DOI: 10.24193/subbtref.70.suppl1.02
Published Online: 2025-12-28
Published Print: 2026-01-30

József POSTA[1]:

István Hatvani – The Natural Philosopher
The Foundation and Application of Hatvani's Natural Science Knowledge in Higher Education

Abstract.

During his theological and medical studies and doctoral work in Basel, Hatvani's goal was to acquire deeper mathematical knowledge. Therefore, from the second half of 1747, he attended the lectures of the world-famous mathematician Johann Bernoulli (1667–1748) and then of his son, Daniel Bernoulli (1700–1782). Hatvani studied in detail the posthumous work of Jakob Bernoulli (1654–1705), entitled *The Art of Conjecture*, published in 1713. Learning about the Bernoulli's groundbreaking work helped him become the first in Hungary to teach probability and mathematical statistics and to perform real statistical calculations. In Leiden, Hatvani mostly attended lectures of physics and presentations of experiments by Pieter van Musschenbroek (1692–1761), who was a student of Newton. He listened to lectures delivered by the astronomer Johannes Lulofs (1711–1768) and the chemist Hieronymus David Gaubius (1705–1780). He gave his inaugural lecture at the Debrecen Reformed College in January 1749, bearing the title *De matheseos utilitate*

[1] Professor Emeritus, Department of Landscape Protection and Environmental Geography, University of Debrecen, 1 Egyetem Sq. H-4032 Hungary; e-mail address: posta.jozsef@science.unideb.hu.

in theologia ac in physica necessitate [On the Usefulness of Mathematics in Theology and Its Necessity in Physics]. Hatvani sets out from the assumption that mathematics is the most exact science of all. He acquired the most modern electrical equipment available at the time and used it to present physical experiments to his students. Making use of his chemical studies, Hatvani taught chemistry for the first time in Hungary starting from 1750. In 1777, he published a book on the analysis of the medicinal waters near Nagyvárad (Romanian: Oradea) and the examination of the salts in the vicinity of Debrecen. According to Hatvani, science and religion are independent forms of consciousness. In his eyes, they are equivalent forms of consciousness that presuppose each other in terms of the prosperity of humanity. Hatvani's position is that he investigates first, then believes, and accepts as true only what he has carefully investigated. With this, he marked his own place on the road to theological rationalism.

Keywords: theology, medicine, probability and mathematical statistics, experimental physics, chemistry, astronomy, land surveying, dormitory hospital

1. The Sources of Hatvani's Knowledge[2,3,4]

István Hatvani (1718–1786) completed his studies at the Reformed College of Debrecen in 1745 and set off on a study trip abroad in 1746. He himself collected nearly 300 Rhine forints for the study trip through his previous work as a praeceptor. In addition, the Reformed College, the city of Debrecen, Nógrád and Szabolcs counties, and private individuals also contributed to his studies with donations.[5]

---

[2] The most detailed and authentic book about the life and work of István Hatvani was published by Ede Lósy- Schmidt in 1931. The fact that Hatvani's descendants found the professor's 32-page-long handwritten autobiography in Latin, in which he followed his own life from birth to the age of 39, helped him a lot in writing the book.

[3] LÓSY-SCHMIDT, Ede (1931): *Hatvani István élete és művei (1718–1786). I. rész* [The Life and Works of István Hatvani (1718–1786). Part I]. Debrecen, Studium Könyvkiadó.

[4] HATVANI, István (1757a): *Autobiography (in Latin).* Budapest, Magyar Tudományos Akadémia, Manuscript Archive, Ms 10.378/a.

[5] Institutions and individuals supporting Hatvani's trip abroad: Debrecen city council – 30 Rhine forint + full equipment for his pack-horse, Debrecen parish – 50 Rhine forint, college school board – 25 Rhine forint + 30 Hungarian forint as aid, Losonc parish – 12 Körmöc gold,

He enrolled in the theological (13 May 1746) faculty of the University of Basel. A semester later (November 1746), he enrolled in the medical faculty, too. He was ordained a priest on 23 May 1747. A month later, he submitted his doctoral thesis in theology under the title *Theological-Critical Considerations*.[6] During the theological doctoral defence, the examining professors were surprised to announce that had they rarely met such a well-prepared debater. He continued his medical studies at the University of Basel. In 1748, he submitted his medical doctor's thesis entitled *De aistimatione morborum cum facie* [Determination of Diseases of the Face].[7] Based on his excellent preparation, he was awarded a Doctor of Medicine degree on 9 April 1748. Hatvani demonstrated his extraordinary abilities during his study trip to Switzerland. During the two years, he obtained two doctoral degrees: a doctorate in theology and a doctorate in medicine. He learned at an incredibly fast pace. His memorization skills were extremely good. Due to his rare abilities, he was able to complete his medical training in as little as 15 months.

