Part I

HISTORY OF SCIENCE IN GDAŃSK

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Abstract: This is the first part of the book entitled *History of Science and Technology in Gdańsk*, edited in 2014 for the 110th anniversary of the Gdańsk University of Technology (*Politechnika Gdańska*). It begins with a concise history of the local education with emphasis laid on schooling in the field of technology. It is followed by the history of the University of Technology founded in 1904 as German *Hochschule* but always having many Polish students. In 1945 it was transformed into a Polish university. The next sections are devoted to the prominent scientists of the old Gdańsk and their worldwide important achievements, not always sufficiently popularized. Many of them were members of foreign academies and scientific societies including the Royal Society of London. Then, the scientific societies of the past Gdańsk are presented, including but not limited to the Experimental Physics Society (later Naturforschende Gesellschaft), one of the first such institutions in the world. Last but not least, scientists of the beginning of the 20th century are presented as well as the pioneers of science in Gdańsk after World War II, who had to rebuild the destroyed infrastructure and create the scientific life in Gdańsk from scratch.

Keywords: history of science, history of Gdańsk

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1. Introduction

The pre-partition *i.e* prior to partitions of Poland Gdańsk, restored to Poland in 1454, was the largest and richest city in the country (with more than 70,000 inhabitants in the 17^{th} century), the main port, and a leading centre of trade, crafts, science and culture. Printing houses started to operate from 1498 and the general compulsory schooling was established in 1526. In 1540 *Narratio Prima* - the first story about the Copernicus system - was published in Rhode's printing shop in Gdańsk. On this occasion, the author, Joachim Rheticus, measured the magnetic declination, initiating the world earliest curve showing its changes. The famous Academic Gymnasium started to operate in 1580, the Gdańsk Library in 1596, and the first periodical newspapers in Poland started to be published in 1619. From 1641 Johannes Hevelius operated the first permanent astronomical

observatory in the world which was equipped with telescopes. This was the place of work and birth of such scientists as Philipp Clüver, the founder of historical geography; Daniel Gabriel Fahrenheit and Daniel Gralath, the pioneers of physics; the mathematicians Peter Krüger and Heinrich Kühn; the naturalists Jacob Theodor Klein, Johann Rajnold and Johann Georg Forster, participants of Cook's second expedition, the great philosopher Arthur Schopenhauer; Hugo Conwentz, a pioneer of the European nature conservation, Adolf Butenandt, a biochemist and Noble Prize winner, and many others.

2. Prehistory

When was science born in our land? It is impossible to offer a specific date. It was already the nomadic tribes moving to and from these areas in pursuit of game that must have had the ability to associate facts and draw conclusions. Similar objects and events were linked with one another and the gained experience was used to create an intuitive theory that would help increase the effectiveness of meeting the needs. The equivalent of the scientists of today were elderly people sharing their knowledge with young generations and becoming their teachers. In this way, peculiar schools of life and survival functioned about which we know practically nothing. It was the priests who possessed this peculiar knowledge, intertwined with superstitions, however, they would pass its basics to their successors only. Thus, we can speak about the beginnings of true science in our country only after Christianity had been introduced and church schools where students learned how to write and could read literature, to a modest extent at least had been established. Owing to the far-sighted decision of the first rulers, we stepped into the Western World of the Latin culture - the magnificent heritage of the ancient Rome. Gdańsk Pomerania had a chance to encounter its representatives as early as in the times of the Caesars, when Roman merchants would come to get amber, nevertheless, these were purely trading relations, more on a material than spiritual level. The products they were bringing occasionally may have had an effect on the domestic technology of manufacture, nonetheless, this impact was hardly very profound. Real ties with the Western culture began to take shape only when Pomerania had been incorporated into the state of Mieszko I in the late 10th century. It was the year 997 that was of great significance in this respect, when St. Adalbert and his companions arrived at *urbem Gyddanyzc* - the City of Gdańsk, to pay a visit [Fig. 1]. He celebrated a mass in the Latin rite, baptized plentiful masses of people and sailed to the land of the pagan Prussia to be martyred there. His stay in Gdańsk did not go unnoticed. The first church must have been built, doubtlessly on the territory of the state hillfort where priests started their activities. A school may have been established, about which there is no mention though. All these processes were fairly superfluous at the time. Subsequent relapses of paganism would restore the former state of affairs, nonetheless, the minds of the citizens of Gdańsk and Pomeranians at that time retained the awareness that somewhere in the West

there was a world where people lived in a different, perhaps better way; a world it would be worth striving for. Gdańsk and Pomerania eventually became a part of this world when Bolesław Wrymouth had incorporated Poland thereto in 1119. Governors were appointed originating the later dynasty of the Samborides. Gdańsk became part of the Kuyavian diocese (in 1148 – as evidenced) with the seat in Włocławek (Leslau) and a network of parishes and parish schools started to be created. A great breakthrough began.

