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The prominence of Danzig Academic Gymnasium as a cornerstone of scientific developments in Gdańsk

Abstract

The *Danzig Academic Gymnasium* (1558–1817) was one of the first Protestant schools at the college level in the Polish-Lithuanian Commonwealth. It became one of the most famous educational institutions in Europe of the 16–18th centuries. For almost 260 years, it attracted one of the best professors and students of the era. We concentrate on the achievements in science, the role of the City Council Library in the academic life in and outside of the *Gymnasium*, and highlight the activities of the *Danzig Naturalist Society*. In this survey, we feature important representatives of the scientific disciplines present in the *Gymnasium*, both faculty and their students, as well as Gdańsk scientists in general.

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We outline the lasting impact of the *Danzig Academic Gymnasium* on the intellectual life in Gdańsk, the Pomerania region, and some intellectual circles in Europe.

Keywords: *City Council Library, Danzig Academic Gymnasium, Danzig Naturalist Society, education, natural sciences, philosophy of science, Reformation.*

Znaczenie Gdańskiego Gimnazjum Akademickiego jako kamienia węgielnego rozwoju naukowego Gdańska

Abstrakt

Gdańskie Gimnazjum Akademickie (1558–1817) było jednym z pierwszych akademickich luterańskich liceów w Rzeczpospolitej Obojga Narodów. Stało się ono jedną z najświetniejszych szkół w Europie doby XVI–XVIII wieku. Przez prawie 260 lat przyciągała ona jednych z najlepszych profesorów i uczniów tamtego okresu. Koncentrujemy się na osiągnięciach w naukach przyrodniczych, roli Biblioteki Senatu Gdańska w życiu Gdańskiego Gimnazjum Akademickiego i poza nim, a także przedstawiamy działalność Gdańskiego Towarzystwa Naukowego. W tym przeglądzie przedstawiamy reprezentantów dyscyplin przyrodniczych Gimnazjum, zarówno profesorów, jak i ich studentów, oraz innych naukowców gdańskich. Szkicujemy trwały ślad, jaki Gimnazjum odcisnęło na życiu Gdańska, regionu pomorskiego oraz niektórych kręgów intelektualnych Europy.

Słowa kluczowe: *Biblioteka Rady Miasta*, *Gdańskie Gimnazjum Akademickie*, *Gdańskie Towarzystwo Przyrodnicze*, *edukacja*, *filozofia nauki*, *nauki ścisłe*, *Reformacja*

1. Introduction[1]

This work constitutes a comprehensive study of the subject, which was a centerpiece of scientific and cultural life in Gdańsk for 259 years, spanning 1558–1817. We outline the extent and impact of *Danzig Academic*

[1] I dedicate this paper to my wife, Dr. Joanna Dankiewicz-Sznajder.

Fig. 1. The Holy Trinity church, Deurer 1996.

Gymnasium on the development of Gdańsk and on the well-being of its inhabitants. The activities of the Danzig Academic Gymnasium (DAG or the Gymnasium) have been pretty well documented in the collection of the Gdańsk Library of the Polish Academy of Sciences and in the Gdańsk Municipal Archives.

There exist several classical sources on the history of *Athenae Gedanenses*, like Praetorius[2] 1713, Hanow 1756b, *Acta iubilaei* 1758, Hirsch 1837, and Skrzypek 2000[3]. The monograph Curicke 1687, serves as a 17th century source of information on Gdańsk in general. For newer ones, see *Gdańskie Gimnazjum Akademickie* 1959 and a recent multi–authored monumental opus, *Gdańskie Gimnazjum Akademickie* 2008[4], with a critical analysis of historical sources.

The dominant research method applied in this work is a synthetic approach to the history of Danzig Academic Gymnasium; that includes history of its professors, its students (in both cases–the most representative figures), and selected chapters on the history of Gdańsk. The reason for choosing such a methodology was dictated by the fact

[2] Ephraim Praetorius (1657–1723).

[3] A collection of excerpts of selected original texts (in Polish).

[4] For relevant reviews of *Gdańskie Gimnazjum Akademickie* 2008, see Żołądź-Strzelczyk 2013; Awianowicz 2009 and Maliszewski 2013.

that a general research on history of DAG has been well-documented, while the recently growing interest and number of publications related to DAG both in Poland and outside, requires a systematic and unified approach to the Gymnasium paradigm. We hope that, at least in part, we achieved this goal. Our main intention was to put emphasis on the science development in DAG, the extent of the research conducted there, a creation of two research societies in Gdańsk, the influence, mostly *Danzig Naturalists Society*, on increasing a scientific consciousness of the city inhabitants via public performances of scientific experiments, astronomical observations, and popularization of the Enlightenment ideas. The Society was in touch with various international scientific communities and was exchanging the information, as well as published research results both in Gdańsk and abroad. A number of recent works in philosophy (ethics including) and history of science have been listed in the Bibliography. It indicates vividly, how much attention the contemporary researchers put to study and understand the efforts of the old masters from Gdańsk.

The present work consists of six sections and the bibliography. We dedicated Section 2 to the history of the Gymnasium; Section 3 provides a brief account on the City Council Library; Section 4 focuses on the activities of the Danzig Naturalists Society, its connections to DAG and the role in the Gdańsk community. In Section 5, we feature important representatives of the Gdańsk intellectual elite, whether professors or alumni of DAG, or both. We put emphasis on the science representatives. Section 6 provides an overall summary of the phenomenon and importance of DAG in science and the local society from the mid-16th century until the beginning of the 19th century.

2.1. An early period

Gdańsk (germ. *Danzig*) – once the largest Hanseatic city, was enjoying a semi–autonomous status. The king Casimir IV Jagiellon (1427–1492) granted this status for its opposition to the Teutonic Order in Prussia, with its own army, legislation, monetary system and jurisdiction; it became an independent entity, Awianowicz 2018. It was an affluent city, which owed its wealth to the coastal location at the mouth of Vistula River.

The city was in a dire need for a decent higher learning institution. Small, mostly elementary parochial schools were not a solution. Gdańsk could afford the best possible schools in Europe, but no one could build a first-class learning institution overnight. The variety of business branches related to maritime industry, like navigation, ship building, astronomy, trade, exchange of goods, stock market and other branches (some extinct now), needed specific knowledge, based on science and mathematics.

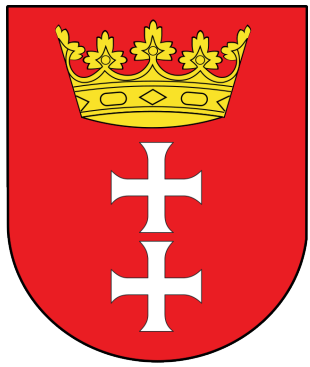

Fig. 2. Gdańsk coat of arms (1457).
Source: *WIKIWAND*; URL: https://www.wikiwand.com/pl/Herb_Gdańska.

For any merchant it was a necessity to be fluent in arithmetic, have some knowledge of stars and astronomy, and know navigation rules, geography and rudiments of physics and mechanics.

The beginning of the 16th century was time of the Reformation. Martin Luther (1483–1546), a German theologian and former monk, by publicly posting his 95–theses manifesto on the doors of All Saints' church and other churches in Wittenberg (1517), initialized a form of disobedience to the Roman Catholic Church. Pope Leon X excommunicated M. Luther in 1521 for spreading heresy. His actions soon started *Lutheranism* and, in general, Reformation. Gdańsk was a fertile ground for the new theological ideas to the point that it became a major stronghold for the Reformation Christianity in the country (Bryćko 2013). The city was attracting ethnically diverse population including Dutch, Jews and Scotts. Many churches became temples of a new faith. The Reformed inhabitants felt safe in Gdańsk, in the Catholic–dominated

Polish-Lithuanian Union. Reformation had an immense influence on education, where the traditional *trivium*, i.e., grammar, rhetoric and logic, was far insufficient for then modern needs. During the Protestant era in Royal Prussia, the academic gymnasiums played an important role. The first one opened in Elbląg (germ. *Elbing*), then in Gdańsk in and Toruń (germ. *Thorn*) in 1568[5]. We focus in this work mainly on the Danzig Academic Gymnasium.

The last guardian of the Franciscan monastery, Johann Rollau, in 1555 ceded it to the City Council, with the intention that it will use the building for educational purposes only. There was much need, caused by a wave of Reformation, in Prussian cities for schools of a classical profile offering a Lutheran education. King Sigismund II August issued an edict granting religious freedom for important Prussian cities (Toruń, Gdańsk, Elbląg) in 1557 and 1558 (March 25, 1557 for Toruń, April 4, 1557 for Gdańsk and December 22, 1558 for Elbląg), thus removed obstacles to establish Lutheran and Calvinist educational institutions. The same year, the City Council created the four-class *Danzig Gymnasium* (*Gymnasium Dantiscanum*), Kubik 1959a, Mokrzecki 2008.

Its first rector was Johann Hoppe[6] (1512–1565), who was earlier working in schools of Chełmno (germ. Kulm) and Elbląg, until the powerful catholic Prince–Bishop Stanisław Hozjusz closed them. The third rector, Andreas Franckenberger (1536–1590), published in 1568 *Constitutio nova Gymnasii Dantiscani*[7], which played a significant role in the embodiment of the programmatic and cognitive foundations of this institution. This constitution (after some updates and improvements) was in force up to the end of DAG (1817), though it contributed at the final period of the school existence to its failure. The document contained the curricula of the subjects taught, along with the list of the faculty. During the war of the city with the king Stefan Batory in 1576, A. Franckenberger left for Wittenberg, where he became a professor of rhetoric and the Gymnasium was in recess (Kubik 1959a, Mokrzecki 2008). In 1580, when the conflict was over, it became *Danzig Academic Gymnasium* with seven chairs (departments): theology, jurisprudence

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[5] Mokrzecki 2008.

[6] F. Schwarz, [in:] *Altpreussische Biographie*, Hrsg. Ch. Krollmann, Bd. I, Königsberg 1941, p. 288.

[7] Franckenberger 1568.

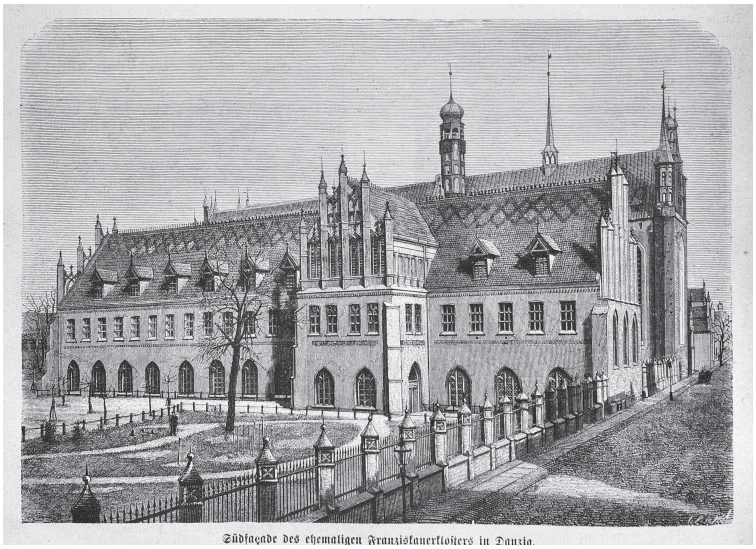

Fig. 3. View of the Holy Trinity church and the Franciscan monastery (1875, the garden view). Source: *Wikipedia*; URL: https://pl.wikipedia.org/wiki/Gdańskie_Gimnazjum_Akademickie.

and history, physics and medicine (with anatomy), philosophy, rhetoric and poetry, Greek and oriental languages, and mathematics. Professors of theology, jurisprudence and history, as well as physics and medicine held doctoral degrees, while other professors usually had master's degrees (some of them had doctorates).

Two more classes at the pre-university level were added (*secunda* and *prima*), so the school had six classes altogether. Foreign universities usually accepted the Gymnasium alumni as the third-year students. By today's standards, it was a college and the academic level of the Gymnasium education was comparable with that of the Bachelor's degree. The professors lectured in Latin and the teaching process was relatively intense[8].

[8] In Mokrzecki 2008, the author states that lower classes had 6 lessons daily, while the academic classes there had 4 obligatory lectures and other courses were elective. Most of the lectures were monographic, where the professors often presented their own research results. On Wednesdays and Saturdays, there were only morning classes. Time slot 4 pm–7 pm was dedicated to the studies in the City Council Library (since 1596), located at DAG.

Jacob Fabricius (1551–1629, born and died in Gdańsk), was the first and with the longest tenure (1580–1629) rector of DAG; a pastor at St. Mary's church[9] since 1578. In 1585, he became a pastor at St. Trinity–the Gymnasium's temple. It was habitual that the rector of DAG, a chair of theology, was there a pastor. St. Trinity church, at that time, was double–denominational (Calvinism and Lutheranism). J. Fabricius, who was a profound educator and a skilled politician, was able to gain a sympathetic ear of both Lutherans and Calvinists in the City Council.

The Gymnasium and a similar type of academic institutions guaranteed a good education not only for the offsprings of patricians and rich nobility, but also less affluent middle-class and even commoners. A huge credit should be given to Pomeranian magnates and patricians who were funding scholarships for both the Protestant and Catholic youth of the diversified social provenance on the Royal Prussia territory. It was not surprising that the Protestant youth were further studying in Prussia (now Germany) and Netherlands, some in England, while the Catholics decided to continue their education in France and Italy, Historia Gdańska 1978. The group of best educated among Polish Lithuanian–Commonwealth middle-class constituted barely 3–8% of the total population, Mokrzecki 2008. Somewhat higher rate was among the Protestant nobility.

The gymnasiums in Elbląg, Gdańsk and Toruń[10] were Protestant institutions, while the Chełmno gymnasium was Catholic. Both types of schools presented different educational philosophies. The majority of scholars teaching in the Protestant institutions were independent thinkers; it resulted, e.g., in an early acceptance (the first half of the 17th century) of the Copernican heliocentric theory[11], which started

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[9] Gdańsk churches, which were hosting elementary/middle schools: St. Mary, St. Peter & Paulus, St. Bartholomew, St. Catherine, St. Barbara, and St. John (Praetorius 1713).

[10] Here is an interesting comparison (Małecki 1971, p. 692): The peak development of the Elbląg gymnasium was in the first quarter of the 17th century (Małecki 1966, p. 58), Toruń gymnasium–in the second quarter (Pawlak 1971, p. 42), and Gdańsk–in the mid of the 17th century (Bodniak 1954, pp. 43–51).

[11] Nicolai Copernici Torinensis, *De Revolutionibus Orbium Coelestium, Libri VI* (*On the Revolutions of the Heavenly Spheres*, in six books) (2nd edition, Basel, 1566). Contemporary edition of *De Revolutionibus* in Polish – 2018, transl. by Jan Baranowski, afterward Maciej Mikołajewski, Robert Szaj; in English – Owen Gingerich 2003 (Digital Edition).

its presence in the Gymnasium curriculum since the beginning of the Department of Astronomy. The merit level of these high schools guaranteed well-paid, secure and prestigious jobs for their alumni, not only in local Gdańsk administration, but also within Polish–Lithuanian Commonwealth.

As we stated before, Gdańsk was very susceptible to Reformation, which at that time meant *Lutheranism* and *Calvinism*[12]. Majority of the professors were coming from the Northern part of the Polish-Lithuanian Commonwealth where Protestantism was ubiquitous, some of them from abroad, but only few from the South of the country. In the 17th century, it was only Samuel Schelwig (1643–1715), who arrived from Leszno. Weakness of Gdańsk middle-class and a Protestant character of the city and the Gymnasium dictated such a situation[13]. The latter circumstance contributed to the fact that no professor of the Jagiellonian University in Kraków moved in to the city at Motława River. Some of the DAG rectors, including Samuel Schelwig, Aedigius Strauch and Abraham Calow, were being offered prestigious positions from various Prussian universities; Schelwig got offers from the University of Wittenberg, Königsberg, Stockholm and even University of Dorpat, and Calow (1612–1686, lat. *Calovius*) – from Wittenberg. Schelwig and Strauch decided to stay in Gdańsk, while Calovius left the Gymnasium. This situation shows that DAG rectors demonstrated a high merit level, high pedagogical and research authority, which directly translated to fame and authority of the school.

During the same century, seven professors were sons of clergy and pastors, one of them was not only a son, but also a grandson of a pastor. Two others were sons of the DAG professors. Both, sons

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[12] In Salmonowicz 1977, the author analyses changes in high school education in the 18th–century Poland. The author described these changes in relation to gymnasiums in Gdańsk, Elbląg and Toruń; he also mentioned some smaller centers: Chojnice, Tczew, Grudziądz and Malbork. He anderscored the role of the National Education Commission (1773). The additional literature on the subject: Pawlak 1972 (Elbląg), Schultz 1941 (Gdańsk) and Tync 1933 (Toruń).