After becoming a doctor, he spent a week in Zurich. He contacted Protestant theologians and natural scientists. Among others, he met Protestant professors Breitinger, Zimmerman, Gesner, and Hagenbeck. Then he travelled to the Netherlands. At the University of Utrecht, he consulted with professors Vogel, Milli, and Vesselnig. He then spent several months at the University of Leiden. Hatvani attended the lectures of Newton's student, Pieter van Musschenbroek, as well as of Johannes Lulofs and Hieronymus David Gaubius. Owing to the excellent masters, Hatvani also became a highly educated scientist.

Szabolcs County – 15 Rhine forint, Nógrád County – 30 Rhine forint, Rádai Gedeon – 4 Körmöc gold, Gyürki István – 2 Körmöc gold, József Darvas – 1 Körmöc gold, Gábor Kántor – 1 Körmöc gold, László Losonci – 1 Körmöc gold, László Vajda – 1 Körmöc gold, Baroness Krisztina Bossányi, widow – 1 Körmöc gold.

[6] HATHVANI, Stephanus (1748a): Animadversiones theologico-criticae. In: *Museum Helveticum. Particula VIII. Turici*. 575–625.

[7] HATHVANI, Stephanus (1748b): *Dissertatio inaug. physico-medica de aestimatione morborum ex facie*. Basiliae, Typis viduae Ioan, Christ.

Several universities tried to win him over as a teacher. The universities of Basel, Heidelberg, Marburg, and Leiden also offered him a professorship and a department. However, Hatvani refused these invitations, saying, "... I prefer my church in a sad situation and the low-income teaching position in my country to the flourishing freedom and a generous teacher's salary in the Netherlands."[8]

The careful and purposeful building of relations with western Protestant universities later proved to be very useful and fruitful. Starting from the year 1752, Maria Theresa forbade the dormitory teachers to be paid by the city of Debrecen. Consequently, it became a matter of particular concern for Hatvani to obtain financial support from foreign (English, Belgian, Dutch, Swiss) Protestant churches. His correspondence turned out to be very successful. Ever since, grants have been coming in continuously for the Reformed College of Debrecen.

István Hatvani's work brought fundamental intellectual and practical development to the Debrecen Reformed College in several areas. Hatvani played a timeless role not primarily in research work but in the efficient transmission of the most modern scientific results of the time. The most important scientific fields in which he took a pioneering role in our country are mathematics, probability calculation, statistics, engineering training, experimental physics, including electricity, astronomy, and especially the introduction of the subject of chemistry into Hungarian education. In the preface to his book *Introductio principia philosophiae solidioris*, he formulates the basic principle of his entire teaching system and pedagogical creed: "And at the very beginning of my career, I set myself the rule that I should not accept anything thoughtlessly and that I should not hastily impose anything on my students as true and certain, only things that have been proven to be true and certain by longer reflection and more serious investigation."[9]

---

[8] RÉVÉSZ, Imre (1871): Hatvani István, 1718–1786. In: *Vasárnapi Újság* [Sunday Newspaper]. 6. 69–71. [The translations of all, originally non-English quotations belong to the author of the article.]

[9] HATVANI, István (1757b): *Bevezetés a szilárdabb filozófia alapelveibe* (Original title: *Introductio ad principia philosophiae solidioris*). Transl. Péter Tóth. Budapest, Debreceni Akadémiai Bizottság, 1990. 1.

2. Mathematics

Hatvani's mathematical activity can be well documented based on printed works. The inaugural for his appointment to professorship, held in January 1749, was published in the journal *Museum Helveticum*.[10] The title of the inaugural lecture was *De matheseos utilitate in theologia ac in physica necessitate* [On the Usefulness of Mathematics in Theology and Its Necessity in Physics].

In his inaugural, Hatvani emphasized that mathematics is one of those sciences whose results cannot be the subject of debate. Mathematics is never wrong in its conclusions. Therefore, according to Hatvani's view, we must first of all get to know the basic principles and methods of this science so that we can then find the truths more easily with their help. With certain conclusions, we should be able to filter out new truths without any mistakes. Theologians are also led by the application of the methods of mathematicians to form correct concepts about God and the divine religion. Although their sole vocation is to preach and teach the truths of the Christian religion, in order to convince their students and opponents of the truth of the dogmas, mathematics will always be of great help to them. Also, with the help of mathematics, we can effectively convince atheists, natural scientists, and deists of their errors and prove to them that there are certain things in nature that we cannot comprehend with finite reason, but whose existence and truth would be, nevertheless, nonsense to deny or cast doubt on.