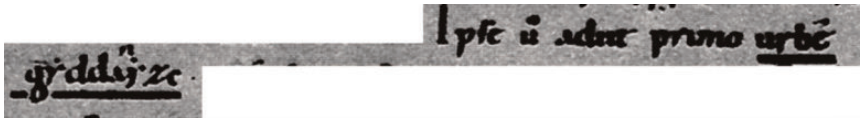

Figure 1. *Ipse adiit primo urbem gyddanyzc* – He (St. Adalbert) first arrives at the city of Gdańsk (997)

3. Education

The first piece of information about a school in Gdańsk is incidental. Three masters: Evrardus, Johannes - described as *physicus* (most probably a physician) - and Gerwinus, "the master of boys" (magister puerorum), *i.e.* a teacher, were mentioned as witnesses of a document of Prince Świętopełek II from 1227 transferring the St. Nicholas Church to the Dominicans who had come from Krakow. This first school in Gdańsk may have functioned at the hillfort parish, and after 1227, at the St. Catherine church. Latin church schools taught reading, writing, the Catechism, singing and calculation. Chalk was used to write on a blackboard, a stylus on a wax tablet, and ink on parchment. There were also monastic schools - with the Cistercians in Oliwa at least from 1224, with the Benedictines in Święty Wojciech (St. Albrecht) after 1236, with the Dominicans in Gdańsk before 1287, etc. The monastery in Żukowo (Zuckau) which was founded in 1214 ran a female school for novices and also for daughters of noblemen and the bourgeoisie at a later time. Girls learned writing, reading and handicrafts. The most educated people were monks, priests, the noble knighthood and the bourgeoisie. Even in the countryside there were quite a lot of people who could read and write.

Mentions about citizens of Gdańsk studying at universities in various countries appeared in the 14^{th} century. In 1357, the name of Peter Pungow from Rybacka Street (Straganiarska Street now) was mentioned; unfortunately, it was not said at which university he studied. In 1376, another student from Gdańsk (the surname was not mentioned at that time) received a bachelor's degree at the University of Prague. In the years 1376-1400, 16 residents of Gdańsk graduated from this university with an academic degree. More information comes from Bologna (1392 and 1395), Erfurt (1400) and Krakow (after 1400, no lists are available from earlier periods). The list of the first students of the University of Rostock, founded in 1419, includes 11 residents of Gdańsk. In the years 1430-1454, 55 students from Gdańsk were enrolled in Leipzig, 34 in Krakow, 24

in Vienna, 15 in Rostock, 8 in Erfurt, 6 in Cologne and 3 in Bologna. More and more representatives of the enlightened classes, clergy and city authorities received PhD degrees. In his *Labyrinth of Married Life* (*Labirynthus vitae coniugalis*, 1432) the city writer, Konrad Bitschin, a graduate of the Sorbonne, was the first to try to capture the entirety of the knowledge of that time: education of young people, methods of ruling the state, the art of war, horse breeding, etc., intermingling the text with colourful stories, such as the story of Grizeld, the most faithful of wives. The Thirteen Years' War resulted in decreasing numbers of students, especially in Krakow: with only 14 in the years 1455-1466, compared with 18 in Leipzig, 17 in Rostock, 15 in the newly opened university in Greifswald, 2 in Vienna and 1 in Bologna and Cologne. In the subsequent periods, the first place was taken by Kraków, where 67 citizens of Gdańsk studied in the years 1467-1492, compared to 41 in Leipzig, 17 in Rostock, 8 in Greifswald, 3 in Vienna and Erfurt, 2 in Cologne and 1 in Bologna. These preferences could be seen even more clearly in the years 1493-1517: 88 students from Gdańsk studying in Kraków, 34 in Leipzig, 18 in Rostock, 17 in Greifswald, 9 in Cologne, 5 in Vienna, 3 in Erfurt, Tübingen and Bologna, 2 in Heidelberg, etc. After the victory of the Reformation, sons of wealthy patricians more often would choose Protestant universities to the disadvantage of the Catholic Krakow. There was still no university in Gdańsk.

Schools established or reinstated in the $14^{th}/15^{th}$ centuries at: St. Mary's (the first mention in 1350), St. John's (a teacher mentioned in 1472), Peter and Paul's (1436), Barbara's (1421), Catherine's (1422) and Bartholomew's (1416 - in the Young City) churches survived in a more or less altered form until 1945. In the beginning, teachers were staffed by church authorities. This tradition was broken by Władysław Jagiełło in 1410 who conferred upon the City Council the right to appoint and dismiss the Rector of St. Mary's School, the largest and most important university in the city. In 1436, all schools were under the city's patronage. The German language was introduced in addition to the existing Latin.

