contemporaries in the arts.'[20]

In research of the typical morphological sciences like botany and zoology, Hungarians did not seek to establish new systems or notions of species, or develop theories about the fixity or transformation of species. They rather collected, described, named and pictured plants and animals that they could find in Hungary. Pál Kitaibel, Imre Frivaldszky and many others were proud of their collections. The same could be said about geologists, geographers and mineralogists in Hungary. In chemistry, the natural-historical line can be seen by the dominance of analytical chemistry in the nineteenth and early twentieth centuries over organic syntheses or general, physical chemistry. The analysis of minerals and mainly mineral waters, or agricultural products attracted the interest of chemistry professors like Károly Nendvich, also a botanist, who analysed various types of coal found in Hungary. Károly Than, Béla Lengyel and Lajos Ilosvay, emblematic professors in the late nineteenth century, were also excellent analysts. Seen in this way, chemistry in Hungary had inclinations similar to those of biology, because both were oriented towards natural history. In addition, many of the scientists mentioned above had an attraction to paintings, drawing and poetry, as

if they exemplified Galison's description. Their epistemic nationalism was manifested in the subjects of their investigations: the description of nature in Hungary rather than the search for new universal laws.

This characterization of Hungarian science can be extended to physics, the modern embodiment of natural philosophy with its universalistic attitude. Loránd Eötvös, the leading personality of physics in Hungary at that time, was also highly skilled in drawing. He wrote poems, and later became an enthusiastic photographer. These attributes of a naturalist did not prevent Eötvös from becoming a physicist. After the mid-1890s, he published on gravitation, a crucial subject of Newtonian mechanics. Eötvös developed an extremely sensitive torsion pendulum, or torsion balance, by which gravitation could be studied with unprecedented precision. He showed, to a high degree of accuracy, that gravitational mass and inertial mass are equivalent, which is an essential postulate in both Newtonian and Einsteinian physics.[21] No scientific statement can be more universalistic. The equivalence of inertial and gravitational mass is supposed to be valid in all parts of the universe, in all countries, independent of nations, locality, politics, religion and other social and cultural factors.

Eötvös, however, was not solely motivated by realizing an exceedingly precise measurement to confirm the well known and widely accepted law. His instrument was so sensitive to changes in gravitation that it proved to be useful for research on geological strata below the surface of the Earth. In other words, the torsion balance was suitable for extending natural-historical description and mapping the unseen part of nature, like the microscope and telescope. In 1901, Eötvös, the president of the Hungarian Academy of Sciences at the time, said that his pendulum was 'simple like Hamlet's flute; one just has to know how to play it and the musician can draw delightful variations from it.'[22] With his instrument, he said, the physicist 'can read the smallest change in gravitation'.[23] He continued, 'Wherever I place my device, with my procedure, I can measure how much and in what direction gravitation changes.'[24] Finally, he explained his motives in a non-physicist rhetoric, a style as picturesque and poetic as the way Galison characterized natural history:

> Encircled by a wreath of mountains, the flatness of the Great Hungarian Plain lies here below our feet. Gravitation formed its surface to its liking. What kind of mountains did it bury, and what kind of hollows did it fill with soft material until the formation of the plain, which grows the golden ear of wheat to give life to the Hungarian nation? As long as I walk on it, as long as I eat the bread it provides, I would like to answer this question.[25]

Eötvös's intention was apparently to link the natural-historical approach to the natural-philosophical one. He wanted to follow a nationalist goal, to map Hungarian mineral resources under the surface of the earth, in

addition to carrying out highly precise measurements with universal significance.

Conclusion

During the long nineteenth century, that is until the First World War, Hungarian science was distinctively nationalistic in its style. This nationalist character fulfilled the requirements of building up an independent nation-state, and reflected both the political situation and the high culture of the country. The cultural fertility of the Austro-Hungarian Dualist Monarchy extended to the natural sciences. In both parts of the Monarchy, a number of important results were achieved and influential scientists worked on them. However, the political position of the two parts, Austria and Hungary, was not symmetrical. This asymmetry was reflected by the continuation of Hungarian nationalism born in the late eighteenth and early nineteenth centuries. Nationalism was a characteristic feature of Hungarian culture, literature, music and science; compared with Austrian universalism, Hungarian scientific thinking was local, practical and historical.