With the help of several concepts belonging to the field of mathesis (e.g. the asymptote of the hyperbola, the approach of irrational numbers with fractions, the sum of an infinite series, or the interpretation of the differential ratio), he tries to create a connection between theology, philosophy, and mathematics. As the concept of infinitely large or infinitely small plays an important role in each of these sciences, he tries to explain the role of infinity.

Above all, Hatvani points out the backwardness of mathematical culture in Hungary. He then goes to great lengths to prove how important a role mathematics plays in the whole range of practical sciences. That is why sciences also using mathematical tools obtain solid results. However, in the course of expressing his ideas,

[10] HATHVANI, Stephanus (1751): Oratio inauguralis de matheseos utilitate, in qua ostenditur. In: *Museum Helveticum. Particula XX. Turici*. 531–557.

he emphasizes not so much mathematical knowledge but rather the importance of his methods and logical thinking. However, even more essential than this is that he goes on to prove the applicability of mathematics through numerous examples taken from practical sciences – namely, its use in agriculture, technology, the design of aqueducts, mills, buildings, the division of inheritance, the lifting of loads, as well as military technology, the construction of ramparts and trenches, the siege of castles, etc., in which mathematics cannot be ignored at all. In Hatvani's opinion, the economic life of our country suffers precisely because of the neglect of mathematics.

Within mathematics, Hatvani taught not only arithmetic and geometry but also plane and spherical trigonometry. In connection with this, he presented a practical solution to various land surveying tasks. Furthermore, differential and integral calculus, as well as civil and military architecture were also part of the subject.[11]

Hatvani's success in teaching applied mathematics is shown by the fact that from the 1760s, more and more "geometers" and "mathematicians" emerged from the students of the college (e.g. 1765 – Ferenc Szokoli; 1779 – György Kováts, who became Debrecen's city engineer and a good copper engraver; 1783 – István Szakáll; geometer Mihály Rétei; mathematician István Horváth). Their number started to increase especially from 1786. On 5 January that year, Joseph II ordered a survey of the country's territory, and eight of the Debrecen students joined the ranks of surveyors over the course of the year.[12] The best-known example is Ádám Pálóczi Horváth[13] (1760–1820), the poet who studied at the College between 1775 and 1780 as an "engineer". As a professional land surveyor, he acquired considerable fortune through this occupation. On the basis of the course material submitted by Hatvani, it could be concluded that the engineering education developed at the college in Debrecen at this time exceeded

[11] HORVÁTH, Róbert (1963): *Hatvani István professzor (1718–1786) és a magyar statisztikai tudomány kezdetei* [Professor István Hatvani and the Beginnings of Hungarian Statistical Science]. Budapest, Közgazdasági és Jogi Kiadó. 68.

[12] TÓTH, Béla (1988): A kollégium története a XVIII. században. In: Barcza Lajos (ed.): *A Debreceni Református Kollégium története* [The History of the Debrecen Reformed College]. Budapest, Magyarországi Református Egyház Zsinati Iroda Sajtóosztálya. 103.

[13] FEHÉR, Katalin (2002): *Hatvani István és tanítványai* [István Hatvani and His Students]. Budapest, Országos Pedagógiai Könyvtár és Múzeum. 56–60.

not only the standards of engineering education provided elsewhere in the country but also the standards of engineering education in a similar direction in Austria.

3. Probability Calculation, Statistics

Chapter 3 of Hatvani's book *Introductio...* written in Latin deals with probability calculation. To the best of our knowledge, this is the very first discussion of this topic in Hungarian-language literature that may be deemed almost complete compared to the knowledge of the time. Probability calculation problems have been raised since ancient times, especially in connection with games of chance, which were very fashionable in the Middle Ages. But until the beginning of the 18th century, we could not speak of a coherent theory of probability calculation. After such antecedents, the famous posthumous work of the Basel mathematician Jakob Bernoulli, *Ars conjectandi* [The Art of Conjecture] was published in 1713.[14] Jacob Bernoulli (1654–1705) interprets some concepts of probability calculation through examples related to gambling, explains the elements of combinatorics, and, finally, outlines the foundations of the law of large numbers – this is the most important part of the book, as it laid the foundation for mathematical statistics.

Hatvani was familiar with *Ars conjectandi*, which book provided him the guiding thread for writing the chapter on probability in his own book *Introductio*… It should be especially emphasized that this presentation of the probability calculus in our country only took four decades after the publication of the first such summary work in world literature. This is a big deal if we think about how much mathematics was neglected and despised as a science in our country at that time.