The Reformation tried to impose compulsory education on all children, rich and poor (1525). The education system was reformed in 1539 by the eminent educator Andreas Aurifaber (Goldschmidt). Latin and German schools were merged. The curriculum was broadened to include the Latin grammar and the basics of Greek. Special care was taken of poor children. From 1551, they would be provided with clothes, books, paper and ink by the school. A typical school building comprised a kitchen and 5-10 rooms. One of the rooms served as the rector's apartment. Unmarried baccalaureates lived in unheated rooms. The discipline was enforced by a rod which could be used to hit "loins in a gentle manner, so that there should be no complaints". The motivation to learn was participation in staged Latin comedies. Some schools had five grades each – where the fifth grade was the lowest. There were up to eight teachers in each school, there were more than 200 students in the grades. Polish was taught in many schools.

In addition to parish schools there were also private schools called 'independent' (54 in 1663). Schools were supervised by the then education office, as of 1600

known as the College of Scholars, composed at a later time of the mayor, three councillors, two jurors and four representatives of the Third Order.

4. Academic Gymnasium

In 1558, the so-called *Particular* or Evangelical Latin secondary school was established in the acquired post-Franciscan monastery by the endeavours of the Mayor, Constantine Ferber, which later, in 1580, was transformed into the Academic Gymnasium [Fig.2] divided into chairs. The first four grades were extended to include two higher grades where philosophy, law, history, medicine, theology, mathematics with geography and astronomy were lectured and retorics, poetry, as well as Polish, Greek and Hebrew were taught. The studies proper, equivalent to the first two years at the university, were pursued by students of knowledge in the highest - second and prime – grades, where each course of study would last for two years. The objective of education in the three lower grades was to prepare students for this stage. The ambitious curriculum covered chiefly the basics of Latin with 15 hours per week in the lowest fifth grade, 12 hours were devoted to calligraphy, calculation and elements of the Polish language, four hours were used to teach the Catechism and sentences from the Holy Bible. In the next grade - the quarter - some of these burdens were replaced by an hour of arithmetic and four hours of music. In the third grade, students were fluent enough in the language of the ancient Romans that they could recite poems and hold debates, and also start to learn classical Greek.

Figure 2. Academic Gymnasium in 1687 (P. Willer)

The curriculum in the highest grades included classes (in Latin) in theology, logic (4 hours per week), philosophy with elements of Hebrew (4 hours),

rhetoric (7 hours), etc. In the best years, the Gymnasium was attended by 600 students from various parts of the country and from abroad. The professors were such celebrities as Bartholomew (Bartholomus) Keckermann (1572-1609), author of the first history of logic in the world, Peter Krüger (1580-1639), mathematician and astronomer, student of the great Kepler, teacher of Hevelius, Johann Kulm (1689-1745), whose textbook on anatomy was translated into seven languages (including Japanese), and many others. Their achievements will be discussed in more detail in the chapter entitled *The Gdańsk Coryphaei of Science*. The level of education in the Gymnasium was so high that foreign universities enrolled its graduates for the third year of studies. A high level of education was also represented by the Jesuit College in Stare Szkoty (Alt Schottland) which was opened in 1621.

The Saxon times brought the downfall of schools from which they were lifted by the reform of 1788. It was at the time that schools would be formed in a way similar to those of today. The Prussian authorities transformed the Academic Gymnasium into the City Gymnasium (1817; located in the building designed by Karl Friedrich Schinkel at Targ Maślany from 1837) [Fig.3] and reformed the other schools. From then on, the old traditions were shown by their names only. In 1794, Karl Friedrich Conradi referred to them by creating the teaching foundation "Conradinum" (the school in Jankowo from 1801, moved to Gdańsk in 1901). The School of Arts and Crafts established in 1803, the Navigation School (1817), the Ilgner Music School (1824) and the so-called Trading Academy (1833) should be mentioned among other new institutions. As of 1864, elementary schools started to be transformed into four-grade public schools. The first Real Gymnasium (on Łąkowa Street) with an extended curriculum of mathematics and natural sciences and the first Real Secondary School (former St. Peter's school) were opened in 1876 and 1888, respectively.

Starting from 1900, schools would be reformed in the direction that we know from the history of Poland too. A new quality was brought when the Gdańsk University of Technology (Technische Hochschule - in Polish Politechnika Gdańska) had been established in 1904. The interwar years include, *inter alia*, a period of fighting for the Polish school in Gdańsk. It was operated by the Polish Educational Society [Polska Macierz Szkolna] founded in 1921 by Franciszek Kubacz. More than 1500 young people studied in seven public secondary schools and more than 1200 in seven so-called Senate Schools operated by the Society with Polish as the language of instruction (1936). The last success before the war was the extension of the superbly equipped Polish Gymnasium at Białowieska Street, Augustyńskiego Street today (the Province Governor's Office nowadays) [Fig.4].

There were three higher education institutions in Gdańsk before the last war: the Gdańsk University of Technology (from 1904), the University of Education and the Academy of Practical Medicine - later the Medical University (both from 1934); moreover, 22 secondary, 38 primary and 8 vocational schools.

At the present time (data from 2014), there are 14 universities Gdańsk (including 6 public institutions) with more than 80,000 students, 87 secondary

Figure 3. Gymnasium at Targ Maślany (Photo: Januszajtis A.)