[13] Kotarski 1993. The author gives a detailed account on education of both rectors and professors at DAG. Each professor usually studied at several foreign (mostly Prussian) universities and completed studies with a master's degree or doctorate. Talent, determination and a thorough education was a determining factor for a success as a professor, scholar or an administrator.

of the pastors and/or professors, came from the families, whose fathers obtained a university education. Interestingly enough, in these two cases, also brothers of the professors were university students. Finally, among fathers-in-law of the professors, there were representatives of the power elite or the intellectual elite of the city. Other professors were not offsprings of local elite. Their social provenance was relatively low, but due to their hard work, talent and dedication, were able to advance into the Gdańsk high class. Without family support, they were usually counting on possible scholarships from the City Council to place themselves in the group of the city intellectuals. We recall J. Oelhaf, B.K. Keckermann and J. Mochinger.

We would like to emphasize here that the group of DAG rectors and professors constituted an enclave, which was absorbing newcomers of the same or very similar intellectual and social provenance, including DAG alumni and learned persons recognized already at other European academic institutions, or just clergy. This group did not have a tendency to permeate the power elite. Both the intellectual elite and power elite (the city mayors and city councilors) were keeping a distance. The likely reason for such a situation might be differences in financial and social standing of both groups. In addition, social positions and entitlements were often inherited and pertaining mostly to the city inhabitants, while members of the learned elite quite frequently were the first generation Gdańsk citizens. However, there were some exceptions: Kotarski[14] features Joachim Hoppe (1654–1712), the law and history professor at DAG, who in 1697 became a city councilor and in 1708 – mayor of Gdańsk. Hoppe was not only a talented scholar but also a very efficient administrator.

In Kubik 1959a, the author sketches a panorama of the growth of science in Europe, including countries like England, France, Italy, Netherlands and Prussia in the 16th and 17th centuries. New developments and experimental sciences required novel precise equipment and instruments like microscope (Antonie van Leeuwenhoek (1632–1723), Netherlands, also known for establishing *microbiology* as a scientific

[14] Kotarski 1993. Gdańsk was quite an attractive place to live; for the time of the beginning of the 17th century, it was the biggest modern port city at the Baltic Sea. The 16th–17th centuries were the peak period for its affluence, economic and cultural development.

discipline), telescope, vacuum pump (Otto von Guericke[15], 1602–1686), barometer (Evangelista Torricelli, 1608–1647, Italy), and chronometer (Christian Huyghens, 1629–1695, Netherlands). In the sequel, we will put an emphasis on the development of science in the Gymnasium during its activity years, that is, within 1558–1817.

Since its beginning, DAG had a humanistic profile and became a stronghold of the classical education: poetry, rhetoric, logic, languages (including the ancient ones). Gymnasium also fostered the studies in history, theology, and jurisprudence. It had a strong curriculum in philosophy. Many former students became Lutheran preachers and orators; some of them became theologians. After all, it was the main call of the school. Thus, the most important was the chair of theology. The next one was the chair of jurisprudence, and in 1603, the history chair became a part of the law department. Even though classes in medicine started with A. Franckenberger (Szarszewski 2014), the chair of medicine and anatomy materialized in 1584, with Johann Mathesius as the chair. Next in a row was the chair of rhetoric, then philosophy, which at the time of Enlightenment did not occupy any specific place, then mathematics, medicine with anatomy, Greek, Hebrew, oriental languages. It reflected upon the university ambitions of the Gymnasium. The Polish language class placed last[16].

Nevertheless, the spectrum of science subjects in the Gymnasium was wide and included arithmetic, geometry, geography, chronology, elements of cosmography, physics, mechanics, civil and military engineering. Chemistry was introduced later. Mathematics was not taught on

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[15] Physicist, inventor and mayor of Magdeburg.

[16] As *Gedanopedia* 2021a indicates, there were 20 lecturers of Polish language altogether (including K.C. Mrongovius) in the history of the Gymnasium. Polish class was created in 1589. See also Praetorius 1713.

In his historical sources collection, Kubik 1961, presented names of several Polish language lectors, including Stephani Jan Łaganowski (1625–1694), who initially was a Catholic priest, then became a Protestant in Königsberg (1666). In 1678–1690, was running a private school with Polish language at the Gymnasium. Another lector featured by Kubik 1961, was Jacob Praetorius (Masurian), lector of Polish at DAG in 1656–1679. He was teaching only lower classes. A lector, not related to the Gymnasium, was Sigismund Koncewicz Kotzer, a private teacher, who, in 1668, was asking the mayor of Gdańsk for permission to run a school "so the children would be able to maintain Polish language".

a continuous basis and this was the reason why it occupied the penultimate position. Despite the fact that the majority of math professors (P. Crüger, germ. *Krüger*, F. Büthner, P. Pater, H. Kühn) were thoroughly educated at foreign universities, higher classes in DAG (*secunda* and *prima*) were assigned only two hours of math per week (1697–1724). In 1733, these increased from two to three hours in *secunda* and to five in *prima*. The expected time for graduation from each of these two academic classes was two years.

In Czerniakowska 2008a and 2008b, we find quite a detailed list with numerous commentaries on textbooks used in DAG in teaching mathematics and physics. In many cases, those books were of a foreign authorship, but there were more than a few, penned by the DAG mathematics/science professors. We will address the issue of the DAG textbooks later.

The remunerations of math professors were lower than those of the professors of other disciplines. Thus, they were forced to offer private lessons, were hired as city surveyors, or working as book and calendar editors. These extras were often higher than their official salaries. To illustrate, rector had the highest annual salary (1,800 florins), the lowest–professors of medicine and mathematics (about 600 florins). Gdańsk professors of other disciplines were earning 1,000–1,400 florins (University of Wittenberg professors were getting about one-third of this amount). For a comparison, mayor of Gdańsk was making 2,000 florins and a councilor of the Main City–1,200. After all, the professors lived a good life and did not complain. Obviously, the main source of income for mayors and councilors were their personal assets[17].

For many professors at the Gymnasium, it was their ultimate position, some of them were active until death (the average life expectancy for this population was about 63 years).

Majority of the faculty were not limited to only one discipline. Someone who was lecturing mathematics might have been active in astronomy, geography, or physics. Those years, physics was not treated as a separate discipline, rather a part of mathematics or medicine (thus term *physician*). Johann Mathesius (1544–1607), taught physics in 1584––1607; similarly professor of medicine, Peter Lossius (1588–1639), also

[17] Kubik 1959a; Kizik 2008; Kotarski 1993.

professor of medicine, Adrian Pauli (1633–1684), Michael Schmidt, and Bartolomew K. Keckermann (1572–1609), professor of philosophy.

The 17th century was the most fortunate period in the Gymnasium development, despite the fact that the plague in 1602 decimated the city population killing one-third of it (15,000 inhabitants, including many DAG students). There were several reasons for growth of the school, including increase of prosperity of the city and the whole Polish––Lithuanian Commonwealth, relatively stable international situation, and influx of new philosophical, scientific and religious trends of the late Renaissance and early Enlightenment era. The last but not least reason was a constantly growing reputation of the Gymnasium, not only in Poland, but also in foreign countries. Danzig Academic Gymnasium established itself as one of the finest academic institutions in Europe.

2.2. The declining years of the Gymnasium

The condition of the city in general and the Gymnasium in particular, at the beginning of the 18th century was low. It was dictated by a difficult economic situation of the region related to various wars taking place on the Polish–Lithuanian Commonwealth territory, a devastating 1709––1710 epidemic, and denominational controversies. All these reasons contributed to the declining academic rigor at the Gymnasium in the first half of the 18th century. The emphasis was put, as it was a century ago, on theological education and philosophical-logical development. The science disciplines, along with mathematics were treated as those of a lesser importance. Case in point: Chair of mathematics vacancy (1702–1705) after professor Sahm's leave and later (1724–1733), after professor Pater's death. There were only 4 hours weekly designated to teach science classes (astronomy, geography, mathematics, and physics), while theological disciplines: History of the church (dogmatic or fundamental), theological disputations and humanities (rhetoric, logic, Latin, Greek, Hebrew), were granted weekly 10 hours of lectures each (Kubik 1959c).

P. Pater was very much supporting a development of technical education; actually, he was introducing technical education to the DAG students, which evoked a strong opposition from some parents, to the point that P. Pater made a statement: "Wrong are those who think that

mechanical exercises are below dignity of a free mind[18]." Evidently, P. Pater was a forerunner of the *sociological positivism*.

Since 1720, the situation of the Gymnasium was terrifying. Professors' earnings were low, so they were in need for an extra income. Each year, the number of students was going down. Many of them were not interested in learning and lecturing in Latin was not conducive to the discipline. The professors were forced to teach in German. The students were often in opposition to their professors. This situation was directly leading to the anarchy. In 1744, a student revolt took place on the Gdańsk streets against the school administration. The rebellion was a reaction to the punishment that the superiors applied for the students' participation in the mutiny.

It was clear that the reforms were necessary in order to improve moral conditions and to end an unequal treatment of students based on their financial status. Both professors and the City Council were concerned about the teaching improvement and overall merit level. The education system, largely based on the A. Franckenberger's constitution introduced 175 years ago, became obsolete. In Kubik 1959c (pp. 174––181), the author presents a detailed record of reforms that either were already undertaken or they were planned. The best professors[19], like Daniel Gralath II, were helping to improve the situation. The style of the school governing was evolving and the Gymnasium was gradually losing its autonomy. There were city officials, inspectors, etc., who were dictating changes in the syllabi and programs of study, thus making the didactic process much more formal.

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[18] *Catalogus Lectionum* 1716 (see Kubik 1959c, p. 172). *Pater was the last math professor in Gdańsk who was developing Science according to the unity of all sciences, so characteristic to the second half of the 17th century. As a Gdańsk innovator in mechanics, he remained conservative in his religious and philosophical convictions, yet far away from being an orthodox* (Kubik 1959b, p. 112).

[19] Daniel Gralath II (1739–1809), son of Daniel Gralath I, studied at GAD in 1752–1757, then in Königsberg, where obtained degree of jurisprudence doctor in 1763. Became a law and history professor at the Gymnasium (1764–1809). He was an initiator of educational reforms at DAG since 1765. Served as Rector of DAG in 1799–1809; this position was vacant for 5 years. Apart from legal treatises, he published *Versuch einer Geschichte Danzigs aus zuverläßigen Quellen und Handschriften,* the first research synthesis of the Gdańsk history up to 1752 (Vols. 1–2, Königsberg 1789, Vol. 3, Berlin 1791). His aim was also to popularize history of Gdańsk among its citizens, see Cieślak 1994b.

It is noteworthy to mention several people who were active at the end of the Gymnasium educational endeavor. Christian Gottfried Ewerbeck (1761–1837), born in Chojnice (germ. *Könitz*), studied philosophy in Königsberg and Halle. He replaced Johann T. Bartoldi (1736–1788) in 1789, as a chair of mathematics and, in 1790, also became a professor of philosophy. In 1790–1812, he was the dean of the City Council Library. Ewerbeck was the last rector of DAG (1813–1817). After the Gymnasium stopped its academic activities in 1817, by the decision of the Prussian government, Ewerbeck became the principal of the Gdańsk School of Navigation. Finally, it was Johann Georg Trendelenburg (1757–1825), town councilor, professor of Greek and oriental languages, since 1806 – Greek and Hebrew at DAG who reinstated Polish language class at that decadent period of Gymnasium. Christopher Celestin Mrongowiusz tutored Trendelenburg in Polish.

Philipp A. Lampe (1754–1827), a former student of DAG, doctor of medicine since 1776, a very active faculty, professor of mathematics (1792–1814) who was a member of the Danzig Naturalists Society. He twice became its president, once in 1886 and then in 1809. In 1794, Philipp A. Lampe became a member of the Kaiserlich Leopoldinisch-Carolinische Akademie der Naturforscher.

Friedrich Ludwig Wachter (1792–1817), was an extremely gifted mathematician, former student of Carl Friedrich Gauss (1777–1855), the last Gymnasium professor of mathematics (1816–1817). Gauss was deeply shocked by the news of his death in Gdańsk, see Dunnington 2004 (p. 179), its circumstances remain unknown. With the Gauss's encouragement, Watchter conducted research in the non-Euclidean geometry[20] and even started to collect the material for his future book[21]. Professor Wachter was also a member of the Danzig Naturalists Society. For more on his scientific activities, see Stäckel 1900. F.L. Wachter's name closes the honorable list of twelve mathematics professors at the Gymnasium in the years 1580–1817. All of them became featured in this work.

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[20] Gauss had already developed the hyperbolic trigonometry and asked Wachter to do the same for himself. Gauss likely wished his results to be double-checked. It was before J. Bolyai (1823) and N. Lobachevsky (1826) made independently their stellar discoveries (see Greenberg 2008).

[21] See *Wikipedia* 2021a and a relevant literature therein.

Tab. 1a. Rectors of the Danzig Gymnasium[22].

1. Johann Hoppe 1558–1559	3. Andreas Franckenberger 1567–1576
2. Heinrich Moller 1560–1567	4. Vacat 1576–1580

Tab. 1b. Rectors of the Danzig Academic Gymnasium[23].

1. Jacob Fabricius 1580–1629	8. Albert Menon Verpoorten 1732–1752
2. Johann Botsack 1631–1643	9. Ernst August Bertling 1753–1769
3. Abraham Calow 1643–1650	10. Wilhelm Paul Verpoorten 1770–1794
4. Johann Maukisch 1651–1669	11. Daniel Gralath II 1799–1809
5. Aegidius Strauch 1670–1682	12. Friedrich Theodor Rinck 1810–1811
6. Samuel Schelwig 1685–1715	13. Nicolaus Gottfried Eckermann 1812–1813
7. Johann Georg Abicht 1717–1730	14. Christian Gottfried Ewerbeck 1814–1817

The worsening of Gdańsk political and economic situation caused by its incorporation to Prussia in 1793 (The Second Partition of Poland) and later the Napoleonic–Russian war, contributed greatly to the collapse of the Gymnasium. The school closed on November 10, 1817 (NB M. Luther's birthday!). It was incorporated into the St. Mary's school[24].

3. The Bibliotheca Senatus Gedanensis

Collections of written sources have a long history in Gdańsk, at least since 1189, when the Order of Cistercians founded monastery in Oliva (now, part of greater Gdańsk). Another library was established in the St. Mary's church at the end of the 14thcentury. In general, church libraries were prevailing, and other churches, like St. John's, St. Peter and Paul, and St. Elizabeth Hospital had their own libraries. After the Johann Gutenberg (1400–1468) print invention in 1439, books of a secular character were also printed.

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[22] See *Wikipedia* 2021b, and also Kotarski 1993.
[23] See fn. 23.
[24] Mokrzecki 2008.

The newly created Gymnasium was in need for a good collection of resources for teaching and research purposes. The church and monastery libraries were not the right choice. Creation of a modern type institution was accelerated by a pure luck, whose main figure was Giovanni Bernardino Bonifacio (1517–1597), duke of Orio (Italy). G.B. Bonifacio was Reformation-oriented, thus made foes in the Inquisition Tribunal of Naples. He emigrated from Italy for good in 1557 and decided to leave England in 1591 to settle in Gdańsk. He took with him a sizable collection of valuable books. The ship had an accident in the Gdańsk port, but Bonifacio, with the majority of his books, was rescued. He decided to donate his priceless bibliophile library to the city in exchange for a lifetime pension and place to stay. The city elders agreed and Bonifacio's collection found its place to the Gymnasium. It gave an impetus to build a real library for DAG. In 1596, created in the Renaissance style, the *Bibliotheca Senatus Gedanensis*, located in the Gymnasium, was ready. It served not only DAG, but also other schools in Gdańsk. It was its statutory obligation.

The library initially comprised four rooms, each of them equipped with the high shelving reaching the crystal vault. These rooms were called white, red, yellow and green, depending on a color of the cloth they were decorated with. The green one was the *Students' room*. The library collection was so rich that in 1756, the school decided to add an extra room (*auditorium anatomicum*). The governing body of the Bibliotheca Senatus Gedanensis[25] was *Collegium Scholarchale*[26]. Its chief person was a *proto-scholarch*; we will call him a *proto-librarian*, who represented the library to the outside world, mostly to the City Council regarding financial resources and the directions the collection should go. The library users were mostly professors of the Gymnasium and the students, exceptionally someone from outside. Students could use books only onsite and could not relocate to another room. Essentially, the regulations were similar to their contemporary counterparts.

The Library got its *Index librorum*, a catalog, updated by the governing proto-librarians. The collection was growing so fast that the *Index* was never up-to-date. Gdańsk authors were obligated to deposit one copy of their work in the Library. Proto-librarian was responsible for

[25] Called here the City Council Library.