In Basel, Hatvani studied Bernoulli's work in depth, and after returning home, he applied the probability calculation to domestic conditions in several areas. His illustrative examples also relate to life insurance and mortality tables. *Introductio...* provides three death tables, but Hatvani – based on the matriculation records in Debrecen – collected authoritative statistical data himself. His comments regarding

[14] BERNOULLI, Jacob (1713): *Ars conjectandi, opus posthumum. Accedit Tractatus de seriebus infinitis, et epistola gallicé scripta de ludo pilae reticularis*. Basel, Thurneysen Brothers.

infant mortality in Debrecen, analysing its possible causes, are particularly significant.[15] At that time, 19.2% of infants died in western countries in the first year of their lives. Measured in the same period, this figure in Debrecen – taking into account the data for the years 1750–1754 – was almost twice the former, i.e. 34.2%. As a doctor, Hatvani made great efforts to find the underlying reason. He believed that the explanation could be found in the less favourable meteorological conditions, the unhealthy drinking water, the air infected by the swamps, and the low level of education of the midwives.

The merits of this study are the advocacy of statistical data collection and the introduction of insurance mathematics. His efforts were not fruitless. We can find a long list of statistical surveys initiated in our country in the wake of Hatvani's work. A further essential point of reference in this regard emerged when Dániel Ercsei (1781–1836), the later professor of the College, wrote the first Hungarian book on statistics, *Statistica* (Debrecen 1814),[16] influenced by Hatvani's work.

4. Experimental Physics

Relatively few sources are available for Hatvani's performances in physics. We can infer their modernity and quality from the physical apparatus and devices he used, as well as from the level of preparation of his many distinguished students. The name "Hungarian Faust" associated with Hatvani's personality was mainly due to his innovative electrical experiments. After Maróthi, Hatvani also had great merits in the expansion of the Collegium's physical laboratory. He made financial sacrifices to buy the equipment necessary for physical experiments, procuring it from abroad or from merchants in Buda. The acquisition of 20 such new devices is linked to Hatvani's name.

As an unconditional follower of Newton, in 1757, he was familiar with and taught the most modern physics. Not even in 1781 were his physics lectures outdated. He constantly developed and expanded them with new results. Among other things, this is indicated by the fact that in 1776, besides an electric machine, he also bought an

[15] HORVATH 1963.

[16] ERCSEI, Dániel (1814): *Statistica. Közönséges statistica és Magyarország statistikája*. Debrecen, Ny. Csáthy György. (Information in *Magyar Hírlap* 1891/195).

electrophorus[17] invented by Volta a year earlier, in 1775.[18] He also managed to get the young Mihály Kabai to be sent abroad by the college to learn the mechanics of building and repairing demonstration devices.[19]

The subjects of his experimental physics lectures are as follows: mechanics, hydrostatics, chemistry, medical physiology, botany, geography, and astronomy. The materials he presented in physics can also be inferred from the carefully prepared lecture notes of one of his enthusiastic students, Ferenc Újfalusi. The book, which also contains accurate drawings of the tools presented at the lectures, is currently housed in the library of the Reformed College.

Hatvani worked intensively on astronomy, too. Already during his stay in the Netherlands, he took part in astronomical observations. He was considered an equal colleague by his professors in Leiden and was included as a partner in their scientific observations. The study of the lunar eclipse of 25 July 1748 was carried out by Hatvani together with professors Musschenbroek, Lulofs, and Aleman (from Franeker).

At home, he later maintained a professional relationship with the Jesuit imperial astronomer Maximilian [Miksa] Hell (1720–1795), with whom he had a long discussion about his observations on Comet Halley. It is due to his interest in astronomy that Hatvani was the first to determine the geographical latitude of Debrecen, with surprising accuracy. (His measurement differed by just 8' from the value accepted today.)

It was on the basis of two astronomy articles that Hatvani was noticed by the wider international professional public. One of his articles explains the aurora borealis, and another one describes the trajectory of a comet that appeared in that period.[20]

---

[17] FLEMING, John Ambrose (1911): Electrophorus. In: Chisholm, Hugh (ed.): *Encyclopædia Britannica*. Vol. 09. (11th ed.). Cambridge University Press. 237.

[18] NAGY, Mihály (1989): Fizika és a 450 éves Debreceni Református Kollégium [Physics and the 450-Year-Old Debrecen Reformed College]. In: *Fizikai Szemle* [Physical Review]. 1989, 3. 96–104.

[19] JAKUCS, István – ZEMPLÉNI, M. Jolán (1962): Debrecen és a magyar fizika kezdetei [Debrecen and the Beginnings of Hungarian Physics]. In: *Fizikai Szemle* [Physical Review]. 1962, 12. 361–368.

[20] JAKUCS, István – BARNA, Péter (1957): Hatvani István. In: *Fizikai Szemle* [Physical Review]. 1957, 1. 3–9.