Figure 4. The Józef Piłsudski Polish Gymnasium, development design (Bielawski Z., 1936)

(including 31 secondary and 7 post-secondary), 68 primary and 42 vocational schools. Every third inhabitant of Gdańsk studies. A wide range of scientific disciplines is represented.

5. Libraries

In 1556, Giovanni Bonifazio, Marquess d'Oria, a supporter of the Reformation, forced by the Inquisition, left his native Naples. He supplemented the collected book collection during his journeys on which he spent all his life. In 1591, rescued from a sea disaster, a half-blind old man donated 1040 soaked volumes

to "the benefit of young students and to the glory of the city" subject to the reservation that the books should not fall into the hands of the Jesuits. The epitaph in the Holy Trinity Church reads: "Here have the bones tossed over lands and seas for too long finally found the place of rest from wandering". In 1596, the books having been arranged in order, with more than 1000 volumes of the Franciscan book collection having been added, the City Council Library was opened in former monastery halls.

The first librarian was Daniel Haselwurtz. The preserved regulations instruct to handle books "with clean hands and an open mind". The number of books was rapidly growing owing to the support of numerous foundations. In the 17^{th} and 18^{th} centuries there were 60 large (more than 1000 books) private libraries in Gdańsk. The largest library - belonging to Heinrich Rosenberg – contained 22 000 volumes, including such rarities as *Flora Japonica*, of which in the World only two copies have survived. Most of these collections enriched the Council Library. Other church collections were added, including, *inter alia*, St. Mary's Library - one of the oldest in Europe. Founded in 1413 by the parish priest, Andreas of Słomów, it was housed in the All Saints' Chapel of St. Mary's Church in 1458. The precious books were chained to the walls. All of these books are currently kept at the Gdańsk Library. Their bindings are masterpieces of the bookbinding craftsmanship.

In 1819, the "City Library" was moved to St. Jacob's Church, and in 1905 - to the new building at Przybramna św. Jakuba Street (now a section of Wałowa Street) where it has been located to date [Fig.5]. The collections, taken over by the Polish Academy of Sciences after the war, serve thousands of readers every year. In 1914, there were 170,000 items, currently – there are more than 800 000 volumes including 56 000 old prints and incunabula, 10 000 manuscripts, 7 900 items of graphic and 9 800 items of cartographic collections. The exemplarily designed seat of the library became too tight with time. In 2005, a new building on the other side of the street was opened.

6. Pater's School

The Gdańsk Academic Gymnasium was a school of humanities where special emphasis was placed on the study of philosophy, theology and classical languages: Latin, Greek and Hebrew. Bartholomäus Keckermann, professor of philosophy (1602-1609), was the first to draw attention to the basics of technology. In one of his treatises, he emphasized the special role of mathematics in the field of mechanics, in the construction of military camps and fortresses, and in defending them with the use of war machines. Physics in the Gymnasium was incorporated in the chair of mathematics or - sometimes - medicine. Some teachers introduced elements of technology as part of mathematics, particularly geometry and physics. This was the case in 1645-1660 when Laurentius Eichstadt who would teach physics as an introduction to medical sciences in which he would include optics, astronomy, gnomonics, statics, geography, chronology and architecture (!). One

Figure 5. The Gdańsk Library building (Polish Academy of Sciences) completed in 1905 (illustration from promotional materials of the Library)

of the the most remarkable teachers in Gdańsk was Paul Pater. He was of German descent and was born in 1656 in Wierzbowo - in Spiš which was then part of Hungary. Having graduated from a gymnasium in Wrocław (Breslau), he studied classical languages, philosophy, history and mathematics in Leipzig and Jena. From 1688, he lectured on mathematics at the Gymnasium in Toruń (Thorn). He was also involved in the manufacture of optical instruments.

In 1703 he presented King August II with a polemoscope which he made with his own hands. This instrument, presently known as the periscope, was invented in 1637 by Johannes Hevelius, the great astronomer of Gdańsk. The King repaid Pater by granting him a patent to print calendars in the whole of northern Poland, which provided him with additional income. The Northern War during which Toruń (Thorn) was besieged by XII of Sweden prompted Pater to leave. He intended to return to Wrocław (Breslau), but he visited Gdańsk to see the treasures of the famous Council Library and stayed. At first he made a living giving private lessons in astronomy, geography and the Latin style. In 1705 he was appointed professor of mathematics at the Academic Gymnasium and held the position until the end of his life. He died in 1724. His legacy includes 28 publications and not fewer than 18 calendar annuals. He instructed that the following inscription be engraved in Latin on his tomb in the Lord's Supper Church (the Holy Trinity Church presbytery) to read: "Here lies Paul Pater, professor of mathematics who never in his life struggled with a disease, was filled with anger or consumed with lust". He passed away as a bachelor on 7 September 1724".