This characterization does not mean that Hungarian science was insulated from other nations' sciences. Hungarian science worked on the periphery of German world-science, it was connected to Austrian and German science by thousands of strong personal, institutional, and intellectual ties and to other national sciences by less strong ties.[26] Some Hungarian scientists published in foreign languages, mostly in German, and participated in the activity of the international scientific community, by participating in conferences, establishing cooperation and the like. They worked for two knowledge markets, a national and an international market. Most of the professors who were active during the second part of the nineteenth century, including Eötvös and Nendtvich, studied and worked in Germany. Eötvös improved his gravitation measurement in the hope of winning the Beneke prize offered by the Royal Scientific Society of Göttingen in 1906, and he wrote up this work in German; the prize committee had invited applications for the best solution of gravitation measurement, well knowing that this was Eötvös' specialty. Nendtvich, who fought vehemently for the use of Hungarian in teaching, also wrote his first textbook in German, enjoying the advantage of being able to write and speak German, the lingua franca of science in the German-speaking world.[27] To foster the connections of Hungarian science with the German-speaking scientific community and to provide a wider scientific forum for results of local interest, the Academy of Sciences launched a scientific journal in German on Eötvös's initiative. The title was telling: *Mathematische und Naturwissenschaftliche Berichte aus Ungarn* (Mathematical and Scientific Reports from Hungary). This alone shows the local, national character of the publications. And yet this local, practical and historical knowledge born in Hungary aimed at contributing to international science.

Notes

1. Ernest Gellner (1996) *Nations and Nationalism* (Oxford: Blackwell Publishing), 1.
2. Ibid.
3. Robert Merton (1973) 'The Normative Structure of Science', in idem, *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago: University of Chicago Press), 267–78.
4. In Gellner's Austrian-type nationalism both power and high culture are in the hands of the rulers, basically the Habsburgs. The powerless have no access to education but share folk cultures. They fight to elevate the folk culture to the rank of high culture. Gellner, *Nations and Nationalism*, 94–97.
5. Plamenatz analysed cultural nationalism instead of political nationalism. He distinguished between two types of European nationalism, a Western and an Eastern type on the basis of 'backwardness'. While Western nationalism was formed in nations (such as Germany and Italy) that were equipped with all modern cultural institutions, skills, behaviours, styles, expertise and values, Eastern nationalism was formed in nations that lacked them (such as Slavic nations). According to Plamenatz, in the process of adaptation to their surroundings, a special tension develops between the ancient cultural tradition and the new requirements. This tension is expressed in the nationalism of the so-called backward nations. John Plamenatz (1976) 'Two Types of Nationalism', in Eugene Kamenka (ed.), *Nationalism. The Nature and Evolution of an Idea* (London: Edward Arnold), 23–36.
6. Ferenc Jánosi (1860) 'Új természetrajzi elmélet – A nemek eredete', *Budapesti Szemle*, 1, 10, 383–418.
7. Jácint Rónay (1864) *Fajkeletkezés. Az embernek helye a természetben és régisége* (Pest: Demjén és Sebes). On Rónay's biography, see Lajos Pál (1976) *Rónay Jácint* (Budapest: Akadémiai).
8. Gregus Ágost (1863) 'Az ember helye a természetben', *Budapesti Szemle*, 18, 420. Greguss Ágost (1864) 'A haladás elvéről', in *Magyar Tudományos Akadémia Értesítő: A Philosophiai, Törvény- és Történettudományi Osztályok Közlönye* (Budapest: Magyar Tudományos Akadémia), 435.
9. See, for example, Gusztáv Beksics (1895) *A román kérdés és a fajok harca Európábanés és Magyarországon* (Budapest: Athenaeum); Gusztáv Beksics (1896) *A magyar faj terjeszkedése és nemzeti konszolidációnk különös tekintettel a mezőgazdaságra, birtokviszonyokra és a népesedésre* (Budapest: Athenaeum).
10. I detailed the nationalist features of the nineteenth-century Darwin reception in Hungary in an article: Gábor Palló (2009) 'Darwin utazása Magyarországon' [Darwin's trip to Hungary], *Magyar Tudomány*, 6, 714–26, and in a paper: 'The adaptation potential of Darwinism: The unending reception in Hungary', delivered at the conference 'Darwin now: Darwin's Living Legacy', Bibliotheca Alexandria, Egypt 14–16 November 2009. In various contexts other authors have also published about the issue; see, for example, Marius Turda (2004) *The Idea of National Superiority in Central Europe, 1880–1918* (Lewiston, NY: Edwin Mellen Press); Katalin Mund, (2008) 'The reception of Darwin in nineteenth-century Hungarian society', in Eve-Marie Engels and Thomas F. Glick (eds.) *The Reception of Charles Darwin in Europe* (London, New York: Continuum), 441–62. Sándor Soós (2008), The Scientific Reception of Darwin's Work in Nineteenth-Century Hungary', in ibid., 430–40.
11. The standard source for the history of the Hungarian Academy of Sciences was published for the anniversary of the Academy. Zsigmond Pál Pach (ed.) (1975)

A Magyar Tudományos Akadémia Másfél évszázada 1825–1975 [*One and a Half Centuries of the Hungarian Academy of Sciences*] (Budapest: Akadémiai Kiadó). A volume was published on the role played by the Academy in the field of natural sciences: László Vekerdi (1994) *'A Tudománynak háza vagyon': Reáliák a Régi Akadémia terveiben és működésében* ['*It is the House of Science': The Academy and the Natural Sciences*] (Piliscsaba-Budapest: Magyar Tudománytörténeti Intézet).