5. Chemical Work

Hatvani is one of the pioneers of chemical education and research in Hungary. In 1777, he published a book in Latin in Vienna about the thermal waters around Nagyvárad:[21] *Thermae Varadienses examini physico et medico subjectae, item de illarum usu salutari: simul cum observationibus medicis, nec non de sale medio in iis contento. Cujus occasione dissertatio inseritur De natura salium. Nominatim vero de salibus qui circa Debrecinum colliguntur. Nitro nostri temporis, et veterum, seu natro id est, alcalino fossili, vel saponario Debrecinensi.*

Viennae. 1777. [The Thermal Waters of Várad, Subjected to Physical and Medical Examination, and Likewise on their Salutary Benefits: At the Same Time with Medical Observations, Not Least on the Common Salt Contained in Them. In Connection with Which the Treatise on the Nature of Salts Is Inserted. Namely on the Salts Which Are Collected in the Vicinity of Debrecen. On the Soda (Sziksó) of our Time and of the Ancients, or Natron, on the Vegetable Alkali, i.e. the Soap Salt of Debrecen].

His 208-page book entitled *Thermae Varadienses...* contains chemical treatises, the title indicating that he determined the chemical composition of the water of Félixfürdő [Romanian: Băile Felix] and Püspökfürdő [Romanian: Băile 1 Mai] near Nagyvárad. Being a doctor, he could also explain their medicinal effects. He investigated the salinization of soils and the medicinal use of native soda (*sziksó*) as a raw material. His investigations in this regard were extremely modern.

From the point of view of the history of science, some of the sentences of his mentioned book bear great significance: “Since the science of chemistry was almost unknown in Hungarian academies and schools, at least until the seventies of this century, I tried to contribute something. From 1750 on, my students are not inexperienced in this area of natural sciences either.”

[21] HATVANI, Stephano (1777): *Thermae Varadienses examini physico et medico subjectae, item de illarum usu salutari: simul cum observationibus medicis, nec non de sale medio in iis contento. Cujus occasione dissertatio inseritur De natura salium. Nominatim vero de salibus qui circa Debrecinum colliguntur. Nitro nostri temporis, et veterum, seu natro id est, alcalino fossili, vel saponario Debrecinensi.* Viennae, Rud. Graeffer.

The telling words above confirm that he was the initiator of higher chemistry education in Hungary in 1750, preceding Selmecbánya Mining Academy by more than a decade and Nagyszombati University by two decades.

Hatvani also presented chemical experiments in his physics lectures. This is evidenced by a surviving note on which he ordered hydrochloric acid, sulphuric acid, and nitric acid on behalf of the College, marking *pro experimentis physichis*. His experiments could still be qualitative analytical procedures.[22] We know from his autobiography that he carried out the experimental work "under the guidance" of Johann Heinrich Winckler (1703–1786), a teacher of philosophy and physics in Leipzig, and he probably used the book *Institutiones mathematico-physicae experimentis confirmantae,*[23] published in 1738, as a guiding thread. Although this book provided a description of salts in brief and general terms, Hatvani discussed the issue of salts very thoroughly, and in close connection with practice, as part of the chemistry he taught.

In his time, chemistry did not yet have solid foundations; so to speak, they were in the initial development stage of learning about the material. In that period (the second half of the 18th century), each small accomplishment could be a valuable contribution to the overall scientific achievements of chemistry. Dealing with salts partly helped the theoretical development of chemistry and partly benefited technical and economic life. The significance of István Hatvani's chemical work must be sought among the latter. If we think about it, the chemical industry knowledge of that time was already required and used by the craft industry – for example, in Debrecen the leather, soap, metal industry, ceramics, etc.

Certainly, Sámuel Tessedik, a student at the college, was greatly influenced by Hatvani's investigations and lectures on *szikső* in the Debrecen area. In 1780, this highly talented and strong-willed student founded the first Hungarian agricultural institute in the town of Szarvas. Following and drawing on Hatvani's chemical experiments with the *szikső* around Debrecen, Tessedik – far ahead of his time – achieved great successes in making useless, barren lands fertile. Through his careful experiments, he was able to

[22] SZABADVÁRY, Ferenc – SZŐKEFALVI NAGY, Zoltán (1972): *A kémia története Magyarországon* [History of Chemistry in Hungary]. Budapest, Akadémiai Kiadó.

[23] WINCKLER, Johann Heinrich (1738): *Institutiones mathematico-physicae experimentis confirmantae.* Leipzig.

improve his saline soils to such an extent that an acre of land yielded a profit worth 150 forints even in the driest year. He made significant contributions to the afforestation of the saline soils of the Great Plain: over three decades, he raised approximately 12,000 saplings of 300 species on the saline soils.[24]

Hatvani's chemical work was continued at the Reformed College by one of his students, Pál Sárvári (1765–1846), who established a department for mathematics and physics in 1798, where he taught chemistry as well as physics.

6. Teaching and Medical Work

Hatvani began his lectures at the Debrecen Reformed College on 20 January 1749. In his autobiography, which he began in March 1752, he presents the list of lectures in nine points, as can be seen below, indicating their scope as well.