[26] Nowak 2008.

acquiring the necessary funds. Important, if not the most important, source of the Library growth were donations by the scholars and the patrician families. The most frequent gifts were coming from Gdańsk, but also from the foreign countries, like Denmark, France, Germany, Italy, and Netherlands. Donations were not only in the form of books, but also museum artifacts, like manuscripts, prints, illustrations, naturalist collections, paintings, maps, numismatic collections, etc. These donations reflected upon the interests of Gdańsk citizens, their cultural ambitions, intellectual level and a high lifestyle.

In 1673, Samuel Schelwig became a philosophy professor at DAG and a librarian of the City Council Library. In 1677, he wrote its history[27] (Schelwig 1992) over the years 1596–1677. Schelwig was very serious about the Library, increased its collection significantly by asking Gdańsk citizens for donations and financial support. He had a quite modern sense of what library should be and what role it should play in the society. In this work, Schelwig gave credit to all the library donors, both Polish and foreign. He tried to print a catalog by Benjamin Engelcke (1610–1680), a former proto-librarian (1655–1661), but the print cost was too high to succeed. The total collection in the 17th century comprised about 12,000 volumes.

Michael Christoph Hanow (1695–1770), physicist, meteorologist and philosophy professor at DAG in 1728, started working on the alphabetical catalog (*Catalogus alphabeticus universalis Bibliotheca Senatus Gedanensis*) but did not finish it. The work was being continued by his successors. He supported the idea of a collecting artifacts related to the entire Polish-Lithuanian Union and the adjacent regions (Nowak 2008).

After 1793, when Gdańsk was taken over by Prussia and when the status of the Gymnasium was declining, the Library met a similar fate. The *Bibliotheca Senatus Gedanensis* changed its name to the *City Library* (germ. *Danziger Stadt-Bibliothek*). In 1819, the whole collection moved to the St. Jacob's church, which was in a remote distance to its original location. After adaptation of the church interior for the library needs, it became open to the public in 1821. At the end of the 18th century, the total volume count was around 26,000. The new Library regulations

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[27] Schelwig, Samuel: *De incrementis Bibliothecae Gedanensis epistola et commentatio* [D.F. Rhete, Gedani 1677].

cleared any connections with the DAG. The City Council Library became now a public library.

At the end of the 19th century, the collection counted about 100,000 volumes. The conditions in St. Jacob's church did not guarantee a proper preservation of the resources (there was no heating system and increase of humidity was conducive to the mildew growth). In 1903–1905, there was new building erected (in about 100 m proximity to the St. Jacob's church). In 1905, it contained about 125,000 volumes, while in 1913 – the collection grew up to 170,000 volumes. A large part of this increase was coming in the form of donation from Gdańsk intellectuals, bibliophiles, scholars, and church libraries. Luckily, the Library survived the WWII in a relatively good shape. Since 1955, due to the efforts of a then director, Dr. Marian Pelczar (1905–1983), it became *Gdańsk Library of the Polish Academy of Sciences*. More on its current status and the library extension, see Nowak 2008[28].

4. Two Societies in Gdańsk

DAG's activities encompassed the period of the late Renaissance, Baroque and the Enlightenment epochs. During the time of Gymnasium operation, methodology of both teaching and research evolved. Pedagogical and cognitive methods propagated by B.K. Keckermann (1572–1609) and one hundred years later by Christian Wolff (1679––1754), who was in Halle, but spiritually present at the Gymnasium, will be addressed soon. It was habitual that the research was performed individually. At the end of the 17th and at the beginning of the 18th century, the ways of working in science started to change. Learned circles in Europe realized that in order to increase communication between the scholars, one needs to create the groups of common interests, called the *societies*. The first in Gdańsk (and in Poland) was the *Societas Litteraria* (established in 1720) with Carl Gottlieb Ehler (1685––1753), astronomer, mathematician and mayor of Gdańsk, Friedrich Gottfried Engelcke (1693–1736) – the City Council secretary, and Gottfried Lengnich (1689–1774), an eminent historian, as founding fathers. Initially, the interests of the Societas Litteraria were in

[28] Zbigniew Nowak was the director of the Gdańsk Library of the Polish Academy of Sciences in 1981–1997.

jurisprudence, history and philosophy. Soon after, the research interests of scientists prevailed and the society stopped its activities in 1727. Interesting is that the society, whose members represented a modern way of thinking in the Enlightenment style, could not count very much on the support of the DAG's humanistic departments, which were not accepting then new intellectual trends[29].

More than fifteen years later, the group of leading Gdansk scientists and learned people, including:

- Johann Philipp Breyne (1680–1764), naturalist, botanist,
- Daniel Gralath I (*1708–1767*), physicist, since 1763–the mayor of Gdańsk,
- Michael Christian Hanow (1695–1770), philosopher, historian and physicist, professor of DAG,
- Jacob Theodor Klein (1685–1759), philosopher and naturalist,
- David Kade, medicine doctor and the first director of the *Societas Physicae Experimentalis*,
- Heinrich Kühn (1690–1769), mathematician, professor of DAG,
- Heinrich Wilhelm von Rosenberg[30] (1711–1794), king's August III councilor, legal counsel,
- Adrian Gottlieb Söchner, teacher, later a jurisprudence professor at DAG,
- Paul Świetlicki (1699–1756), lector of Polish language at GAD, physicist, pastor in the St. Anne chapel,
- Friedrich August Zorn von Plobsheim (1711–1789), naturalist, examined shells of New Zealand[31], established a modern scientific society, *Societas Physicae Experimentalis*; ten years later, it was known as the *Danzig Naturalists Society* or *Danzig Research Society* (germ. *Die Naturforschende Gesellschaft*)[32].

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[29] Kubik 1959c, p. 168. In the same essay (p. 167), we learn that the medical research in medicine was very much of interest by members of the Danzig Society. Doctor Emmanuel Davisson presented the results of his examination of hair sickness (pol. *kołtun*), called *Plica polonica,* which is now an official medical terminology. As the cause for this illness, Davisson indicated lack of hygiene (it was the pre-Pasteur era!).

[30] Heinrich Wilhelm von Rosenberg came from an old aristocratic family in Gdańsk. He owned one of the richest private libraries in the city.

[31] *Der Naturforscher,* Zorn von Plobsheim, 1775 (see Andrews 2000).

[32] Kubik 1959c. The Latinized name of the Society had always been *Societas Physicae Experimentalis* (see Januszajtis 2002).

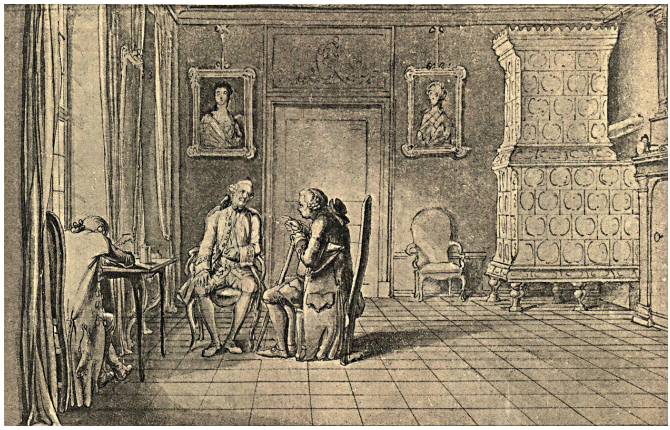

Fig. 4. Heinrich Wilhelm von Rosenberg (in the middle), the director of the Danzig Society (1749 and 1765–1766) during a conversation with Dr. Remmers (surgeon), portrayed by Daniel N. Chodowiecki (1726–1801, sitting at the table on the left), 1773[33].

The aim of the Society was to support *free, independent thinking*, and seek the *truth*. The Society established its own statute including the set of rules, code of ethics, and most importantly – the requirement of conducting research and its popularization among various social groups in the city (26 paragraphs). There were manifold goals for the Society, including popularization and application of new achievements and ideas of the Enlightenment era in a practical and reformative way. A scholar had a moral obligation to share his own knowledge and developments with the public for a general benefit. The Danzig Research Society members, especially M.C. Hanow[34], H. Kühn[35], P.S. Lürsenius (1726–1762, physician and scholar), G. Reyger[36] and Nathanael Matthäus von Wolf (member since 1769) were especially active by giving public lectures and conducting scientific experiments for the public[37]. The group decided to prepare and perform the experiments according to

[33] Von Ottingen, 1883. D. Chodowiecki left about 2000 copper engravings and 4000 drawings. Illustrated most of the works by Johann Wolfgang von Goethe. See also, Gothezeitportal 2022.

[34] Brodnicki 2019.

[35] More on H. Kühn and other experimentalists is in Section 6.1.

[36] Gottfried Reyger (1704–1788), botanist and astronomer, since 1755 the president of the Society.

[37] Górska 2011.

the three-volume handbook of physics by Christian Wolff[38] and in the Leipzig periodical *Acta Eruditorum*. Only those experiments were valuable and important that could be duplicated by independent groups of experimentalists and/or researchers[39].

Gottfried Reyger reorganized the Society by introducing the departments; he became a chair of the Naturalists Department. The scientists organized in groups with common interests conducted research in the Society. In 1746, the Danzig Naturalists Society was located in the *Green Gate*[40]. The astronomical observatory was there, as well as the Society's library. D. Gralath I, along with P. Świetlicki, was performing his experiments with electricity. The works of the Society members were documented in the annals of the Society, *Versuche und abhandlungen der Naturforschenden Gesellschaft in Danzig*[41], which now (those that survived WWII) have been archived in the Gdańsk Technical University. The first three volumes of *Versuche* ... contain 48 treaties, of which 30 were devoted to physics, which included 17 strictly physics texts, astronomy, meteorology and popular science. Other treaties pertained to botany and zoology. As Januszajtis 2002 observes, at the later period of the existence of the Society (the 19th and 20th century), the process of the departure from physics started. There were several reasons for it, mainly a very fast development of the subject that required a specialized and expensive equipment, which the Society as an institution could not afford.

The Society played an important role in the Gdańsk community and beyond. In the mid- of the 18th century, the vast majority of the city's population was not adequately educated. One of the important aims of the Society was a popularization of practical knowledge and important skills. These would contribute to a better quality of life, better health, safety and taming the hazard.

In his treaties, Hanow[42] stressed the importance of prevention and control of city fires. He even proposed some regulations and instructions

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[38] Christian Wolff, *Allerhand nützliche Versuche, dadurch der Weg zu genauer Erkänntnis der Natur gebahnet wird*, Halle 1721 and 1745.

[39] Januszajtis 2002.

[40] Green Gate (built in 1568–1571) was a residence of the Polish Royalty. It was closing the Long Market and together with the Long Street bound on the opposite side by the Golden Gate creates the Royal Route.

[41] Vol. 1, Danzig 1747; vol. 2, Danzig and Leipzig 1754; vol. 3, Danzig and Leipzig 1756.

[42] Hanow 1754; 1756.

for Gdańsk citizens to become more vigilant and more effective in fire extinguishing. Hanow also proposed a reorganization and improvement of fire brigades.

Some of the Society's experimentalists, in response to the need of rescuing mortally wounded persons, like suicide attempts, drowned, asphyxiated or freezing people, in cooperation with the City Council issued a guidance for the First Aid for the public (November 21, 1769). There were already included the elements of CPR[43].

Philipp Silvester Lürsenius was investigating the salinity of the Baltic Sea deep water. He was studying the natural-physical properties of the solution, behavior under various thermal conditions (evaporation at the boiling point, freezing temperature, slow evaporation and distillation). The final goal was to eventually extract salt from the sea water. Lürsenius was trying to use a marine salt or a saline water as a meat preservative. His findings were published in vol. 3 of *Versuche* ...[44].

Let us stress once again that at the initial period of existence of the Society, a vast majority of the Danzig Naturalists Society members were either alumni or members of the faculty of the Gymnasium.

It is important to indicate two outstanding Gdańsk scientists, naturalists of the 18th century: Johann Reinhold Forster (1728–1798) and his son, Johann Georg Forster (1754–1794). Johann Reinhold was botanist, zoologist, geographer and ethnographer. His research on new colonies located on the banks of Volga River in the Saratov province opened him doors to the *Royal Society*. In the years 1772–1775, both participated in the second James Cook expedition around the world and brought back rich ethnographic and naturalist collections, which were vital in supporting numerous research publications.

Johann Reinhold Forster became an honorary member of the Danzig Naturalists Society[45]. Johann George is considered one of the outstanding forerunners of evolutionism before Darwin[46].

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[43] *Cardiopulmonary Resuscitation*, i.e., an emergency lifesaving procedure performed when the heart stops beating.

[44] Philipp Silvester von Lürsenius, Vom Salzgehalte des Seewassers bei Danzig, *Versuche und Abhandlungen*, T. 3, 1756.

[45] *Wikipedia* 2021c.

[46] Gołaszewski 2008.

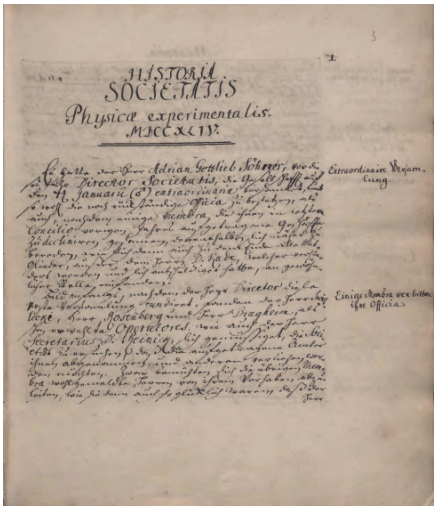

Fig. 5. Front-page of the annals of the Society of Physica Experimentalis (1745). Courtesy of Biblioteka Gdańska PAN, www.bgpan.gda.pl.

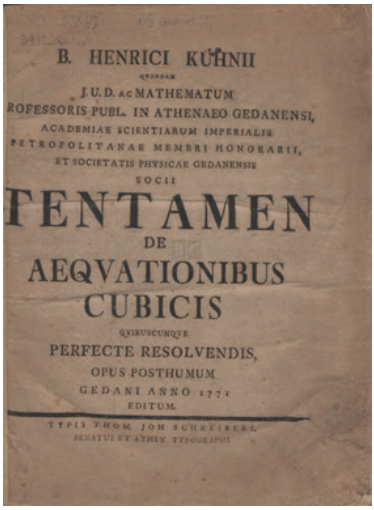

Fig. 6. The title page of H. Kühn's posthumous work[47]. Courtesy of Biblioteka Gdańska PAN, www.bgpan.gda.pl.

Fig. 7. The Green Gate (From Gołaszewski 2008).

[47] Kühn 1771.

Here is the list of Naturalist Societies in Europe formed before 1744[48]:

- Accademia dei Lincei – Rome (1603–1951),
- The Royal Society – London (1660–),
- Collegium Naturae Curiosorum Schweinfurt (1652– , in 1670 transformed into Leopoldine-Caroline Nature Academy with the seat in Halle),
- Accademia del Cimento – Florence (1657–1667),
- Science Society – Caen (1662–),
- Academie des Sciences – Paris (1666– currently included in the Institute de France)
- Accademia Fisico-Matematica – Rome (1667),
- Prussian Academy of Science (now German Academy of Science) – Berlin (1700),
- Societas Litteraria – Gdańsk (1700–1727),
- Imperial Academy of Science – Petersburg (1724– , now Russian Academy of Sciences),
- Societas Physicae Experimentalis – Gdańsk (1743–1945).

Thus, the Societas Physicae Experimentalis became the 11th one in the world (and the second in Poland) Naturalist Society.

The Danzig Naturalists Society owned a sizable collection of 30,000 items. A list of papers and monographs addressing the roles and activities of the learned societies in Europe we present below[49]. We emphasize that the modern publication (especially important are annotations therein and an exhaustive bibliography) by Górska 2011, brings a wealth of knowledge on various facets of the Society's activities including efforts of its members to create an obstetrics education (1781).

The Society was working incessantly after Poland completely lost its independence (The third Partition of Poland, 1795). It was also active after the Gymnasium ceased to exist in 1817. Due to the Gdańsk tortuous fate, the Society's activities declined after WWI and stopped in 1936. The last meeting took place in 1942. The Society terminated its existence in 1945 and some of its resources moved to Germany.

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[48] Rolbiecki 1972.

[49] Böning 2005; von Dülmen 1986; Francois 1986; Im Hof 1982; Kämpfert 1985, 1997; Letkemann 1992, 1997; Mokrzecki, Kubik 1969; Staszewski 1975; Stuber et al. 2009; Vierhaus 1980; Zaunstöck 1999. The older work is in Schück 1880.