12. James McClellan (1985) *Science Reorganized: Scientific Societies in the Eighteenth Century* (New York: Columbia University Press), 3.
13. On the early work of the Academy, see Agnes R. Varkonyi (1975) 'A Magyar Tudományos Akadémia megalapítása 1825–1831' and 'A Magyar Tudós Társaságtól a Magyar Nemzeti Akadémiáig 1831–1849', in Pach (ed.) *A Magyar Tudományos Akadémia*, 11–27 and 31–51, here 23–49.
14. István Sinkovics (ed.) (1985) *Az Eötvös Loránd Tudományegyetem Története 1635–1985* [*The History of the Eötvös University*] (Budapest: ELTE), 144–46, 163–68, 189–90.
15. Károly Nendtvich (1858) *Amerikai utazásom. Egy földabroszszal és három kőrajzzal* [My Trip to America] (Pest: Heckenast).
16. There is no published biography of Nendtvich. His name is mentioned in some books and articles, e.g. Ferenc Szabadváry and Zoltán Szökefalvi-Nagy (1972) *A kémia története Magyarországon* [The History of Chemistry in Hungary] (Budapest: Akadémiai Kiadó), 201–03. Károly Nendtvich (1884) *Die Judenfrage in Oesterreich-Ungarn. Eine kulturhistorische Studie* (Pest).
17. Michel Foucault (1973) *The Order of Things: an Archaeology of the Human Sciences* (New York: Vintage).
18. Peter Galison (1999) *Image and Logic: A Material Culture of Microphysics* (Chicago: Chicago University Press), 75.
19. Ibid., 79.
20. Ibid., 75.
21. Roland v. Eötvös (1890) 'Über die Anziehung der Erde auf verschiedene Substanzen', *Mathematische und Naturwissenschaftliche Berichte aus Ungarn*, 8, 65–68. The long series of gradually improving measurement techniques has been related in a posthumously published paper by Eötvös and his assistants: Roland Eötvös, Desiderius Pekár and Eugen Fekete (1922) 'Beiträge zum Gesetze der Proportionalität von Trägheit und Gravität', *Annalen der Physik*, 68, 11–66.
22. Eötvös Loránd (1901) 'A Föld alakjának kérdése. Elnöki megnyitó beszéd, 1901' [The problem of the shape of the Earth. Opening address], *Természettudományi Közlöny*, 33, 321–28 (accessible online at: http://mek.oszk.hu/03200/03286/html/eotvos1/foldalak.html).
23. Ibid.
24. Ibid.
25. Ibid.
26. I have detailed Hungarian–German scientific relations in Gábor Palló (1995) 'Deutsch-ungarische Beziehungen in den Naturwissenschaften im 20. Jahrhundert', in Holger Fischer and Ferenc Szabadváry (eds.) *Technologietransfer und Wissenschaftsaustausch zwischen Ungarn und Deutschland. Aspekte der historischen Beziehungen in Naturwissenschaft und Technik* (Südosteuropäische Arbeiten 94) (Munich: Oldenbourg), 273–89.
27. Karoly Nendvich (1839) *Grundriss der Stöchiometrie nebst einem geschichtlichen Überblick derselben für angehende Chemiker und Pharmaceuten entworfen* (Budae).

6

Acts of Creation: The Eötvös Family and the Rise of Science Education in Hungary

Tibor Frank

When asked about the reasons for the appearance of so many excellent mathematicians in Hungary at the turn of the nineteenth and twentieth centuries and afterwards, Professor George Pólya of Stanford University answered: '[a] general reason is that mathematics is the cheapest science'.[1] This was, indeed, important in a relatively underdeveloped country. As to specific reasons, Pólya listed the *Középiskolai Mathematikai Lapok* (High School Papers in Mathematics), the Eötvös Competition, and the personality of the mathematician Lipót Fejér.[2] In order to understand and appreciate the significance of Baron Loránd Eötvös, the man mainly responsible for this achievement, we should first consider the nature of the Hungarian brand of creativity and its peculiarities.[3]

Hungarian creativity

Hungarian creativity is embedded in a complex tradition. Two aspects deserve particular emphasis: the almost constant entanglement with internal and international conflicts, wars and revolutions, and the long coexistence with German culture and civilization. Through many centuries of Habsburg rule and beyond, German philosophy, science, literature, education and music shaped and harnessed the intellectual energies and talents of one Hungarian intellectual generation after another. The social history of the Hungarian cast of mind – indeed of the way of thinking across much of East-Central Europe – is deeply rooted in war and conflict, abetted by a foe of an entirely different nature: poverty. Often in a cross-fertilizing way, both the German impact and the many international conflicts left a lasting imprint on the Hungarian mind, its ways of solving problems, creating new ideas and organizing thoughts.

Problem solving, almost a passion, permeated all aspects of life, from the mundane to the abstruse. Much of this came from the multiethnic,