1. Lectures Joh. according to Gottlieb Heineccius's history of philosophy, 20 sheets.

2. Explanation of the basic principles of philosophy, in 53 paragraphs, cc. 6 sheets.

3. Ontology Joh. according to H. Winckler, 14 sheets.

4. *Natural Theologia*, also based on Winckler but expanded to 16 sheets. Here he notes that he gave these lectures in the winter because in the summer, when the weather was good, he taught mathematics.

5. Lectures on cosmology and general physics (*Physica Generalis*): 16 sheets. He held this from January 1752 to March 1753.

6. Experimental physics, which, however, included the basic principles of chemistry, botany, medical physiology, geography, hydrostatics, as well as all areas of mechanics and the basics of astronomy. He notes that he was engaged in these fields for a period of three years, up until 2 December 1752.

7. Ethics – 46 sheets. He taught this throughout the year 1750.

8. Natural law (*Ius naturale*) according to J. G. Heineccius, in § 160. 40 sheets. He started this at the end of 1752 and finished it in a year.

[24] FEHÉR 2002, 53.

9. Explanation of William Derham's physico-theology. 3 and a half sheets. He translated this from French into Hungarian and delivered it every Sunday throughout the summer of 1752.[25,26]

He renewed education, introduced new subjects, presented spectacular experiments in his classes: there were times when he even managed to induce lightning. He fascinated the students with his experiments. Consequently, magical stories about his special abilities have sprung up. There were stories about him getting the black book from the throat of a snake, which made him master of the devils; that he conjured water on the floor of the dancing hall; he tapped the table leg, from which Tokaj wine was dripping; and a magic ring warned him of the dangers.[27]

In addition to improving the knowledge of his students, he was also concerned about their health. In 1775, Hatvani founded a dormitory hospital, adding a hospital fund and a patient fund. He became the first school doctor. He gained a reputation not only as a teacher but also as a medical doctor. Hatvani worked as a real school doctor: he treated sick students, gave health lectures, and managed the school hospital. During the discussion of the study schedule, he objected to mental strain and, for example, the teaching of mathematics lectures in the early hours of the winter morning. This time, he wanted to spare the eyes of the students.[28] He trained as a city doctor and then as an inspector of pharmacies in the city of Debrecen and the county of Bihar. The news of his medical successes spread far and wide. Patients even came to him from abroad.

7. Science and Religion

How did Hatvani relate to the prevailing ideas of his time, the Enlightenment?[29] Feudal and Catholic Europe had lost their unity as a result of bourgeoisification and in

[25] LÓSY-SCHMIDT 1931, 214.

[26] HATVANI 1757a.

[27] B.F.I. (1796): *Bódogh Gyula ajándéka. Hatvani életéből fennmaradt töredékek* [Surviving Fragments from Hatvani's Life). Debrecen, Déri Múzeum, Number: Szap. 1907. 377.

[28] ELEKES, György (1937–1938): Data for the Development of the School Medical Institution. In: *Iskola és Egészség* [School and Health]. 273–278.

[29] SZABÓ, Botond (1987): Hatvani európaisága [Hatvani's Europeanness]. In: *Confession*. 1987, 1. 35–41.

the wake of the Reformation; Hungarian culture split into two poles in legal terms as well. The Protestant party was tied to the Low Countries, Switzerland, and England, which were at the forefront of civil development. And while no Protestant student at Hungary's sole university, in Nagyszombat, obtained a doctorate in medicine in 1768, the Hungarian Reformed could train at 24 western universities.[30] Between 1700 and 1790, we know of more than 3,000 Protestant peregrines.[31]

What characterized Debrecen on the edge of Europe? The customs decree of 1754, which served the interests of the unified Habsburg Empire, eroded Debrecen's long-distance trade.[32] Its society was made up of peasants, farmers, industrialists, merchant nobility, and the noble-ecclesiastical-secular intelligentsia resulting from their amalgamation, which had to reckon with the mistrust and even hostility of the Habsburg power. Despite the deteriorating economic environment, with the College and the printing house, there was a relatively significant number of educated intellectuals in the background capable of scientific performance measurable by international standards. The intensive relations with the Protestant West prevented the provincialization of the intellectual sphere until the end of the century.

The literature on Hatvani also deals with the relationship between the professor and the Enlightenment. It was difficult to identify him with the materialist line of the Enlightenment, as Hatvani was deeply religious. Thus, against the trends of the Enlightenment that broke with religion, Hatvani is connected to his admirer, Newton, who was also a religious figure.