5. More on the representatives of scientific disciplines in Gdańsk of the DAG times

In this section, we feature the intellectual activities in Gdańsk by featuring important faculty/alumni of the Gymnasium and presenting their short bios and achievements in the respective disciplines, as well as mutual interaction and collaboration (whenever it was feasible). We mainly focus on sciences, that is, astronomy, mathematics, medicine, philosophy and physics, rather than on classical humanities and theology. We make some exceptions and present a great theologian Johann Mochinger; Samuel Schelwig, a Renaissance intellectual and a second-longest serving rector of DAG (1685–1715), the dean of the Library of the City Council; and a great historian Gottfried Lengnich. Since many faculties were active in several disciplines, we feature them essentially in only one section.

5.1. Mathematics, mechanics

Mathias Meinius (1544–1601), taught astronomy in 1572–1579, but later became entirely devoted to editing calendars[50] (1579–1602). At the earlier period, Meinius introduced mathematics to the Gymnasium in order to teach the students how to eliminate the time gap in the observance of Easter Holidays in the new Gregorian calendar. By the resolution of the Council of Nicaea (325), Easter Holidays were established along with precise timing of the observance. Since 1571, Meinius was a rector of the St. John's school (Praetorius 1713, p. 37). In 1578, Meinius published the results of his observations[51] of a trajectory of a comet in 1577. He corresponded with the astronomers Tycho Brache (1546–1601), Bartholomew Scultetus (1540–1614), and Johann Praetorius (1537–1616)[52].

Johannes Moller became a successor of M. Meinius and taught mathematics in 1580–1589, astronomy and geography, based on the

[50] Calendars were important media. In Paluchowski 2013, the author presents a detailed record of editing and printing calendars and almanachs in Gdańsk. The list of editors is long and comprises names like J. Moller, L. Eichstadt, F. Büthner, H. Kühn, P. Crüger, and P. Pater.

[51] Mathias Meinius, *Von aller geschlecht der Cometen [...] uns zu Danzigk den 12 Novembris 1577 Jahr erscheinen ist...*, Jacob Rhode 1578, Danzig.

[52] Czerniakowska 2008a.

Gregorian calendar, introduced by Pope George XIII in *Inter gravissimos* (1582), which the king Stefan Batory brought to Poland. Since 1580, he was a rector of the St. John's school[53]. J. Moller was teaching at DAG for 22 years (1579–1601).

Peter Crüger (1580–1639), taught at the Gymnasium in 1607–1639 and elevated teaching of exact sciences (next to Kraków) to the European level. Born in Königsberg, where he started university studies and then moved to Gdańsk to continue his schooling at DAG. Subsequently, continued in Leipzig and Wittenberg. The City Council appointed Crüger as math and poetry professor in 1607. At the same time, he also became a city surveyor and a calendariographer[54]. Not much has been known about teaching of math in 1589–1607. Starting 1607, Crüger, a pupil of Keckermann, was teaching the following mathematical subjects: arithmetic, geometry, trigonometry, astronomy, optics, physics, and additionally, geography and logic.

He was the first who introduced logarithms to math curriculum and taught how to use them in trigonometry, arithmetic and astronomy. In his physics classes introduced material related to magnetism and meteorological optics; in geometry he taught principles of triangulation measurement. In 1612, Crüger published *Synopsis trigonometriae...*[55] It was the first treatise on planar and spherical trigonometry in Poland. In two appendices, he presented applications of trigonometry to distance computation between two cities with known geographic coordinates. In 1616, he published a textbook *Logistica sexagenaria*, where he explained the role of fractions with denominators of 60 in astronomy, geography and other sciences. The publication of *Praxis trigonometriae ...*[56] made Crüger famous. He developed the most accurate tables of Neper logarithms of those times.

To help his students, Crüger wrote a text on arithmetic, *Ein neues Rechenbuechlein auff der Feder* (Danzig 1631). He explained the foundations of integer arithmetic and then of fractions. In the second part, he

[53] Praetorius 1713, p.41.

[54] In 1623, the Polish king Sigismund III granted P. Crüger the right of editing/publishing calendars and publishing math works in Gdańsk.

[55] P. Crüger, *Synopsis trigonometriae sive doctrina triangulorum cum canone trigonometrico*, Dantisci 1612.

[56] P. Crüger, *Praxis trigonometriae logarithmicae cum Logarythmorum tabulis...* (Dantisci 1634).

presented methods of solving problems in merchant arithmetic based on proportions. The book became very popular and had several editions. In another text, *Geographiae discendae Typus* (1635), Crüger divided geography into general and particular. His textbooks indicate a high level of teaching of mathematical sciences in the Gymnasium. In his very words, astronomy and geometry are sciences that serve the humanity in solving difficult life situations.

Crüger was in touch with important scientists of his era, including Johannes Kepler (1571–1630) and Jan Brożek (1585–1652), who was also a leading academic persona of his era. Anchored in Kraków, he stayed in touch with Caspar Förster (1574–1652), cantor and a bookseller in Gdańsk, librarian at DAG. Several of Brożek's works were published in Gdańsk[57]. P. Crüger died in Gdańsk as a victim of the bubonic plague[58].

Daniel Lagus (1618–1678) was of the Moravian origin, studied math in Frankfurt/Oder and in Königsberg, where he initially lectured. At the Gymnasium (1640–1654), he taught math and general physics with the foundations of meteorology and astronomy as well as geometry, cosmology, and celestial physics. Published several disputations devoted solely to physics: *Physicae generalis disputatio I de constitutione physicae* (1642) and *Theses physicae de sole* (1643)[59]. In 1654, Lagus left Gdańsk for the University of Greifswald (Gryfia), where was appointed at the mathematics chair. In 1658, he became a professor of theology there. In 1669, he gave up all academic privileges, left the university and moved to Orunia (germ. *Ohra*, then a suburb of Gdańsk) where he lived in seclusion until his death.

Friedrich Büthner (1622–1701) was born in Königgrätz in Bohemia. He was a student at DAG since 1640 and then studied mathematics at Königsberg and Wittenberg. In 1653, he became a rector of

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[57] J. Broscius, *Aristotele et Euclide contra Petrum Ramum et alios* (Dantisci 1652), where he refuted the views of Petrus Ramus, who negated the Copernican theory.

J. Broscius, *De numeris perfectis disceptationes duae*, 1st Ed. Kraków 1637, 2nd Ed. Dantisci 1652, BGd., sign. Sa 1.

[58] *Słownik biograficzny Pomorza Nadwiślańskiego*, 1994, t. 2, pp. 520–521. See also Dianni 1970.

[59] Lagus's most important scientific treatises are: *De hypathesibus astronomicis in genere* (Regiomonti 1635), *Thematum uranographicorumpentas I.* (Gedani 1641), and *Theoria Meteorologica* (Gedani 1650).

St. John School in Gdańsk, and in 1663–a professor of mathematics and rhetoric. His pedagogical talents can be easily seen through the titles of the textbooks he was writing: *Tabulae mnemonicae, geometriam and stereometriam complexae* in 1682 (published in Gdańsk), *Trigonometria propitia* (1690), and *Algebra propitia*. Büthner was a proponent of math symbols used first by François Viète (1540–1603) in his *In artem analyticam isagoge* in 1591 (the use of algebraic symbols was hardly existent before the 16th century). He was also teaching elements of *nautics* and was underscoring the role of mathematics in everyday's life of sailors.

Büthner was quite an active astronomer. Two treatises, *Disputatio astronomica* (1660) on spherical astronomy, and *Paradoxon astronomicum* (1669) on the principles of creating calendars and usefulness of astronomy in chronology, were his important achievements. F. Büthner was a faculty member with the longest tenure (1663–1701) in history of the Gymnasium. At the day of his death, the faculty paid homage to him for such a long time he spent on educating and grooming his students[60].

Christian Sahm arrived in Gdańsk from Königsberg in 1701, after death of F. Büthner. He studied in Königsberg, Leipzig and Altdorf under the tutelage of an accomplished mathematician Johann Christoph Sturm (1635–1703), whose text *Mathesis Juvenilis das ist: Anleitung vor die jugend zur mathesin* (1699/1701) was used at DAG. Sahm was underscoring a thorough knowledge of mathematics by such illustrious scientists like J. Hevelius and F. Büthner, which helped those making discoveries in cometology and meteorology, as well as creating astronomical tables. Sahm became a rector of St. John's School and mathematics professor at the Gymnasium, where he was a strong proponent of the heliocentric theory and contemporary natural scientific methods. He spent only

[60] Johann Heinrich Notwanger, a faculty member at DAG, dedicated Büthner a beautiful poem (Praetorius 1713, p. 121, a free translation on the right side):

Büthneri faciem tabula spectamus in ista
Aethera Mens, ipsam nulla tabella, capit.
Astrorum Proceres Gedanum quos jactat Alumnos,
Ad latus invitant, associantque sibi.
Rex probat, Hevelia est Hipparchum reddere cura;
Eudoxum Gedano Büthneriana dedit.

We look at the picture of Büthner in that
Aether and the mind captures the picture itself.
The chiefs of the stars, whom he boasts of the Gedanites,
Invite the Alumnos to the side, and accompany them.
The king approves, that Hevelius is responsible for Hipparchus;
Eudoxus gave to Gedanus Büthner.

Fig. 8. Friedrich Büthner (1622–1701). Source: gedanopedia.pl.

Fig. 9. Front page of the calendar edited by F. Büthner (1664). Source: gedanopedia.pl.

one year in this capacity (1701–1702). After Sahm's relocation back to Königsberg, mathematics chair position was vacant for 3 years.

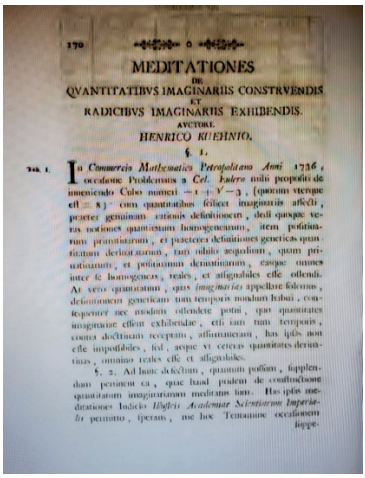
Paul Pater (1655–1724) was born in Wierzbowo, Spisz (then Hungary). After graduating from Gymnasium in Wrocław (germ. *Breslau*), studied mathematics in Jena and Leipzig. Since 1688, was lecturing mathematics in Toruń Gymnasium. In 1703, due to the North War, Pater left for Gdańsk and in 1705 became a professor of mathematics at DAG (1705––1724). His didactic interests were very broad and included mathematics, mechanics, astronomy, geography, technology and architecture. Pater was an ardent proponent of applied science, mostly mechanics, technology and surveying. He taught mechanics in an axiomatic way, similarly to Euclid's *Elements*. He organized summer camps for his students, where was teaching how to apply math to survey fields, forests and gardens, as well as to compute heights and distances of various places. During numerous disputations, Pater was demonstrating the use of compass and other nautical instruments. He was also editing calendars (1704––1724). Some of them were published in Polish, like *Kalendarz Gospodarski na rok 1717*. In 1710, he established his own print shop along with a typographical school, the first such an institution in Poland. An extensive list of P. Pater's articles and treaties, mostly published in

Gdańsk, Leipzig and Toruń, one can find in Kubik 1959b. After his departure, the mathematics chair position became vacant for 9 years until Dr. Heinrich Kühn arrival.

Heinrich Kühn (1690–1769) was born in 1690 in Königsberg. After graduation from high school, *Palaeopolitanum*, he studied law, philosophy and mathematics (1707–1714) at the University of Königsberg. Soon after, he left for Halle for 3 years where he became a student of professors Christian Thomasius (1655–1728, a philosopher and important German representative of early Enlightenment) and a famous physicist, mathematician and philosopher, member of academies in Berlin, London, Saint Petersburg and Paris, Christian Wolff[61], the author of *Elementa Matheseos Universae*, 1713–15, 2 vols. Halle, used as a textbook at DAG. Ch. Wolff was a proponent of modern methods of teaching mathematics, science and philosophy.

[61] Christitian Wolff (1679–1754), born in Breslau, albeit not directly related to DAG, made a lasting impact on philosophy and philosophy of science taught at the Gymnasium. He was a German philosopher, mathematician, and scientist of the Enlightment era; was considered the most influential and important philosopher between Leibniz and Kant. He wrote more than 50 (mostly multi-volume) treatises and dozens of shorter essays and nearly 500 book reviews. His philosophy was omnipresent, he had many students and followers, as well as sympathizers including Voltaire, É. du Châtelet, Catherine the Great (who offered him a pension). Kant, in the *Preface to his Critique of Pure Reason* (1720), called Wolff "the greatest of all dogmatic philosophers". In 1703, Ch. Wolff completed his *Habilitationschrift entitled: Philosophia practica universalis, metodo mathematica conscripta.* Soon after, he got job offers from Danzig and Wismar. Eventually, he landed up in Halle (1707). This started a very creative and prolific period in his life. His lectures initially covered mathematics and natural science, later extended to philosophy. Wolff's first philosophical text, the *Vernünfftige Gedanken von den Kräfften des menslichen Verstandes und ihrem richtigen Gebrauche in Erkäntnis der Wahrheit*, appeared in Halle in 1713. Here is the definition Wolff provides: "Philosophy is the *science* of all possible things, together with the manner and reason of their possibility". In 1720, Wolff published his German text on metaphysics, *Vernünfftige Gedanken von Gott, der Welt und der Seele des Menschen, auch allen Dingen überhaupt* (Halle, 1720). In his *Discursus praeliminaris de philosophia in genere* (Frankfurt 1730), Wolff divides philosophy into two branches, practical philosophy and theoretical philosophy. Practical philosophy deals with human actions and includes morality, politics, jurisprudence, and economics. Theoretical philosophy, in turn, deals with sets of possible and actual objects and is itself divided into three branches: (1) ontology, (2) "special" metaphysics, which includes general cosmology, psychology and natural theology, and (3) physics. His philosophy very much influenced Germany and foreign European academic centers, including Gdańsk. For more details, as well as a rich list of references on work on Ch. Wolff, see Hettche, Dyck 2019.

The influence of Ch. Wolff on H. Kühn was so profound, that the latter became a faithful follower of his philosophy to the rest of his life. After coming back to Königsberg in 1717, H. Kühn obtained his doctoral degree in law. After passing his habilitation examination in 1727, he had a right to lecture in mathematics, law and philosophy. Since 1727, Kühn was teaching math at the University of Königsberg (Kubik 1969a).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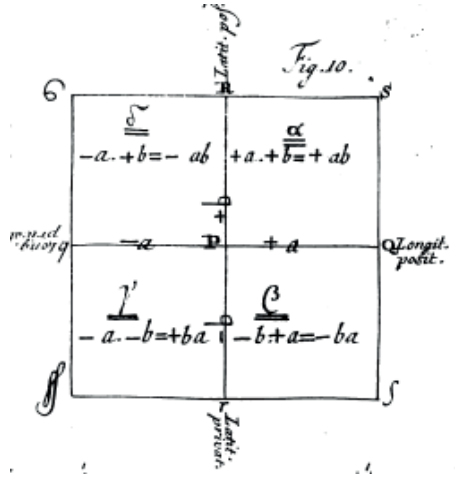
MEDITATIONES
DE
QVANTITATIBVS IMAGINARIIS CONSTRVENDIS
ET
RADICIBVS IMAGINARIIS EXHIBENDIS.
AVCTORE
HENRICO KUEHNIO.

§. 1.

Inn. 1. In *Commercio Mathematico Petropolitano Anni* 1736, occasione Problematis a *Cel. Eulero* nobis proposita de inueniendo Cubo numeri -1 (quorum vterque est $= 8$) cum quantitatibus fictae imaginariis affecti, praeter genuinam eiusmodi definitionem, dedi quoque varias notiones quantitatum homogenearum, item positionum praeditarum, et praeterea definitiones genericas quantitatum derivatarum, tum nihilo aequalium, quam priuationum, et positionum denominationem, easque omnes inter se homogeneas, reales, et assignabiles esse ostendi. At vero quantitatum, quas *imaginarias* appellare solemus, determinationi genericae tum temporis nondum habui, consequenter nec modum ostendere potui, quo quantitates imaginariae essent exhibendae, etsi iam tum temporis, contra doctrinam receptam, affirmaueram, has ipsis non esse impossibiles, sed, aeque vt ceteras quantitates determinatas, omnino reales esse et assignabiles.

§. 2. Ad hunc defectum, quantum possum, supplendum pertinent ea, quae haud pridem de constructione quantitatum imaginariarum meditatus sum. Has ipsis meditationes Iudicio *Illustris Academiae Scientiarum Imperialis* permitto, operam, me hoc Testimonio occasionem hoppe-



Figs. 9, 10. Meditationes de quantitatibus imaginariis construendis et radicibus imaginariis exhibendis. Novi Commentarii Academiae Scientiarum Imperialis *Petropolitanae* 3 (1753), front page and the complex numbers diagram.