In his classes with students Pater laid emphasis on practical skills and applied knowledge - mathematics and technology. He propagated and implemented his ideas already while working at the Gymnasium in Toruń (Thorn). He believed

Figure 6. St. Trinity Church presbytery - place of rest of Academic Gymnasium teachers (Photo: Januszajtis A.)

that "mechanics is the most useful science for all mankind," and that "wrong are those who think that exercises in mechanics are not worthy of a free mind". This was by no means anything new at the Academic Gymnasium in Gdańsk. Although natural sciences and sciences were assumed to be of little or no importance whatsoever compared to the predominating theology, philosophy and logic, some teachers would include them in their classes to an extent larger that contemplated in the official curriculum of education. One of those who would do it was Peter Krüger, professor of mathematics in the years 1607-1639. One of his successors, Friedrich.

Büthner (1663-1701) would additionally introduce knowledge in optics, mechanics, statics, architecture and civil and military construction within a modest number of hours dedicated to mathematics and astronomy. After his death, the earlier approach, not very favourable to this kind of innovation, prevailed. Contrary to the university authorities, Pater tried to enrich the curriculum to include mathematics and applied physics (e.g. simple machines), even with outlines of fortifications. Nonetheless, as it was impossible to fully implement his program in the Gymnasium, he would teach it at private courses. At the same time, he initiated efforts to obtain a concession to operate a printing shop where he could print his calendars. When he finally obtained the permission in 1711, he organized a Mathematical and Mechanic Workshop of Arts at his printing shop. As we will

see later, it was the first school of technology in Gdańsk and in Poland. It was located at Żabi Kruk Street, possibly at the later number 39, marked in the land registers with the note "for the use of the Gymnasium".

More detailed information on this school can be found in the promotional brochure entitled *Practical information on the newly founded Mathematical and Mechanical Workshop of Arts of Professor Paul Pater in Gdańsk*, although published in 1714, but also referring to the earlier period of its activity. Let us quote two from among the 13 items contained therein: 4. As regards the main business of this Workshop and who from among the teachers is in charge of the education, as it was the author himself who had established the facility by his own resources, it is also he who manages all things and carries out inspection not only over those who work in the printing shop, but over all other exercises as well. Before noon, he himself teaches the useful art of calculation, according to the weights and measures, geometry, how to draw any shapes on paper, and how to measure all the desired points and squares in the area or in the field with instruments suited to this purpose. He also shows geography and how to use the sky and the globe with all of their structure and application on maps of the country and in astronomy to easily recognize both planets and stars fixed in the firmament. And he uses many an afternoon hour for mechanical exercises by which he is particularly attracted, and in which he would practice for many years from his youth with the most eminent masters in Wrocław (Breslau), Augsburg and Leipzig. 5. A special room is provided where lenses are polished, perspectives [telescopes], microscopes, magic lanterns, thermometers and other useful optical things are made under the guidance of an experienced master of mechanics. The same master shows how to artfully prepare pipes [tubes] for perspectives and microscopes made of wood or cardboard and how to give them a shining with marrow or lacquer varnish prepared in the Italian way. And also how to meticulously lathe small handy and pocket perspectives, subtle microscopes, snuffboxes, etc. made of metal, ivory, amber, horn and rare types of wood with screws. As well as how to make, with the help of certain instruments and dividing heads, very profitably and quickly, any sundial, lunar and star clocks, transporters, rulers, quadrants, armillary spheres, compasses etc. of silver, brass and other materials. He shows those who have already mastered lathing and carpentry also how to build musical instruments, such as flutes, harpsichords, spins and harps, following the method of organ builders. He gives the basics and rules from the civil and military architecture: teaches how to make various models of churches, palaces, fortresses, pleasure houses [German: Lusthaus], fountains, voice tubes made of sheet metal, plaster, wood or cardboard, according to the scale. As regards statics, he shows the basics, understanding of and differences in the mass and weight, teeth and gears, screws and bolts, bearings and other major implements, and how it happens that we can lift a weight of many centners with one pound only.

We do not know who the "experienced master of mechanics" was, he, under whose guidance youngsters were trained, *inter alia*, in making thermometers,

however, much shows that it may have been Daniel Gabriel Fahrenheit who stayed in Gdańsk at that time (until 1713) of whom we know that he worked with Pater. In his lectures, the professor used (as he himself claimed) "his own mathematical method", based on the works of great English and French naturalists including Hooke, Harvey, Bacon and Descartes. He does not mention Isaac Newton, however, in view of the lively contacts of Gdańsk with England, it seems impossible that he should not have heard about his *Principia*.

Professor Pater was an example of laboriousness. In winter he would get up at 4:00 a.m., in summer at 2:00 a.m. to get on with his activities straight away. Like many scholars, he was known to be absent-minded. His thoughts were constantly revolving around "mathematical and mechanical" problems. Despite his various eccentricities he was liked by his students who defended him against allegations of school officials. A list of objects prepared after his death included many finished or unfinished optical instruments made by his students.