Based on his studies, his work as a teacher, his outlook on life, and his theological view, the question remains as to how Hatvani reconciled his faith and knowledge. His prestigious education acquired on home soil was defined by two periods. András Kármán, who visited Utrecht and Leiden, paved his way at the Losonc high school. He taught philosophy, logic, history, and mathematics based on the works of Wolff, Heineccinus,

---

[30] KOSÁRY, Domokos (1980): *Művelődés a XVIII. századi Magyarországon* [Culture in Eighteenth-Century Hungary]. Budapest, Akadémiai Kiadó. 127.

[31] KOSÁRY, Domokos (1981): Értelmiség és kulturális elit a XVIII. században Magyarországon [Intellectual and Cultural Elite in 18th-Century Hungary). In: *Valóság*. 24, 2. 11–20.

[32] BAJKÓ, Mátyás – BALOGH, István – GYIMES, Sándor (1981): *Debrecen története 2. (1693–1948)* [The History of Debrecen]. Debrecen, Debrecen Megyei Városi Tanács V. B. 379.

and Weidler. Hatvani's other period of education, significant from the point of view of the Enlightenment, was defined by his encounter with the Newtonian approach as a student of Sámuel Szilágyi at the Debrecen College.

On his way to Western Europe, he studied in Switzerland and the Low Countries. The atmosphere of both countries was extremely tolerant in relation to contemporary Europe. Hundreds of thousands of French emigrants, persecuted Protestants, and free thinkers were living in these countries. A significant number of works were published here that could not be published elsewhere in Europe. However, it is true that Switzerland and the Netherlands tolerated rather than approved the radical religious criticism of the Enlightenment. The influence of Calvinism and the "reasonable orthodoxy" proclaimed by Samuel Werenfels in Basel was manifested in all areas.

Some characteristics of Professor Hatvani's operation point to enlightened pedagogical aspirations. Such is the illustrative method and the service to the practical needs of life. On the subject of freedom of conscience and religion, Hatvani wrote his work *De jure Summorum Imperantium*[33] already during his time in Basel. According to him, it is against the universal human value to force dissenters to change their opinion. He built his understanding of tolerance on the characteristics of human cognition. His conclusion: apart from our intellect, we have no means of recognizing the truth, and since religion is hidden in the intellect, opponents can only convince each other with rational arguments.

Hatvani discusses what kind of treatment atheists deserve. Accordingly, if an atheist publishes their thoughts about a supreme being, it is nothing more than their private opinion, which, right or wrong, is harmless in itself. It is not necessary to ban such a writing. However, if atheists bypass both sound reasoning and the truths of the Holy Scripture, and if they seek to recruit followers by the force of their arguments, it becomes dangerous to society and should be banned.

His inaugural presentation reveals the rational colour of his religiosity. Its main purpose is to prove that the cultivation of reason is beneficial to religion and that philosophy being the mother of heresy is an unfounded prejudice. In his didactic argument, he

[33] HATHUANIUS, Stephanus (1757): *De jure summorum imperantium in religionem et conscientiam civium commentatio* ... Apud Joh. Rudolphum Im Hof, Basileae.

sometimes resorts to unusually strong expressions. According to him, anyone who proclaims that arithmetic, botany, and medicine can be learned more efficiently from the Bible than from the works of Newton, Bernoulli, Linné, and Boerhaven is insane. However, he considers science to be a weapon that can harm and benefit man equally, so we must learn how to use it.

In addition to modern natural scientists, he refers to the ideas of Locke and Leibnitz, which also became his favourite thesis in his *Introductio*… – accordingly, certain places in the Scriptures do not contradict reason but are above it. He also presents his position on the changed relationship between faith and knowledge. Contrary to the old orthodox theology of "Do not investigate but believe", Hatvani's position is that he investigates first, then believes, and accepts as true only what he has carefully investigated. With this, he marked his own place on the road to theological rationalism.

In addition to philosophical truth, Hatvani also knows religious truth. According to him, science and religion are independent forms of consciousness. In his eyes, they are equivalent forms of consciousness that presuppose each other in the context of humanity's prosperity. It breaks with the doctrine of verbal inspiration, with the literal interpretation of the Bible. He derives true religion from the relationship between Reason and Scripture.

References:

BAJKÓ, Mátyás – BALOGH, István – GYIMES, Sándor (1981): *Debrecen története 2. (1693–1948)* [The History of Debrecen]. Debrecen, Debrecen Megyei Városi Tanács V. B.

BERNOULLI, Jacob (1713): *Ars conjectandi, opus posthumum. Accedit Tractatus de seriebus infinitis, et epistola gallicé scripta de ludo pilae reticularis*. Basel, Thurneysen Brothers.

B.F.I. (1796): *Bódogh Gyula ajándéka. Hatvani életéből fennmaradt töredékek* [Surviving Fragments from Hatvani's Life). Debrecen, Déri Múzeum, Number: Szap. 1907. 377.