H. Kühn was appointed a professor of mathematics at the Gymnasium by the City Council in 1733, after recommendation by Carl Gottlieb Ehler (1685–1753), then the mayor of Gdańsk. Kühn was serving in this capacity until 1769. It was a very fortunate choice to support such a talented persona.

It was H. Kühn who made Leonhard Euler (1707–1783) then working at the Imperial Academy of Sciences in St. Petersburg, aware of the so-called *Königsberg bridge problem* (also known as the *7 bridges problem*). Euler solved it in 1735, but due to a huge backlog in the print shop, his solution was not published until 1741. This paradigm originated two mathematical disciplines: topology of the plane and the graph theory. Kühn was a proponent of geometric interpretation of complex numbers (Kühn 1753). Up to day, it is considered his main achievement in mathematics. In the contemporary math, French-Swiss Jean-Robert Argand

(1768–1822), eventually got credit[62] for a similar interpretation of complex numbers (1806), roughly 50 years after H. Kühn's development[63]. C.F. Gauss was the first mathematician who contributed to a full acceptance of complex numbers as a mathematical concept.

He was also the author of an award-winning publication on the origins of springs and ground water, Kühn 1741, at the competition organized by the Scientific Society of Bordeaux in 1741. He won the first prize, paid in gold. The paper was published in French, German and Latin. H. Kühn[64] was one of the most outstanding professors and the best mathematician in the Gymnasium history. He deserves a separate publication. Interestingly, he was the first person in Poland who was teaching mathematical analysis, and differential and integral calculus. Similarly to P. Pater, his teaching spectrum was very wide: arithmetic, algebra, geometry, trigonometry, mechanics, hydrography, geography, astronomy, chronology, gnomonics, civil and military engineering. In 1743, Kühn became a co-founder of Danzig Naturalists Society. He constructed the scale with friction wheels that D. Gralath I used to perform scientific experiments in the newly founded Society.

The correspondence with L. Euler, whom he later befriended, spanned around 20 years (the collection of letters include 22 letters from Kühn to Euler and 2 from Euler to Kühn[65]). In his letters, Euler expressed a high opinion about Kühn's achievements, see, e.g., his correspondence[66] (April 1742) with a French mathematician and astronomer, Alexis Claude Clairaut (1713–1765), where Euler wrote about H. Kühn as "one of the best German mathematicians." Euler, through his prolific correspondence, contributed to spreading Kühn's name in the European scientific community[67].

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[62] About 70% of mathematical developments in history have been named by the people, who were not their original creators/discoverers. H. Kühn was no exception.

[63] In Günther 1883, there are interesting comments on lack of a proper recognition of the Kühn's discovery (Kühn 1753).

[64] Mokrzecki 1994b.

[65] Opera omnia, Series IVA *Commercium epistolicum*, vol. 1. *Leonhardi Euleri Commercium Epistolicum. Descriptio Commercii Epistolici / Leonhard Euler Briefwechsel. Beschreibung Zusammenfassungen der Briefe und Verzeichnisse*. Edited by Adolf P. Juškevič, Vladimir I. Smirnov, Walter Habicht. Basel: Birkhäuser (1975).

[66] 4 Bl. – AAN, f. 136, op. 2, Nr. 1, pp. 207–210.

[67] Sznajder 2015

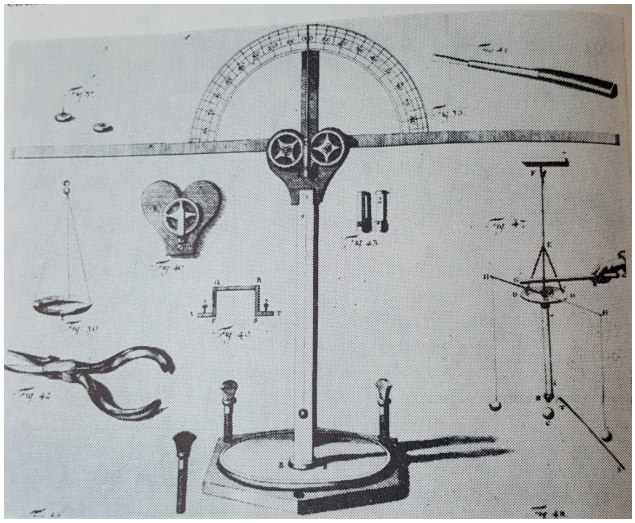

Fig. 11. Gralath–Kühn electrostatic scale with its equipment (Kühn 1747).

On June 13, 1758, on the occasion of the 200th anniversary of the Gymnasium, Kühn gave a lecture, *Influence of mathematics on the earthly happiness of mankind* (Kühn 1758). It actually included more than the title was showing – it was an exposition of humanism, science and the Enlightenment ideals. His last work was Kühn 1771 (82 pages), where he was examining exact solutions of certain cubic equations, but was aware that "Insufficient development of mathematics does not allow to get exact solutions of equations of degree five and higher", Kühn 1771, p. 12 (Kubik 1969a, p. 223). In 1756, he became a member of the Imperial Academy in St. Petersburg and granted a lifetime pension of 100 rubles per year. Kühn is considered the best mathematician in the Polish-Lithuanian Commonwealth of the 18th century.

Christian Sendel (1719–1789) was a professor of medicine and physics (1771–1774), also taught mathematics. His lectures on arithmetic, geometry, planimetry and trigonometry were based on the Ch. Wolff[68] text. C. Sendel was a member of the Danzig Naturalists Society since 1744 and experimented with electricity and optics. He was using convex and concave mirrors and was studying light interference and expansion

[68] Ch. Wollf, *Der Anfangs-Gründe aller mathematischen Wissenschafften* (Elements of All the Mathematical Sciences), Halle 1710.

Fig. 12. A seal from *Acta iubilaei secundi Gymnasii Gedanensis* [Gedanii 1758] commemorating the 200th anniversary of the Gymnasium.

of steam during the heating process. Was investigating origins of rain and circulation of water in the nature. The results published in two papers, *De pluvia* (1757) and *Causa efficiens motus astrorum* ...(1769)[69]. As a physicist, C. Sendel detected/created lines of magnetic field, a novelty those times; as a physician – was a precursor of electrotherapy[70], i.e., the use of electric charges to treat various maladies. Not much we know about his achievements as a physician or anatomist[71], however he was teaching anatomy, as well.

Johann T. Bartoldi (1736–1788), alumnus of DAG and a successor of H. Kühn. Studied mathematics in Rostock and Jena (1757–1763), then traveled around Europe. As a professor of mathematics at the Gymnasium (1774–1788), he was also teaching mechanics and physics. Bartoldi lectured in both *prima* and *secunda*. Initially, used *Mathematische Anfangs-Gründe* by Abraham G. Kästner (1760). Later, used *Lehrbuch aller mathematischen Wissenschaften* by H.W. Clemmius, based on a philosophical system of Ch. Wolff, especially using his *Anfangs-Gründe aller mathematishen Wissenschaften*, mentioned already in the footnote 68.

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[69] Christian Sendel, *De pluvia*, Gedani 1757 ; idem, *Causa efficiens motus astrorum ex principiis pyrotechniae naturalis derivata*, Gedani 1769.

[70] Januszajtis 2001.

[71] Szarszewski 2014.

5.2. Physics and philosophy, medicine and geography

The first appointed DAG faculty who was stressing the need for introduction and development of medical sciences, was Andreas Franckenberger (1536–1590), see Szarszewski 2014. Initially appointed a professor of rhetoric and history had no medical preparation. He started lecturing medicine at the Gymnasium based on *Liber de Anima* (1540) by his former professor, Philipp Melanchthon[72] (1497–1560), at the University of Wittenberg[73]. We will not focus on Melanchthon here, but mention only that he was the first and main theorist of *Lutheranism*, a friend and collaborator of M. Luther. Franckenberger presented Melanchthon's ideas in the mentioned before *Constitutio nova Gymnasii Dantiscani* (Franckenberger 1568). Literary talents of A. Franckenberg, also drew attention of the historians, see Nadolski 1959b. Another faculty, who was teaching medicine was Johannes Placotomus (Brettschneider, 1514–1577, Praetorius 1713), a Gdańsk physician and pharmacist.

Bartholomew K. Keckermann (1572–1609) taught at the Gymnasium in 1602–1609. He was one of the most illustrious of its alumni, a man of outstanding personality, professor of philosophy and author of numerous publications (see Freedman 1997 for their full list along with the information on subsequent editions). Besides being a magnificent professor, he demonstrated an extraordinary talent in research management. His achievements and philosophy are still a subject of active research in history of philosophy, ethics, historiography and science (see Brodnicki 2007, Nadolski 1961, Gibbs 1972, Ryczek 2017, Freedman 1997, Omodeo 2017).

B. Keckermann was a student of Jacob Fabricius, the first rector of the Gymnasium (Kotarski 1993) and an ardent Calvinist[74] who infused him with this new doctrine. Keckermann matriculated at the Wittenberg University in 1590 and then spent one semester at the University of Leipzig, finally arrived at Heidelberg in 1592, where he obtained his M.A. in 1595. His academic career started to spin.

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[72] Johann Hoppe, the first rector of the Gymnasium, was a former student of Melanchthon.

[73] In his writings, Melanchthon did not put emphasis on medical craftsmanship (art), but on ethical, philosophical and religious aspects.

[74] Tode 2004.

Figs. 13, 14. Bartholomew K. Keckermann[75] (1572–1609).

Initially, appointed a tutor and then a lecturer in philosophy at the University of Heidelberg. In 1600, Keckermann became a chair of Hebrew, while working on his doctorate in divinity (Heidelberg 1602). City Council was well aware of Keckermann's academic achievements[76] and invited him in 1597 to return to DAG. He did not accept this first invitation, but accepted the second one and became professor of philosophy in 1602. He spent his final seven years at this position, before he died in 1609.

At the Gymnasium, Keckermann, although not a pure Ramist, tried to implement a Ramist reform[77] of the curriculum with a scheme

[75] The first portrait is an engraving from Curicke 1687. The second one appeared within the Gdańsk 1610 and Hanau 1610 editions of Keckermann's textbook of physics *Systema physicum, septem libris adornatum, propositum in Gymnasio Dantiscano*. Hanoviae: Apud Guilielmum Antonium, 1610.

[76] Mokrzecki 1994a.

[77] Petrus Ramus (French: *Pierre de la Ramée*) (1515–1572) was an influential French humanist, logician and educational reformer of the Renaissance era. A Protestant convert, he was one of the most prominent victims of the St. Bartholomew's Day massacre. See *Wikipedia* 2021d; O'Connor, Robertson 2000.

intended to give youths an encyclopedic education within three years. In this new *cursus philosophicus* the first year was devoted to logic and physics, the second – to mathematics and metaphysics, and the third to ethics, economics, and politics. He was putting an emphasis on analytical approach, which was a novelty in the Renaissance era[78]. Ramist movement was proposing a wider access to education for the whole society (Gibbs 1973).

In 1602, Keckermann fundamentally reformed the philosophy education and, as a result, both philosophy and ethics became the dominant disciplines in the Gymnasium curriculum. Instead of theology, which dominated thus far, he introduced practical philosophy (Brodnicki 2007). He identified himself with the progressive Aristotelian views that outlined in *De methodis* by Jacopo Zabarella[79] who, as a logician, was a representative of late scholastic. Keckermann believed that he needs direct efforts towards developing new Aristotelian methods and analytical systems. In his philosophical and logical *Praecognita...*[80], initialized the first theoretical discussion on the set of precepts describing each science. For more on teaching logic at DAG, we recommend Dąmbska 1958[81].

The spectrum of Keckermann's teaching at DAG was unusually wide and included logic, politics, physics, metaphysics, ethics, theology, Hebrew, geography, geometry, astronomy, and optics. His *Systema physicum*[82], a set of lectures delivered in 1607 and published posthumously in 1610, discussed physics, astronomy, and natural philosophy, mainly in the Aristotelian terms. These works are of the philosophical and

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[78] See Rose 2019.

[79] Jacopo Zabarella (Italian: *Giacomo*) (1533–1589, Padua, Italy) is regarded the main representative of Renaissance Italian Aristotelianism. Known mostly for his writings on logic and methodology. Zabarella's philosophy had followers among Protestant Aristotelian authors. See Mikkeli 2018; Schmitt 2018.

[80] Keckermann B, *Praecognitorum philosophicorum libri duo, naturam philosophiae explicantes et rationem eius tum docendae, tum discendae monstrantes*. Hanoviae: Apud Guilielmum Antonium, 1607.

[81] Apart from B. Keckermann, Dąmbska indicated Heinrich Nicolai (1605–1665) as an instructor of logic at DAG and the author of the textbook, *Gymnasium Logicum*, Danzig 1640. H. Nicolai is not in the mainstream of our interest here, yet we direct a reader's attention to Nadolski 1959a.

[82] See footnote 75.

pedagogical nature but bear almost no scientific value and originality. They also contain serious gaps and errors, some of them criticized already by Isaac Beeckman[83] (1618). Nevertheless, they have a methodological value as they show that Keckermann excluded grammar, rhetoric and logic from philosophy (these were the *trivium* disciplines). His writings shed light on academic life and academic curriculum in natural philosophy at the turn of the 16th and 17th centuries.

His *Systema compendiosum totius mathematices*[84] is a collection of lectures given in 1605 (and some other years) on astronomy, geography, geometry, and optics. This set was intended for the second year of the *cursus philosophicus*. It is quite likely that it was *Scholarum mathematicarum*[85] by Ramus (1569) that influenced not only the geometry chapter, but also the whole *Systema*. Keckermann was also discussing the achievements of Copernicus and Copernicus's criticism of the Ptolemaic geocentric system[86]. Unfortunately, he did not provide any critical study of the Copernican system (Ryczek 2017).

Keckermann was the author of the first ever text on history of logic[87]. For more details on his views of history and historiography, see a thorough article, Ryczek 2017. In his treatise *De natura et proprietatibus historiae commentarius* (Hanovie 1610), Keckermann called history "a dangerous domain" and denying it status of a scientific discipline. In a sense, he was contradicting himself by admitting that history has its own "methods".

Nowadays definition of a scientific discipline differs from what it was in the 17th century. His *Gymnasium logicum*[88] found its place on

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[83] See Hooykaas 2018.

[84] *Systema compendiosum totius mathematices*. Hanoviae: Apud Petrum Antonium, 1617.

[85] Petrus Ramus, *Scholarum Mathematicarum Libri Unus et Triginta*. Facsimile of an edition from 1569. Hildesheim, Germany: Olms, 2008.

[86] A heliocentric system was not generally accepted until Johannes Kepler (1571–1630) developed his three laws of planetary movement (1609 and 1619). The Ptolemaic system was eventually abandoned following Galileo's observations of the phases of the planet Venus.

[87] *Systema logicae. Succinto praeceptorum compendio tribus libris annis ab hinc aliquot adornatum. Nunc extrema aura recognitum ... et eius fontes ex Aristotele et aliis praestantibus Logicis monstrantur ... cum doctrina Melanchthoniana ut servire possit Gymnasio Dantiscano* ... Dantisci: Ex officina typ. Guilhelmi Guilmothani, 1605. [Gdańsk, Bibl. PAN: Fa 22007 80].

[88] B. Keckermann, *Gymnasium logicum, id est de usu et exercitatione logicae artis absolutiori et pleniori libri tres* (Londini, 1606).

the list of forbidden books (*Index Librorum Prohibitorum*) by Vatican. Keckermann was attracting many students to the Gymnasium, some of them like David Schumann, were later editing his works and preparing for publication. Keckermann died in Gdańsk at age of barely 37 and was buried in the St. Trinity church.

Joachim Oelhaf (1570–1630) was a physician, scholar. He graduated from DAG in 1588, studied in Wittenberg and Altdorf, where in 1593 he obtained his doctoral degree in medicine. In the years 1594–1595 stayed at the court of the Polish king Sigismund III Vasa, where he benefited from the experience of the court medic Jan Baptist Gemma. Thanks to the scholarship from the Gdańsk City Council, he continued his studies in Padua and Montpellier, where in 1600 he received the degree of Doctor of Philosophy. In 1602, he took a position of a municipal physician in Gdańsk. He gained recognition in the city due to his full dedication to the medical profession during the plague pandemic that year, when about 16,000 Gdańsk residents died. In 1603, he became professor of anatomy and medicine at the Gymnasium. In 1607 became a senior of the city's doctors. His prestige increased by the visit paid by the king Sigismund III Vasa during his stay in Gdańsk.

Oelhaf dealt with anatomy and physiology; based his research on visual inspection and autopsies. He performed publicly at least three of them: the first was an autopsy of a child with liver pathology, the second–an autopsy of the Gdańsk scientist Bartholomaeus Keckermann in 1609, showing that the cause of his death was a heart attack. The third one, carried out on 27 February 1613 in a small refectory of the Gymnasium, was the first, in this part of Europe, public autopsy of a Pruszcz Gdański newborn with a multiple defect syndrome. The results of this last section were published, so it became known to the medical world of that time. Oelhaf was, among others, the author of a treatise on physiology and anatomy (*Trias problematum physiologicorum*, 1615[89]).