7. Technical Education in Europe

It remains to place Pater's school against the background of similar initiatives in Europe. Starting from the Middle Ages, young adepts of technology learned its secrets in a guild system: apprentice - journeyman - master (foreman), drawing knowledge directly from the masters of a selected branch of the craft. In guilds and professional associations in general, as e.g. in construction (the so-called Masons' Guilds), elements of technical knowledge were secret and could not be made public. The accelerating development of science in the 16th-18th centuries was the reason why guild training was not able to keep up with it, and changes were needed. Extending the curricula in the existing schools and universities to include technical subjects encountered resistance. The only option was to create a new type of institutions - vocational and technical schools. In fact, we should begin with those that operated on the borderline of art - civil schools of construction and architecture. The first of such schools to operate was the Academy of the Arts of Drawing in Florence (1563), then the Academy of Saint Luke in Rome (1577). Similar institutions were established in Paris (1671) and Vienna (1692), but these were not schools in the strict sense of the word. The Academy of the Arts of Painting, Sculpture and Construction (Akademie der Mahl- Bild- und Baukunst) founded in 1696 in Berlin was transformed in 1704 into the Royal Prussian Academy of Fine Arts and Mechanical Sciences (Königlich-Preußische Akademie der Kunst und Mechanischen Wissenschaften). The addition of "mechanical sciences" to the name meant only that the Academy was to educate also craftsmen manufacturing artistic objects: weavers, goldsmiths, watchmakers, opticians and mechanics, hence, specialists not so much in the field of technology, but rather in applied art.

In England, the first proposal to establish a school of technology with an extensive curriculum was formulated in 1647 by the learned physician, William Petty, who in a letter to Samuel Hartlib wrote: "I have had many flying

thoughts, concerning the Advancement of Real Learning in general, but particularly of the Education of Youth, Mathematics, Mechanics, Physics, and concerning the History of Art and Nature…" He further elucidated his ideas for the reform of education in which he recommended, *inter alia*, that "all children, though of the highest rank, be taught some gentile manufacture in their minority, such as are turning of curious figures, making mathematical instruments, dials, and how to use them in astronomical observations, making watches and other trochaic motions, limning and painting on glass or in oil colours. graving, etching, carving, embossing and moulding in sundry matters, the lapidary's art of knowing, cutting and setting jewels, grinding of glasses dioptrical and catoptrical, botanic and gardening, making musical instruments, navarchy and making models for buildings and rigging of ships, architecture and making models for houses, confectioners, perfumers or dyers arts, chemistry, refining metals and counterfeiting jewels, anatomy, making skeletons and excarnating bowels, making mariners compasses, globes, and other magnetic devices."… "For the advancement of all mechanical arts and manufactures, we wish that there were erected a Gymnasium Mechanicum or a College of Tradesmen wherein we would that one at least of every trade (but the prime most ingenious workman, the most desirous to improve his Art) might be allowed therein"… Whether Paul Pater knew this program - we do not know, but the similarities are doubtless. Anyway Petty's Mechanical Gymnasium was never established. The first schools of technology in England started to appear as late as in the 19^{th} century.

Some elements of technical education were introduced by the so-called military academies, the predecessors of which were various types of specialized training institutes and military schools. In 1600, on the initiative of Maurice, Prince of Orange, a field of study in military engineering called "Low German Mathematics for Future Engineers" (Nederduytsche matematicque voor aanstaande ingenieurs) was inaugurated at the University of Leiden. The curriculum, developed by Simon Stevin himself, included mathematics, land surveying and military construction. Graduates would build fortifications of the Dutch type in many countries, also in Poland - in Gdańsk. The Italian builders of fortifications who were equally famous in Europe were trained rather by practice, although some of them were graduates of studies in mathematics and physics at one of the old Italian universities. In France, the first institution of this type may be considered to be the artillery school in Douai (1679). In 1716, Ecole de Ponts et Chaussées was established to prepare workers to build roads and bridges. In 1720, there were five similar military schools, in 1789 seven, including the famous Royal Engineering School of Mézières, founded in 1748. The School for Mathematicians and Navigators, opened in 1701 in Moscow, intended "for the skills of those who sail on the sea and for engineering skills, as well as for the artillery and civilians" should be considered as the first military academy in Russia. The cities in Europe where subsequent schools of technology were established included Berlin (1717), Turin (1739), Woolwich (1741), Wiener Neustadt (1748), Paris (1749).