ELEKES, György (1937–1938): Data for the Development of the School Medical Institution. In: *Iskola és Egészség* [School and Health]. 273–278.

ERCSEI, Dániel (1814): *Statistica. Közönséges statistica és Magyarország statistikája*. Debrecen, Ny. Csáthy György. (Information in *Magyar Hírlap* 1891/195).

FEHÉR, Katalin (2002): *Hatvani István és tanítványai* [István Hatvani and His Students]. Budapest, Országos Pedagógiai Könyvtár és Múzeum.

FLEMING, John Ambrose (1911): Electrophorus. In: Chisholm, Hugh (ed.): *Encyclopædia Britannica*. Vol. 09. (11th ed.). Cambridge University Press.

HATHUANIUS, Stephanus (1757): *De jure summorum imperantium in religionem et conscientiam civium commentatio* ... Apud Joh. Rudolphum Im Hof, Basileae.

HATHVANI, Stephanus (1748a): Animadversiones theologico-criticae. In: *Museum Helveticum. Particula VIII. Turici*. 575–625.

(1748b): *Dissertatio inaug. physico-medica de aestimatione morborum ex facie*. Basiliae, Typis viduae Ioan, Christ.

(1751): Oratio inauguralis de matheseos utilitate, in qua ostenditur. In: *Museum Helveticum. Particula XX. Turici*. 531–557.

HATVANI, István (1757a): *Autobiography (in Latin)*. Budapest, Magyar Tudományos Akadémia, Manuscript Archive, Ms 10.378/a.

(1757b): *Bevezetés a szilárdabb filozófia alapelveibe* (Original title: *Introductio ad principia philosophiae solidioris*). Transl. Péter Tóth. Budapest, Debreceni Akadémiai Bizottság, 1990.

HATVANI, Stephano (1757): *Introductio ad principia philosophiae solidioris.* Debrecen, Gregorium Kallai, Typogr.

(1777): *Thermae Varadienses, examini physico et medico subjectae item de illorum usu salutari, simul cum observationibus medicis, nec non de sale medio in iis contento. Cuius occasione dissertatio inseritur, de natura salium nominatim vero de salibus qui circa Debrecinum collegiuntur nitro nostri temporis et veterum, seu nitro idest alcalino fossili vet saponario Debrecinensi.* Viennae, Rud. Graeffer.

HORVÁTH, Róbert (1963): *Hatvani István professzor (1718–1786) és a magyar statisztikai tudomány kezdetei* [Professor István Hatvani and the Beginnings of Hungarian Statistical Science]. Budapest, Közgazdasági és Jogi Kiadó.

JAKUCS, István – BARNA, Péter (1957): Hatvani István. In: *Fizikai Szemle* [Physical Review]. 1957, 1. 3–9.

JAKUCS, István – ZEMPLÉNI, M. Jolán (1962): Debrecen és a magyar fizika kezdetei [Debrecen and the Beginnings of Hungarian Physics]. In: *Fizikai Szemle* [Physical Review]. 1962, 12. 361–368.

KOSÁRY, Domokos (1980): *Művelődés a XVIII. századi Magyarországon* [Culture in Eighteenth-Century Hungary]. Budapest, Akadémiai Kiadó.

(1981): Értelmiség és kulturális elit a XVIII. században Magyarországon [Intellectual and Cultural Elite in 18th-Century Hungary). In: *Valóság*. 24, 2. 11–20.

LÓSY-SCHMIDT, Ede (1931): *Hatvani István élete és művei (1718–1786). I. rész* [The Life and Works of István Hatvani (1718–1786). Part I]. Debrecen, Studium Könyvkiadó.

NAGY, Mihály (1989): Fizika és a 450 éves Debreceni Református Kollégium [Physics and the 450-Year-Old Debrecen Reformed College]. In: *Fizikai Szemle* [Physical Review]. 1989, 3. 96–104.

RÉVÉSZ, Imre (1871): Hatvani István, 1718–1786. In: *Vasárnapi Újság* [Sunday Newspaper]. 6. 69–71.

SZABADVÁRY, Ferenc – SZŐKEFALVI NAGY, Zoltán (1972): *A kémia története Magyarországon* [History of Chemistry in Hungary]. Budapest, Akadémiai Kiadó.

SZABÓ, Botond (1987): Hatvani európaisága [Hatvani's Europeanness]. In: *Confession*. 1987, 1. 35–41.

TÓTH, Béla (1988): A kollégium története a XVIII. században. In: Barcza Lajos (ed.): *A Debreceni Református Kollégium története* [The History of the Debrecen Reformed College]. Budapest, Magyarországi Református Egyház Zsinati Iroda Sajtóosztálya.

WINCKLER, Johann Heinrich (1738): *Institutiones mathematico-physicae experimentis confirmantae*. Leipzig.