Johann Philipp Breyne (1680–1764), studied in DAG and since 1798 was a student at the University of Leiden; became a medicine doctor in 1702. Followed the footsteps of his father, Jacob Breyne (1637––1697). Johann Philipp toured Europe in 1703–1704 for educational purposes (London, Oxford, Portugal, Spain, Italy, Austria, Saxony and

[89] *Trias Problematum Physiologicorum* De quibus Deo Triuno Annuente. In Gymnasio Dantiscano Praeside Ioachimo Olhafio D.

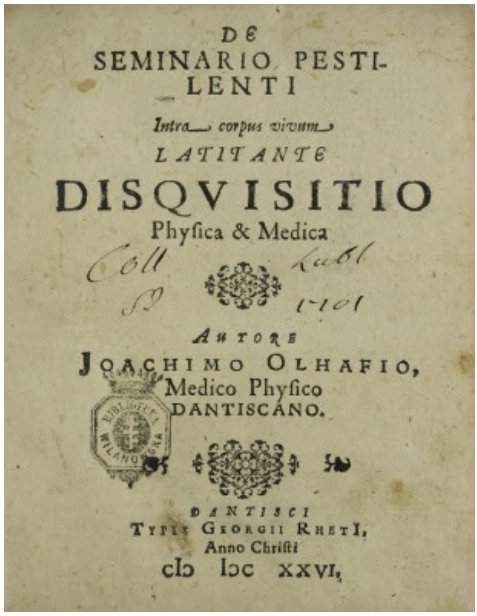
DE
SEMINARIO PESTI-
LENTI
Intra corpus vivum
LATITANTE
DISQVISITIO
Physica & Medica
Coll Publ
SD 1701
AUTORE
JOACHIMO OLHAFIO,
Medico Physico
DANTISCANO.
DANTISCI
Typis Georgii Rheti,
Anno Christi
clɔ Iɔc XXVI.

Fig. 15. *Intra corpus vivum*...(Dantisci 1626).
Source: *Encyklopedia Gdańska.*

Germany). After coming back to Gdańsk, he built a European class botanic garden of selected plants, including pineapple bushes, coffee and fig trees. Breyne, Jr. was a co-founding member of the Danzig Naturalists Society. In the course of his life, Johann P. Breyne became a member of several societies and academies: Since 1703, a member of the Royal Society in London, since 1715, a member of the Académie des Sciences and German Leopoldine (then located in Augsburg, now known as *Germany's National Academy of Sciences*). He was also a member of new Gdańsk societies: Societas Litteraria (since 1721) and the Danzig Naturalists Society.

Jacob Theodor Klein (1685–1759), considered the most outstanding systematist before Carl Linnaeus (1707–1778). Klein systematized the animal world, except the insects. He was the author of many significant works[90], very much valued by the foreign scientists. Member of foreign

[90] Including *Historiae avium prodromus*. Schmidt, Lübeck 1750, and *Historiæ piscium naturalis promovendæ missus quartus de piscibus per branchias apertas spirantibus ad justum numerum et ordinem redigendis.* Gleditsch & Schreiber, Leipzig, Danzig 1744 (5 vols.).

scientific societies: in London (*Royal Society*, since 1729), Bologna (*Academy of Sciences*, since 1748), St. Petersburg (*Imperial Academy*, since 1753), Halle (since 1756) and Jena (*Deutsche Gesellschaft,* since 1755). J.T. Klein owned one of the biggest natural collections in Europe. Became a co-founder of the Danzig Research Society and its first secretary (1743–1746), then the president in 1746[91].

Johann Adam Kulmus (germ. *Kulm*, 1689–1745) was born in Wrocław (germ. *Breslau*), studied at DAG in 1707–1710. Left for Magdeburg and Halle, where he attended lectures of Christian Wolff in math and physics. Kulmus obtained his doctoral degree in Basel in 1715. After coming back to *Gdańsk,* started his medical practice, founded a medical school and anatomy offices (Skrzypek 2000), appointed professor of medicine and physics at the Gymnasium in 1725. Was also substituting in teaching mathematics but offering mostly private lessons. Kulmus used the textbook *Mathesis Juvenilis*[92] by Johann Ch. Sturm. In 1724–1733, the chair of mathematics was vacant. In the science, courses Kulmus was using texts by Ch. Wolff. He was also teaching optics and astrognosis (an earlier version of astrology) and was leading disputations in physics. Some of the participants were future members of the Danzig Naturalists Society, including Daniel Gralath I and Michael Christoph Hanow. In 1731, Kulmus described *auroras,* which appeared in Gdańsk that year. The important work of J.A. Kulmus includes *Anatomische Tabellen*[93], *Elementa philosophiae naturalis*[94], *Disputatio de vita et morte*[95] and disputations of his students[96]. He was conducting research in anatomy until 1741. The same year, the *auditorium anatomicum*, where anatomy classes were taught, where the public (and non-public) autopsies were carried out, and the disputations were taking place, was moved out from the Gymnasium to the *Wide Gate* (Szarszewski

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[91] See Geus 1977; Kubik 1959c.

[92] Joh. Christophori Sturmii, Philos. Nat. & Mathem. P.P. *Mathesis Iuvenilis. 1,* (Acad. Altdorff. Typographus 1699).

[93] Johann A. Kulmus, *Anatomische Tabellen*, Danzig 1722.

[94] *Elementa philosophiae naturalis observationibus, necesariis experimentis et sana rationis suffulta*, Gedani 1727.

[95] *Disputatio de vita et morte*, Gedani 1728.

[96] *Fasciculus exercitationum physicarum de variis ac praecipuis rebus ad philosophiam naturalem spectantibus*, Gedani 1729.

2014). J.A. Kulmus was the last outstanding anatomist in Gdańsk in the 18th century.

Johann Ernst Scheffler (1605–1673), alumnus of DAG. Studied medicine and philosophy in Louvain (now in Belgium) and became a doctor of medicine in 1633. Then he held a position of *Royal-Polish doctor* at the Polish royal court. In 1661, Scheffler became a municipal physician and in 1665, together with Johannes Schmiedt, developed *Pharmacopoeia*, the first collection of recipes for medications in Poland (there were already 6 pharmacies in Gdańsk, the oldest opened in 1399). Any medication to be sold, required the City Council approval. Scheffler converted to Catholicism, but one week after his death had a Lutheran funeral in the St. Mary's church! In 1663, he founded his own epitaph in a truly baroque style in the St. Nicolai Dominican church in Gdańsk.

Johannes Schmiedt (1623–1690), also known as J. Fabricius (or Fabritius), was an alumnus of DAG. At age of 7, his parents sent him to Rudno nearby Pelplin, where the pastor Johann Schröder was lecturing Polish and Latin. It was a desire of his father (a municipal physician in Gdańsk) that his son becomes a theologian, so after his graduation from the Gymnasium, Johannes started his philosophical studies in Königsberg in 1642. Soon after, he shifted to medicine. In 1646, he left for Leiden, Netherlands, to study botany and Arabic, then to Paris, Lyon and Aquisgrán (now Aachen), and to Montpellier. Schmiedt earned his doctorate in medicine in 1649, Schmiedt 1649. Finally, for one year, he arrived in Padua for additional studies in anatomy, surgery, physics and chemistry. In 1650, he returned to Gdańsk and in 1661, appointed a city doctor. He became a very successful physician, exemplary scholar and prolific researcher in neurology and psychiatry (using contemporary terms). Among other cases, he was studying hypoesthesia, aphasia and various speech disorders (see Schmiedt 1676, with the co-authors Johann AP Gesner and Peter Rommel). He was the first to apply intravenous injections (IV). In neurology, his lasting achievement was the IV administration of anti-seizure drugs, Pękacka-Falkowska 2021. He was one of the first to realize that convulsive episodes were caused by neurological disorders rather than by demonic possession.

J. Schmiedt published numerous articles in various countries. In his lifetime, some of his works were translated to other languages. Along

Fig. 16. Ernst Scheffler (1605–1673) epitaph. (St. Nicolai Dominican church, Gdańsk).

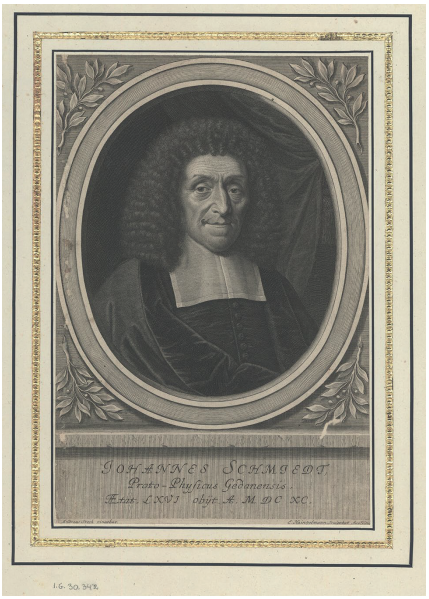

Fig. 17. Johannes Schmiedt (J. Fabricius, 1623–1690). Courtesy of the National Digital Library Polona (Poland).

with Johann E. Scheffler, developed the Pharmacopoeia (*Dispensatorii Gedanensis*) in 1665[97], mentioned earlier, which was not published until 1668. His only son, doctor Johann Gabriel Schmiedt died in 1686 at the age of 24. Johannes Schmiedt never recovered from his loss.

Michael Christoph Hanow (1695–1773), was an alumnus of DAG and a former student of Paul Pater. Studied in Leipzig. In 1724, he arrived in Gdańsk and in 1727 became a Gymnasium professor of philosophy. His research interests comprised law, theology, philosophy, natural sciences, and mathematics. He was a leading intellectual (polyhistor) of his era. He was a polyglot (fluent in Polish, as well). As a philosophy professor, he was teaching mathematics privately. M.C. Hanow became a pioneer of meteorology and was performing measurements of the atmospheric

[97] Schmiedt J, Scheffler JE, *Dispensatorium Gedanense continens omnia Materialia et Medicamenta Galenica, quem Chymica quae in officinis Gedanensibus prostant*, Auctoritete Magnif; et Ampliss. Senatus munitum, opera vero et studio Joh. Ernesti Scheffleri D. et Joh. Schmidt D. Physicorum huius loci ordinariorum adornatum, Anno a parte Virginis MDCLXV.

pressure by using the Torricelli barometer (Baszanowski 1994). Hanow himself was constructing various types of barometers. His observations were published in Gdańsk's weekly "Danziger Erfahrungen". In 1736, he became the editor of the first popular science journal, *Erläuterte Merkwürdigkeiten der Natur*.

Fig. 18. Michael Christoph Hanow (1695–1773). Source: *Wikipedia*; URL: https://en.wikipedia.org/w/index.php?title=Michael_Christoph_Hanow&oldid=1006120826.

M.C. Hanow introduced *medical statistics*, tabulated births and deaths in Gdańsk and Elbląg, and compared with similar data in other European cities. He was studying great accuracy weighing but was also working on construction of grain scales. In physics, he investigated the water freezing process and other liquids, as well as cooling processes of matter by evaporation of liquid on the surface. M.C. Hanow coined the term *biology*[98]. In 1762, he published Volume I of his *Philosophia naturalis...*[99], which comprised earth and celestial physics (considered general physical

[98] von Prantl 1879.

[99] M. Ch. Hanovius, *Philosophiae naturalis sive physicae dogmaticae: Geologia, biologia, phytologia generalis et dendrologia*, Halae – Magdeburgicae, 1762–1768, Bd I–IV.

properties of bodies, magnetism, electricity and heat measurement). The text was modeled after Ch. Wolff's philosophy. M.C. Hanow, his acolyte, did not create his own philosophical system, but was continuing development of the Wolff's philosophy and was the most outstanding continuator of his ideas in Poland. He became one of the founding members of the Societas Physicae Experimentalis; wrote about 120 papers and treatises. In mathematics, among other things, M.C. Hanow was working (unsuccessfully) on the *squaring circle problem*[100].

Georg Seger (1629–1678), was a professor of medicine and physics (taught physics in 1675–1678). He studied medicine at the universities in Leipzig, Wittenberg, Altdorf, Basel and Copenhagen. In 1669–1670, published 14 treatises in physics under a common title *Theoremata Physica De Anima Sensitiva*[101]. Seger spent his last three years in Gdańsk and became a chair of anatomy at DAG and a city physician. His spectrum of interests in medicine was wide and included anatomy (human and animal), cardiology, gynecology, pharmacology, and physiology. Among others, published *In Hippocratis librum de corde* (Gedani 1678)[102]. He conducted a public autopsy in March 1676 and his first autopsy–he performed in Toruń (1666), where he spent the majority of his life. Epilepsy was the illness which he was very much interested in and which he tried to cure[103]. Altogether, G. Seger authored 30 publications, including 5 on epilepsy.

Daniel Gralath I (1708–1767) graduated from the Gymnasium in 1728 and left Gdańsk for his jurisprudence studies in Halle and Marburg, but was also studying philosophy, physics and mathematics.

He was dazzled by the Christian Wolff's philosophical system of natural sciences and was continuing studies in that direction. In 1734, D. Gralath I came back to Gdańsk. The reports from the first year of activities of the Danzig Naturalists Society indicate that he was experimenting with electrostatics.

D. Gralath I wrote on the history of electricity research. It appeared as *Geschichte der Elektrizität* in three separate volumes of *Versuche und Abhandlungen der Naturforschende Gesellschaft zu Danzig* (1747, 1754 and

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[100] M. Ch. Hanovio, *Impossibilitas quadraturae circuli, a priori adserta*, Gedani 1741.
[101] Georgio Segero, *Theoremata Physica De Anima Sensitiva,* Thorunii 1670.
[102] See *Gedanopedia* 2021b.
[103] Łysiak 2005.

Fig. 19. Daniel Gralath I (1708–1767).
(Schumann 1893)

1756, published by the Danzig Naturalists Society[104]). In addition, he completed the bibliography of electricity research (*Elektrische Bibliothek*, 1732–1746).

D. Gralath I became recognized by his experiments with a condenser as well as a prototype of battery, a device to store up electricity. He was using the electrostatic Winkler machine and originated research on the ways of measuring electricity and the influence of electricity on live organisms. At the same time, he was the first physicist in the world who was measuring electrostatic forces by using the electrostatic scale (Gralath–Kühn scale), thus preceding Henry Cavendish (1731–1810) and Charles-Augustin de Coulomb (1736–1806). Around 1750, D. Gralath I made Gdańsk a leading research center for static electricity. Since 1763, he served as a mayor of Gdańsk (Cieślak 1994a).

Daniel Gabriel Fahrenheit (1686–1736) was born in Danzig, died in Hague; was a student at the Gymnasium. After the death of his parents in 1701, his custodians sent him for studies in Amsterdam. Fahrenheit

[104] Gralath Daniel, Geschichte der Elektricität, in: *Versuche und Abhandlungen der Naturforschende Gesellschaft in Danzig*, Part I, pp. 175–304, Danzig 1747; Part II, pp. 355–459, Danzig, Leipzig 1754; Part III, pp. 492–556, Danzig, Leipzig 1756. See also Sawicki 2018.

was an engineer and physicist. Initially, his main interest was construction of thermometers and devices for pressure measurement (barometers and manometers). He was visiting Gdańsk twice: in 1709 and 1712, where was collaborating with Paul Pater on building measurement instruments.

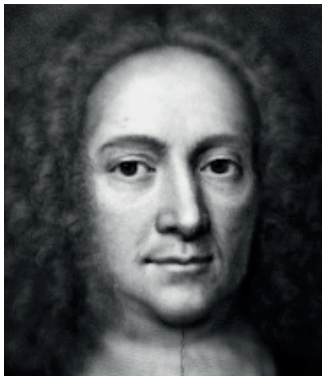

Fig. 20. Daniel Gabriel Fahrenheit[105] (1686–1736). Source: Gedanopedia; URL: https://www.gedanopedia.pl/gdansk/?title=FAHRENHEIT_DANIEL_GABRIEL.

Continued his research in Dresden in 1714, while working in glass foundry there. He was the first who used mercury in construction of thermometers (1715). Since 1718, Fahrenheit was teaching chemistry in Amsterdam. In 1721, he described a water super-cooling process. In optics, he improved construction of Newton's telescope[106]. His development Fahrenheit was presenting in 1723 and 1724 at the meetings of the Royal Society in London and, the same year, elected a member of the Society. Just before his death, in 1725, developed thermometric scale, called the *Fahrenheit scale*, which is still in use in the USA, Australia and New Zealand[107].