Pater may have been influenced more directly by Christoph Semler, a pastor and educator in Halle, who taught courses for young people there in 1707-1710. Classes which were conducted twice a week covered "63 things, presented and explained in all aspects", including: "a clock mechanism, house model, warship, fortress, salt works, mill, mine, chemical workshop, glassworks, weaving workshop, lathe, horse and wagon, plough, harrow and tillage; then: all kinds of scales, Irish coins, measures, ordinary stones, precious stones, all kinds of wool and silk, spices, seeds, roots, minerals, animals, birds, fish, sea plankton. As well as: geometrical and optical instruments, tools of the art of motion, types of barometers and fountains, a magnet, a compass, weapons, a drawing of a building, the topography of the city of Halle, sky spheres, and much more". Nonetheless, it was not a school in the strict sense of the word. In 1727, the Prussian king, Frederick William I, introduced elements of technical knowledge to the program of study at the universities of Halle and Frankfurt (Oder), however, no information about the success of this undertaking is available. The first technical school in Germany was founded in 1747 in Berlin by Johann Julius Hecker. Hecker's School played an important role in the establishment of real schools (e.g. such a school was founded by his brother, Andreas Peter Hecker, in Stargard), and its specialist grades developed later into vocational schools. In France, the first school of technology was the famous Ecole Polytechnique, founded in Paris in 1794. Nowadays, the oldest university of technology in the world is considered to be the Technical University in Prague, founded in 1707 by Christian Joseph Willenberg (1676-1731) of Legnica. Nevertheless, this school started to operate as late as in 1717 - later than Pater's school in Gdańsk.

The juxtaposition of dates leads to the conclusion that Paul Pater's Mathematical and Mechanical Workshop of Arts, operating in Gdańsk in 1711-1724 was the first non-military technical school of technology in the world! For the sake of accuracy, let us add that it did not enjoy much interest. Pater had few students, which does not diminish his world pioneer's input into the education of technology.

8. Engineers

The origin of the word "engineer" is not clear. The Italian *enzignerius* discovered by Franz Maria Feldhaus in a Genoese manuscript from 1195, denoting the builder of fortifications, is supposed to come from Latin *encingere* - to gird. A year later, Alamanus Guitelmus described by this designation, built fortifications in Milan. In 1248, during the Crusade, the construction of siege machines was supervised by *mestre engegnere* Jocin de Cornaut. Another *mestre engingnieur*, Gascon Jean de Mesos, received nobility in 1254. Jean Albom - a clockmaker and engineer (*ingenieur*) of Provence is mentioned in the French accounts from 1537-1540. A different etymology can be found in English dictionaries: "Engineer, early 14c., constructor of military engines, from Old French *engigneor*, from late Latin *ingeniare*; general sense of: inventor, designer is recorded from 15c., civil sense in reference to public works is recorded from c. 1600". The word

engine which originates from Latin *ingenium* - inborn talent - is discussed separately. Let us add that in later dictionaries *ingenium* also means a military engine. The engineer in those times was a constructor of military engines and fortifications, and a constructor of all machines - only from the 18 century. In our area this is explained by Gottfried Lengnich in the Public Law of the City of Gdańsk of 1769: "The master of wall construction, experienced in this work who with time would be called 'engineer' reported to the Fortification Office." One of such builders in 1571 was Thomas Kardinal, who promised to save ten thousand zlotys annually on costs and expenses".

When did the first engineers appear in Gdańsk? By the end of the 16^{th} century, specialists employed to erect fortifications were called master builders, and those higher in rank would be called city master builders (Stadtbaumeister) with the prefix 'city'. Others were given various titles: master builder of walls and buildings (Wall- und Baumeister), master builder of water structures (Wasserbaumeister), master builder of mills or windmills (Muhlen- or Windmuhlenbauer), city master carpenter (Stadtzimmermeister), etc. When submitting a supplication (application) for employment in 1565 the famous Hans Kramer signed it as the Builder of Dresden. Employed in 1592, Jan Vredeman de Fries is recorded in the documents as a city builder, the great Anthoni van Obberghen - as builder of walls, or simply as Master Anton.

The answer to this question is provided by Paul Simson, the author of the History of Gdańsk (Geschichte der Stadt Danzig) from 1913-1917 (unfortunately unfinished): "We do not know much about Dickmann (Aegidius Dickmann, the author of the *Views of Gdańsk*, published in 1617 – author's note), it seems that he was an engineer, in any case in 1624 the Gdańsk City Council ordered Colonel Lisemann to propose the engineer's position to Dickmann, a native citizen of Gdańsk, if he were to meet him in the Netherlands". A year later, Adam Wybe aka Wybe Adams (the creator of the famous cable car at a later time) the "builder of mills " returned from Warsaw with the title of "Royal Engineer".

Nonetheless, this is not a final answer. Earlier pieces of news refer to the Italian engineers, as they are usually referred to, Hieronimo Ferrero and Giovanni Battista, brought in 1600 to give an expert opinion of the Gdańsk fortifications. We owe them the farsighted plan of a magnificent circle of bastions defending the city from the east. But was the word "engineer" used then indeed? In the source materials the former expert is referred to as the captain, and both of them together - as "masters of military construction" (Kriegsbaumeister). In 1619, a citizen of Gdańsk, Hans Strakowski and Dutchman Cornelius van der Bosch appear as engineers serving the city - as it seems for the first time - and they can be considered the first engineers in Gdańsk. In the reports of Order meetings of 4 May 1622, the latter was called "the newly hired engineer".