Paul Świetlicki (1699–1756) was a nobleman from Ostróda (town in Northern Poland, in the Masuria region) who was interested in physics. He was a student at the Gymnasium and, in 1720, under the tutelage

[105] Daniel Gabriel Fahrenheit, computer image constructed by using a genetic algorithm developed by programmers at the Gdańsk Technical University, working by Piotr Józefowicz from the Academy of Fine Arts.

[106] On Newton's developments in engineering, see Rodzeń 2020.

[107] *Słownik biograficzny Pomorza Nadwiślańskiego*, 1992, t. I, p. 397

of P. Pater, P. Świetlicki gave a dispute on Persian astrology. Then, he studied in Rostock and Wittenberg, later was touring France and England. After returning to Gdańsk in 1730, he was appointed a lecturer of Polish language at DAG, then, became a pastor in the St. John's Church. Was against attacks of anti-Pietists. He was one of the founders of the Danzig Naturalists Society. At the first four of its meetings, P. Świetlicki was lecturing on composition and elasticity of the air. He was an initiator of Daniel Gralath's experimentation with electricity. Their results were described in the letter (on March 9, 1746) sent to a French physicist A. Nollet, who, unfortunately, got an earlier report on experiments of Pieter van Musschenbroek (1692-1761) in Leiden. He developed, what we now call, the *Leiden jar*. Otherwise, it might be called the Gdańsk jar. It was a precursor of the condenser. It is worthwhile to notice that such spectacular instruments were attracting attention of many scholars, including Leonhard Euler who, in his *Letters to a German Princess*, dedicated one essay to the Leiden jar[108]. P. Świetlicki's research activities in physics and astronomy were presented to the Danzig Naturalists Society in 1778 by G. Reyger.

Gottfried Reyger (1704–1788) was a botanist, meteorologist and astronomer. An alumnus of DAG who for a long time was collaborating with Jacob T. Klein, a renowned Gdańsk naturalist. Once P. Świetlicki brought a Leiden jar to Gdańsk, it inspired Reyger to the start collaboration with D. Gralath I on measurement of electric power. He was also experimenting with free fall of bodies and movement on an inclined plane. As a botanist, was using taxonomy (systematics) of Carl Linnaeus. He wrote *Tentamen florae Gedanensis* (1764–1766) and *Die um Danzig wild wachsenden Pflanzen* (1768). As a member of Danzig Naturalists Society, was editing and popularizing the achievements of its members. In 1753, he became a president of the Society.

In his work, Salmonowicz[109] discusses the pedagogy of physics in the academic gymnasiums in Royal Prussia, with an emphasis on the Copernicus city–Toruń, where the proponents of the Copernican system and Tycho Brahe's ideas were very active. The system was introduced the earliest in Toruń among all Royal Prussia gymnasiums. We recall that at the earlier stage of education, general physics was

[108] 1812 Euler Leonhard, Lettre CXLIX, *Sur l'expérience de Leyde*. Le 28 Juillet 1761.
[109] Salmonowicz 1973.

treated as a part of natural philosophy. Teaching physics at DAG was then of marginal importance, nevertheless, as it was indicated before. Michael C. Hanow, Christian Sendel and Heinrich Kühn were performing many novel experiments in various physical disciplines like mechanics, optics, Earth magnetism and meteorology. It is worth mentioning here Michael Faraday (1791–1867), a self-educated British electrical scientist, the author of many discoveries, like Faraday's law of electrolysis and Faraday's law of induction, a person who was able to measure the capacity of condensers (capacitors). The units are *Farads*; In a popular use we have pF (pico-Farads) and μF (micro-Farads). Because of his age, Faraday would not be able to meet any of the primary physicists from the Society staff[110].

5.3. Astronomy and Medicine

Laurentius Eichstadt (1596–1660) was a physician from Szczecin, studied in Griffia, Wittenberg, Jena and Leiden. In 1621, he got a doctorate in philosophy and medicine from the University of Wittenberg. Started practicing medicine in Stargard Szczeciński, subsequently in Szczecin. Eichstadt was appointed a professor of medicine, mathematics and physics at the Gymnasium (1645), and at the same time took the office of the city physician. He performed his first public autopsy in 1651. Published *Problemata electro-logica Physico-Medica* (Gedani 1650).

In his program of teaching astronomy published in *Programma ad Philosophiae et Astronomiae studiosos in celebri Athenaeo Gedanensi* (Gedanii 1648), L. Eichstadt presented the up-to-date achievements in astronomy. He became a successor of P. Crüger and was using Keckermann's planetary doctrine, which he presented in *Solis in Ecliptica* (1648). Corresponded with important scientists and intellectuals of his time: Gerard J. Vossius (1577–1649), Daniel Heinsius (1580–1655), Hugo Grotius (1583–1645), Jan A. Komeński (1592–1680), and Johannes Hevelius (1611–1687).

Among many works in astronomy, Eichstadt published *Pars Prima Ephemeridum novarum et motuum coelestium quinquennalis ad annos aerae Christianae 1636, 1637, 1638, 1639, 1640* (Stetini: Typis et Impensis

[110] In Schumann 1893, there is no reference to M. Faraday, one of the greatest experimentalists of the 19th century.

Davidis Rhetii, 1634), where, in the introduction, he explained his views on connections of mathematics and medicine; *Ephemeris parva* (Dantisci: Typis Andreae Hunefeldii, 1647) and *Ephemeridum novarum et motuum coelestium ab anno 1651 ad 1665 pars tertia* (Dantisci: Apud Andream Hünefeld, 1644)[111]. He was also editing calendars, some of them in Polish, like *Nowy i stary kalendarz na rok 1654 i 1655*. L. Eichstadt was the best physician in Danzig, nevertheless, his achievements in astronomy were much more spectacular. He was supporting Tycho Brahe's ideas. For more on his philosophy and other accomplishments, see Omodeo 2017.

Johannes Hevelius (1611–1687), alumnus of the Gymnasium, was the most outstanding Polish astronomer after N. Copernicus. He was a student of P. Crüger. The list of Hevelius's developments is long. He described location of many celestial bodies with a great precision, created atlas of the Moon, which for decades was considered the most precise. Described about 400 observed comets, including 9, which he discovered himself. Based on his own observations, Hevelius catalogued precise positions of more than 1500 stars, Januszajtis 2015. Up to now, some of them have been described by the numbers from his catalog. In 1647, Hevelius published *Selenographia*[112], the first book of lunar maps and diagrams. He was not only a great scientist but also a great artist who was frequently illustrating his own books. Hevelius also developed new celestial maps by grouping stars into constellations, e.g., *Scutum Sobiescianum*, which is in force up to day. Polish king John II Casimir visited Hevelius in is observatory and was delighted by seeing pendulum clocks, which the astronomer constructed. One of them Hevelius gifted to the King. French King Louis XIV granted him a pension paid until 1672[113], king Jan Sobieski supported Hevelius with the annual salary of 1000 Polish złotys, exempted him from paying any taxes, as well as allowed him to trade beer on a free market. Being a brewer master was the source of affluence for his family.

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[111] L. Eichstadt also authored *Tabulae harmonicae coelestium motuum tum primorum, tum secundorum, seu doctrinae sphaericae et theoriae planetarum* (*Harmonic Tables of Heavenly Motions – First and Second Ones – or Spherical Doctrine and Planetary Theory*) (Stettin, 1644), the most important work completed during his Szczecin period.

[112] J. Hevelius, *Selenographia: sive, Lunae Descriptio*. Typis Hünefeldianis. Gedani 1647.

[113] In his dedication of *Cometographia* (1668) to King Louis XIV, Hevelius wrote such words: *heroicam liberalitatem incomparabilem benignitatem sumamque munificentiam*.

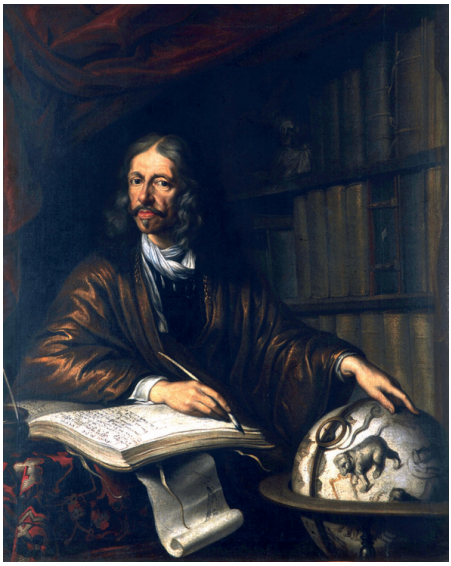


Fig. 21. Johannes Hevelius (1611–1687) by Daniel Schultz (1677), Gdańsk.

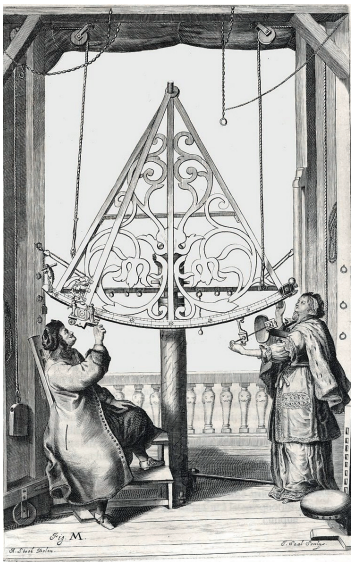


Fig. 22. Johann Hevelius observing sky through the sextant with his wife Elizabeth[114].

In the letter dated January 9, 1681, to Adam A. Kochański, called himself a *citizen of the Polish world*, Januszajtis 2015. Germans living in Gdańsk that time were mostly loyal to the Polish Crown. Hevelius invented the largest telescope in history, was manually cutting and polishing lenses to his instruments. He applied a micrometer screw to set his telescope precisely; it was its first application in the construction of scientific instruments[115]. His observatory located over the block of his three houses was considered the best and the largest in the world. He was corresponding with famous astronomers, including Edmund Halley, whom he hosted in his observatory. Hevelius was helping doctor Israel Conradt (1634–1715) in conducting research experiments. In his work, *Dissertatio medico-physica...*[116], Conradt called him *Sidus ipsae fulgidum et ornamentum patriae nostrae* (the brightest star and ornament of our

[114] Engraving by I. Saal after drawing by A. Stech, from his *Machina Coelestis*, Gedani 1673.

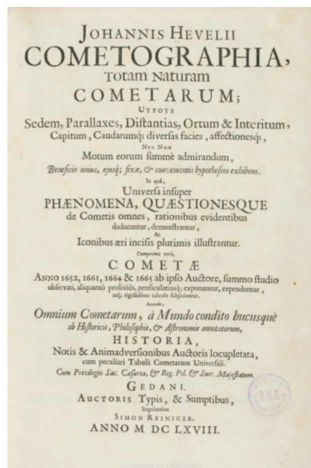
[115] *Słownik biograficzny Pomorza Nadwiślańskiego,* 1994, t. 2, pp.198–200.

[116] Israel Conradt, *Dissertatio medico-physica de natura atque effectibus frigoris*, Monasteri Olivensis S. Ord. Cist. Anno MDCLXX.

country). Along with J. Hevelius and naturalist Jacob Breyne[117], Conradt proposed establishing in Gdańsk a scientific society (1670).

Elizabeth Catherina Koopman (1647–1693), Hevelius's second wife, the first woman-astronomer in Poland (possibly, in the world). In 1579, after the fire broke out in the observatory, she helped to rebuild it. After Hevelius' death in 1687, Koopman edited his works, including *Prodromus astronomiae...*[118] (1690). Their jointly compiled catalogue contained 1564 stars and their positions. This edition included 56 star charts. Koopman was corresponding with the secretary and some members of the Royal Society in London. She was not a member of the Society, but J. Hevelius was one of its first members and the first foreign member.

Fig. 23. Hemisphere of the Northern Sky (1690)[119].



JOHANNIS HEVELII
COMETOGRAPHIA,
Totam Naturam
COMETARUM;
UTPOTE
Sedem, Parallaxes, Diſtantias, Ortum & Interitum,
Capitum, Caudarumq; diverſas facies, affectionesq;,
NEC NON
Motum eorum ſummè admirandum,
Beneficio unius, ejusq; fixæ, & convenientis hypotheſeos exhibens.
In quâ,
Univerſa inſuper
PHÆNOMENA, QUÆSTIONESQUE
de Cometis omnes, rationibus evidentibus
deducuntur, demonſtrantur,
Ac
Iconibus æri inciſis plurimis illuſtrantur.
Comprimis verò,
COMETÆ
ANNO 1652, 1661, 1664 & 1665 ab ipſo Auctore, ſummo ſtudio
obſervati, aliquantò prolixiùs, penſiculatiusq; exponantur, expenduntur,
atq; rigidiſſimo calculo ſubjiciuntur.
Accedit,
Omnium Cometarum, à Mundo condito hucusquè
ab Hiſtoricis, Philoſophis, & Aſtronomis annotatorum,
HISTORIA,
Notis & Animadverſionibus Auctoris locupletata,
cum peculiari Tabulâ Cometarum Univerſali.
Cum Privilegio Sac. Cæſareæ, & Reg. Pol. & Suec. Majeſtatum.
GEDANI.
AUCTORIS Typis, & Sumptibus,
Imprimebat
SIMON REINIGER.
ANNO M DC LXVIII.

Fig. 24. *Cometographia* – title page[120].

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[117] Jacob Breyne (1637–1697), Gdańsk merchant, naturalist and DAG alumnus. Father of Johann Philipp Breyne, one of the founding members of the Danzig Naturalists Society. Created a respectable book collection.

[118] Johannes Hevelius, *Prodromus astronomiae cum catalogo fixarum et firmamentum Sobiescianum,* (Johannis Zachariae Stolle Gedanii M DC XC).

[119] Engraving from: Johannes Hevelius, *Prodromus astronomiae cum catalogo fixarum et firmamentum Sobiescianum,* Gedani, 1690. Photo: © The Polish Academy of Sciences Gdansk Library (Grzybkowska 2012).

[120] A full title: *Cometographia totam naturam cometarum exhibens*, Gedani 1668. https://lynx-open-ed.org/sites/default/files/2017-09/Hevelius_1668_000_tp.jpg.

Fig. 25. Map of the Moon from *Selenographia* (1647).
(Andreas Stech and Charles de la Haye).

Johann Daniel Titius (1729–1796) was born in Chojnice (germ. *Könitz*). His mother, Dorothea, was a sister of Michael C. Hanow[121]. Titius is a Latinized name of Tietz. As his father, Jacob Tietz, orphaned him early, Johann Daniel was sent to Gdańsk under the wings of his uncle, M.C. Hanow. Titius was an alumnus of the Gymnasium and in 1748 started his studies at the University of Wittenberg, where he became an ordinary professor in 1756, and in 1768 became a rector of this university. He has primarily been known as a Polish-German astronomer. Nowadays, he is mainly recognized for the Titius–Bode law (1776) as an empirical rule for the distances of the planets from the Sun[122], Nieto 1972. He predicted existence of various celestial bodies, including asteroid Ceres, reclassified a dwarf planet in 2006. The asteroid *1998Titius* and crater *Titius* on the Moon were named in his honor. Titius was an active researcher in various branches of physics. In 1765, he presented an up-to-day survey on thermometry. In his earlier writings, Titius based on findings of other scientists, including Georg W. Kraft,

[121] There are two letters of Hanow (Hanow 1763, Hanow 1764), preserved in the Manuscripts and Rare Books Department of the University of Tartu Library, to his nephew, Johann D. Titius (December 17, 1763 and August 17, 1764).

[122] It was the Titius–Bode law that stimulated C.F. Gauss's interest in astronomy.

one of the top physicists of his time and the chair of physics at the Imperial Academy in St. Petersburg. Titus was a prolific author and the editor of six periodicals in natural sciences. His interests were also in physics (theoretical and experimental, especially in *thermometry*), biology, especially in classification of organisms, and minerals. *Lehrbegriff der Naturgeschichte zum ersten Unterrichte* (Leipzig 1777) was his major work in biology, where he gave a systematic classification of plants, animals, and minerals. See Folkerts 1976, also Kleinert 2004, for an explanation of the Titius–Bode law and many details regarding his life, as well as Jones 1970 and Sznajder 2015.

He also wrote historical works, including a history of West Prussia and Wittenberg, a description of the conquest of West Prussia by the king Casimir IV in 1454–1466, Titius 1763. Many of his historical works are related to Gdańsk.

In his only letter to Euler[123] (December 25, 1752), Titius asked for comments on his *Dissertatio Inauguralis, Luminis lunaris theoria nova, argumentis CL. Euleri superstructa* (Titius 1752).

Fig. 26. Johann Daniel Titius (1729–1796).
Source: *Wikipedia*; URL: https://en.wikipedia.org/wiki/Johann_Daniel_Titius.

Matthaeus Natanael von Wolf (1724–1784), born in Gdańsk, was a Gymnasium alumnus, studied in Jena, Halle, Leipzig and Erfurt. He obtained his degree in medicine in 1748 and became a court doctor for the Lubomirski and Czartoryski families, Polish aristocratic families. He became a member of the Danzig Naturalists Society (1776) and

[123] 2 Bl. – AAN, f. 136, op. 2, Nr. 6, pp. 229–230.

the Royal Society in London (1777). In July of the same year, he met Johannes III Bernoulli, when the latter was visiting Gdańsk. In his journey diary, *Reisen durch Brandenburg* ..., dated July 6, 1777, Johannes III made several very sympathetic notes regarding von Wolf. In 1765–1769, M.N. Wolf conducted astronomical observations in the Blue Palace in Warsaw while working at the Corps of Cadets as a physician general of the Polish military. In 1768, he was knighted by the king Stanisław A. Poniatowski. In 1769, von Wolf started practicing medicine in Tczew (germ. *Dirschau*), a town in the vicinity of Gdańsk. In 1772, after the First Partition of Poland, he moved to Gdańsk, which was still under the Polish jurisdiction, so as not to become a Prussian citizen, and opened his doctor's office there.

Fig. 27. Nathanael Matthaeus von Wolf (1724–1784). Source: *Wikipedia*; URL: http://en.wikipedia.org/wiki/Nathanael_Matthaeus_von_Wolf.

In 1781, using his own funds, von Wolf built the astronomical observatory on Bishop's Hill and equipped it with state-of-the-art instruments. von Wolf collaborated with the Imperial Academy. His observatory gained an excellent reputation in the rest of Europe for the accuracy of its observational data. The observatory was destroyed during the Napoleonic war by the Russians during the siege of Gdańsk in 1813.

Wolf's botanical work, *Genera plantarum, Vocabulis characteristicis definita* was published in 1776. This refers to the purported effects of vegetable juice as an antidote against snake venom[124]. Wolf was a strong proponent of the vaccination against smallpox, which was plaguing the population every several years. Children were the most vulnerable group. Initially, Gdańsk community was very reserved, but gradually acquiesced, and in 1774, the City Council accepted vaccination. N. Wolf was the only doctor who was prepared to perform the procedure. He died in December of 1784 while helping his fellow citizens battle the flu pandemic. Before his death, von Wolf granted 4000 ducats to Danzig Naturalists Society with the will to hire the observer and pay the costs of maintenance of the observatory (Sznajder 2015).

5.4. Outstanding humanists (not included before)

Christopher C. Mrongovius[125] (pol. *Krzysztof Celestyn Mrongowiusz*), 1764––1855, was born in Olsztynek (Masurian region, East Prussia). He was the last teacher of Polish language at DAG, Protestant pastor, linguist, translator and one of the first ethnographers studying the Kashubian folklore. He was preserving Polish cultural heritage in Gdańsk and the areas within the partitions of the Polish-Lithuanian Union. Mrongovius studied philosophy and theology at the University of Königsberg, where he was teaching Polish (1790–1796), then at DAG (1798–1812). Since 1812, he taught at St. John's parish school, wrote many publications, developed textbooks for Polish language and grammar, composed Polish-German dictionaries. Mrongovius was also translating works of Plato, Homer and Kant. As an ethnographer, he was collecting Masurian and Kashubian folk songs, and became a member of several European scientific societies. His library of more than 1,000 volumes is now a part of the collection in the Gdańsk Library of the Polish Academy of Sciences. Most of his life Mrongovius spent in Gdańsk, where he died in 1855 (Szturc 1998).

Johann Mochinger (1603–1652), professor of rhetoric at the Gymnasium (1630–1652) and the gymansium of Toruń, then in Wittenberg, Leiden and Strasbourg. In 1628 became a deacon, in 1638–1652,

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[124] Cf. *Memin Encyclopedia* 2016.

[125] See Bieńkowski 1977.

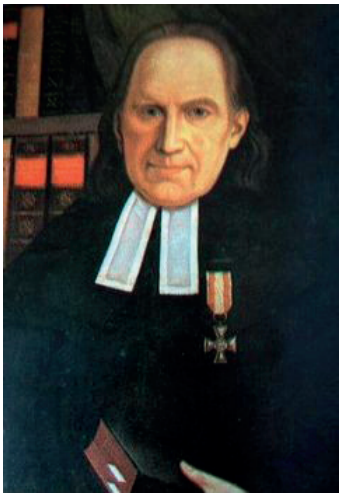

Fig. 28. Christopher C. Mrongovius (1764–1855).
Source: *Encyklopedia Warmii i Mazur*.

a pastor in the Luteran St. Catherine's Church in Gdańsk. He was one of the most outstanding educators, rhetor and rethorist (theorist of rhetoric) in Polish–Lithuanian Commonweath in the first half of the 17th century. Mochinger was the official speaker, gave orations after the death of the Polish king Sigismund III Vasa (1566–1632), after election and death of king Władysław IV (1595–1648), after election of king Johann II Casimir, and after the conclusion of peace with the Swedes in Sztum. He published some of his speeches in the collection *Orationes* (1637).

Mochinger was also known as a preacher. He published commentaries on Cicero's speech in *Floridorum e dissertationibus rhetoricis super Cicerone sylva* (Gdańsk 1640) and a textbook of rhetoric (*Orator atque rhetorista*, 1641). In these writings, Mochinger openly quoted Jesuit thoughts and treated them as an important source of inspiration[126]. In 1645, he participated, along with Michael Falcki (also a professor at the Gymnasium) in *Colloquium Charitativum*, i.e., meeting of Catholics, Lutherans and Calvinists in Toruń. He was buried in the church of St. Catherine, where his epitaph monument since 1663 has been located[127].

[126] For more details, see Awianowicz 2018.
[127] Mokrzecki 1997a.

Samuel Schelwig (1643–1715), Silesian, was born in Leszno (now, in Greater Voivodeship in Poland). Samuel studied Latin and Greek at early age and became acquainted with various religious texts. No doubt that this profile of his education was dictated by his father, an Evangelican pastor in Lower Silesia and paternal and maternal grandfathers, the latter being also a pastor. In 1661, Samuel matriculated at the University of Wittenberg. He studied history, philology, philosophy and theology. He was very much influenced by Aegidius Strauch who was an orthodox Lutheran. Schelwig obtained his master's degree in 1663. Subsequently, was completing his knowledge in theology, preaching and conducting religious disputations aiming at both Catholicism and Calvinism (Schelwig 1992, p.4 and ff.). Scientific achievements of young assistant professor in the chair of philosophy at the university of Lutheran Wittenberg, made Schelwig a sort of celebrity in academic circles where there was a need for academic administrators and teachers, especially those who presented anti-Catholic and anti-Calvinist attitude. Schelwig fit well that profile. At the beginning of 1668, he became a conrector of the Gymnasium Thoruniensis, where he was teaching logic, metaphysics and poetry.

In 1673, Schelwig assumed professor of philosophy and librarian positions at the Gymnasium. Besides, the same year he got an invitation for a position of rector from the Elbląg Academic Gymnazjum, which he declined. The invitation from Gdańsk was signed by Aegidius Strauch, a rector of DAG at the time, and earlier, a favorite professor of Schelwig in Wittenberg. He did not hesitate with the choice. Schelwig also became a successor of Strauch and became a second longest serving rector of the Gymnasium (1685–1715). He was an evangelist in the St. Catherine church and, since 1685, a pastor of the Holy Trinity church in Gdańsk. In a recent article, Lewandowska 2020 sheds some light on Schelwig's theological disputes regarding Pietism[128]. Schelwig was the

[128] Pietism was a 17th-century movement for the revival of piety in the Lutheran Church.This article presents an analysis of the foreword by Samuel Schelwig (entitled *Grüindliches und wolgesetztes Bedencken, Von der Pietisterey*, 1693) to the opinion issued by the theological faculty of the University of Leipzig on Pietism and its founder Philipp Jakob Spener (1635 –1705). The abstract in Lewandowska 2020, reads: *The author of the foreword (Schelwig) made an assessment of the religious condition of the new movement and also pointed out that its supporters misunderstood the essence of piety, comparing them to medieval*

author of more than 150 publications and treatises. He was known for his wide intellectual horizons and was one of the finest scholars and most outstanding intellectuals of his time in Europe.

Fig. 29. Samuel Schelwig (1643–1715).
[Nr inw. PAN BG: 5452]

Gottfied Lengnich (1689–1774) was born and died in Gdańsk. In the years 1707–1710, he was a student at the Gymnasium. After his studies in Halle (history, law and rhetoric), in 1713 became a jurisprudence doctor. He was a lawyer and a noted historian. In 1722, co-founded *Societas Litteraria* in Gdańsk, a society of a humanistic profile. Soon after (1722) he left, as the society was changing its profile. The City Council offered him a salary to finish the work of Caspar Schütz (*Rerum Prussicarum Historia*, up to 1525). Lengnich was successfully continuing it as *Geschichte der Preußischen Lande Königlich-Polnische Antheils* (up to 1733), which was edited in 9 volumes in the years 1722–1755.

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and early modern heretics. (...) The analysis of the source text is part of broader research into the history of the Pietistic movement in Gdańsk, which has incorporated research methods in the fields of philology and history, as well as biblical hermeneutics (..). See also Górska 2014, on Schelwig as an opponent of Pietism.

Fig. 30. Gottfried Lengnich (1689–1774). Source: *Gednopedia*;
URL: https://gdansk.gedanopedia.pl/gdansk/?title=LENGNICH_GOTTFRIED.

In 1730, he became a professor of rhetoric and poetry. In 1738, the empress of Russia, Anna Ivanovna, bestowed upon him a membership of the Imperial Academy of Sciences in St. Petersburg. In 1739, the king of Poland, August II, granted him an annual salary and in 1740 appointed him a Saxon legal counsel. In 1749, Lengnich edited the oldest Polish chronicles by *Gallus Anonimus* and *Wincenty Kadłubek*. He, along with M.C. Hanow, was among the most important local historians in the 18th century. For more details on other historical and legal deeds of Lengnich, see Kubik and Mokrzecki 1976 and Zientara 1995, as well as Salmonowicz 1972.

6. Epilogue

The initial purpose for creating the Danzig Academic Gymnasium was to educate a new wave of Protestant preachers and theologians in a classical profile school. The humanity part (history, philosophy, rhetoric, theology and other forms of religious studies) was a prevailing one in the academic studies at DAG. The science component that included astronomy, geography, mathematics, medicine, natural sciences

and physics, was rather modest and dominated by the humanities. Here, we put an emphasis on the science development, which was one of the reasons for writing this article. To keep balance, we featured several outstanding representatives of the widely understood humanities, whose significant achievements immensely contributed to the glory of the Gymnasium. Despite having the university ambitions[129] and a full spectrum of academic departments, the DAG never became a university; its academic level was high.

The school was offering a complete education and professors excelled in their disciplines, as they were carefully selected for their positions. The DAG achieved a strong, solid position in the European science and education. Among other gymnasiums in Royal and Eastern Prussia: Toruń, Elbląg and smaller, like Malbork and Chełmno (Vistula River), the DAG was a towering institution.

Here is the list of scientific disciplines along with their significant personae:

- *Astronomy*: F. Büthner, P. Crüger, L. Eichstadt, J. Hevelius, J.D. Titius, M.N. von Wolf,
- *Mathematics & Mechanics*: P. Crüger, H. Kühn, P. Pater,
- *Medicine & Anatomy*: L. Eichstadt, J.A. Kulmus, J. Oelhaf, J.E. Scheffler, J. Schmiedt, G. Seger, M.N. von Wolf,
- *Natural sciences:* J. Breyne, J.P. Breyne, J.R. Forster, J.G. Forster, J.T. Klein, P.S. Lürsenius, F.A. Zorn von Plobsheim, G. Reyger,
- *Philosophy, ethics*: M.C. Hanow, B.K. Keckermann, S. Schelwig,
- *Physics*: B.K. Keckermann, D. Fahrenheit, D. Gralath I, M.C. Hanow, H. Kühn, G. Seger, C. Sendel, P. Świetlicki.

Danzig Academic Gymnasium was in touch with the leading European universities (mostly in Germany), including: Altdorf, Basel, Copenhagen, Halle, Jena, Königsberg, Leiden, Leipzig, Marburg, Rostock, Strasbourg, Wittenberg, but also in France, England, Italy, Netherlands and Russia. DAG alumni were studying there and the professors were recruited from the above universities. The exchange of research and pedagogical accomplishments of the faculty and alumni with these

[129] The first university level academic institution in Gdańsk became the Königliche Technische Hochschule zu Danzig (1904), now known as the Gdańsk University of Technology. The University of Gdańsk was created in 1970.

respected schools contributed to the acknowledgment by the external world the achievements of the Danzig Academic Gymnasium as an academic center in Gdańsk and the Commonwealth. The phenomenon of traveling abroad and studying at several consecutive universities, often in various countries was known as *peregrinatio academica*[130].

The City Council Library was growing and proto-librarians and librarians were making every effort to keep the collection up-to-date. The achievements of numerous professors and alumni are still a subject of the contemporary studies, mostly in the context of history of their disciplines, subject matter, or philosophy of science and ethics[131], as the bibliographical items indicate.

During the DAG academic activities, two Societies were created in the 18th century Gdańsk: Societas Litteraria (short lived) and the Danzig Naturalists Society, which was one of the most important means to represent the city's science outside. The Enlightenment era habit of team working was exemplary there. Not surprising, four of the DAG faculty were founding members of this Society. Other founding and ordinary members, in their majority, were the DAG alumni. Some of the city patricians also held the Society's membership. It did not harm to have valuable sponsors. There were astronomical observations performed there, as well as the experiments in physics, described earlier. The newest developments in medicine were presented at the Society's meetings. It was in possession of rich naturalist collections, which were either donated by the Society's members who visited foreign regions, or were the gifts by the external donors. Public lectures were advertised in the city and were contributing immensely to popularization of science in Gdańsk. We reiterate efforts the Society made to improve a social consciousness regarding hygiene, vaccination (mainly, by Dr. M.N. von Wolf) and obstetrics. The midwifery institution was created, albeit its activities we not performed on a permanent basis. The Society also had its own rich library, second only to the City Council Library. The membership was treated as a distinct honor and was taken seriously. The heritage of the Society is rich.

It is also imperative to acknowledge the achievements of the leading Gdańsk humanists: Gottfried Lengnich, Johann Mochinger, Christopher

[130] Nadolski 1965.
[131] Brodnicki 2007.

Celestin Mrongovius, and Samuel Schelwig. Without deeds of those titans of independent thinking, the assessment of the Danzig Academic Gymnasium scholarly activities would have not been complete.

A high level of recognition of the scientific achievements of the Gdańsk scholars can be seen in ennoblings and honors bestowed upon some of them as royal secretaries, medics, and historiographers. Case in point: Joachim Pastorius (1611–1681), professor of jurisprudence and history at DAG[132] (1655), was bearing the title of Brandenburg court historiographer and, at the same time, was in service for the Polish king Jan II Casimir (ruled in 1648–1668). J. Pastorius was taking minutes during the Polish–Swedish negotiations before the Oliva peace treaty in 1660. He became ennobled by the king Jan II Casimir in 1662. We indicate two royal court physicians: Georg Seger (1629–1678) – *medicus regius*, physician of the kings: Jan II Casimir (1609–1672) (pol. *Jan Kazimierz*), Michael I (1640–1473) (pol. *Michał Korybut Wiśniowiecki*), and John III Sobieski (1629–1696) (pol. *Jan III Sobieski*). We also mention Mathias N. von Wolf (1724–1784), a court doctor of the Polish aristocratic families of Lubomirskis and Czartoryskis.

Several Gdańsk luminaries became members of the foreign academies: Jacob P. Breyne, Johann Hevelius, Jacob T. Klein, Heinrich Kühn, and Gottfried Lengnich. Daniel Fahrenheit, Johann R. Forster, and Johann Hevelius were members of the Royal Society in London. As we indicated before, Philipp A. Lampe became a member of the Kaiserlich Leopoldinisch-Carolinische Akademie der Naturforscher.

Some thoughts we owe C.C. Mrongovius, whose linguistic achievements and literary work already positioned him very high. At his time no one was aware that his ethnographic interests, folk song collections, etc., would play a critical role in the preservation of the national and cultural identity of the Kassubian people of the second half of the 19th and the first half of the 20th centuries.

The Danzig Academic Gymnasium was active for 259 years (that is a quarter of a millenium), going through fortunate as well as tumultous years of its academic activities, witnessing changing curricula and pedagogy. Achievements of the scholars related to the Danzig Academic Gymnasium have been permanently recorded in the history of science.

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[132] Praetorius 1713, pp. 114, 233. See also Mokrzecki 1997b.

The Gymnasium as an entity, intellectually influenced Gdańsk, the Polish–Lithuanian Commonwealth, and the scholarship of the 16th––18th century Europe.

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