Here is how Józef Naronowicz-Naroński (approx. 1610-1678), the author of the *Book of Mathematical Sciences*, a three-volume textbook for engineers, written in 1655-1659, described the required qualifications of an engineer. Having

emphasized the importance of good preparation in the field of arithmetic, optics and perspective, painting, geography, history and politics, philosophy, artillery, pyroballics (today we would say pyrotechnics), astronomy, mechanics, chemistry, magic (!), gnomonics, and construction and operation of all kinds instruments, he wrote: "For true is the parable that the *ingienier* should have an iron head, so that it should last for work and thinking; a leaden cross in the rear, so that he should stately speculate until he has finished; ostrich eyes, so that he should hatch his thing with inventions like an ostrich would hatch with its sight; deer legs, so that he should not be lazy about delineations and about building fortresses, camps, trenches, but run when founding; a bag of fortunes for expenditures, for instruments and materials, for papers and books, that is why *ingeniors* are paid dearly so that they should have enough for the expenses needed. Not only should my *ingienier* know all this, but he shall also perfect to be called by the title of a good ingienier".

It would not be easy for the engineers of today to meet all these requirements!

9. From Pater's School to the Gdańsk University of Technology

Professor Pater's school ceased to operate with his death. It seemed that his ideas would be forgotten. The curriculum of an innovative school, the so called Conradinum founded by Karl Friedrich von Conradi in Jankowo near Gdańsk which was inaugurated in 1801 was *par excellence* humanistic and remote from technology. The School of Arts and Crafts organized in the Golden Gate in 1803 was artistic in nature, despite the "craftsmanship" in the name. Technical subjects were also missing in the curriculum of the Navigation School which started to operate in 1817. In 1824, the Royal Provincial School of Crafts was opened in one of the tenement houses of the Old Suburb, intended for "young people who want to devote themselves to one of the various building trades (bricklayers, carpenters, well and pipe builders, masters of mills, locks and canals, stonemasons, potters, joiners and locksmiths)". According to the assumptions, each year the best graduate was to receive a scholarship to continue studies at the Craft Institute in Berlin founded in 1821. At first, the school met with such poor interest only one student was sent there by 1833. The poor condition was the reason why it closed down and a new school was established to be headed by the astronomer, Karl Theodor Anger. The restructuring brought an effect: eight graduates received scholarships to continue further studies in 1835 alone. In 1843 the school had as many as 60 students. Operating since 1828, the Craft Association (Gewerbe-Verein) opened an Evening and Sunday Supplementary School for craftsmen in 1838 in which there were as many as 96 students aged 12 to 35 years [Fig.7]. In 1858, specialized sections, including chemical technology, mechanical technology, life sciences and construction were opened in the Association. In 1872,

the Craft Association announced the initiative to transform the courses of supplementary study into a school of technology, motivating it in the following way: "The high attendance observed at this school for years provides indeed the most obvious evidence to its importance and the need to expand and reform it in line with the progress of technology.

Figure 7. House of the Skipper's Guild - the later seat of the Crafts Association (Photo: Januszajtis A.)

As the development of the industry in Gdańsk is awakening, a matter of life is to have an institution to educate technicians needed in all factories and to provide the factories with the needed masters and technical managers in the future, while now it is hard to acquire them from far away and for a longer time." The initiative hit a vacuum and still there was no genuine school of technology in Gdańsk. In 1879 the Association opened the School of Steam Boiler Stokers. In 1879, at the Association's request, the Gdańsk Municipality granted a subsidy to the Supplementary School and provided rooms at 65 Piwna Street, and in 1880 even more convenient rooms were allocated in the building of the Saint Catherine School at 4 Katarzynki Street owing to which the number of grades was increased to three. The number of students reached 163. When the State Supplementary School was established in 1892 the Association was released from the obligation to conduct this type of activity. It was recommenced in 1899, when the so-called Master Courses (for craftsmen) were launched. In 1903, the Association took over a private school for stokers and engine drivers founded in 1880 by the engineer

and mill builder Friedrich Stahl. Stokers were educated in the lower grade, railway engine drivers - the upper class. The curriculum also included knowledge of the construction of steam engines.

10. How the Gdańsk University of Technology was established

The developing industry was accompanied by the growing need to establish a university in Gdańsk. At first, a university was contemplated, however, as such an institution operated in nearby Königsberg, the concept was changed to a university of technology. The proposal which put forward by Heinrich Rickert, a member of the Parliament, and supported by the Natural Society of Gdańsk and the Craft Association was presented to the authorities in Berlin in 1897. Gdańsk spared no funds to create the desired university. Without waiting for a reply, 6.5 hectares of land were purchased at Droga do św. Michała (Traugutta Street nowadays). Meanwhile, other cities submitted competing applications. As the anecdote says, Minister Bosse – having heard the experts who mostly supported Wrocław (Breslau) - announced: "Thus and therefore, I am announcing the decision: the University of Technology will be built in Gdańsk." In 1898, funds for this purpose were assigned by the Reichstag. The first, neo-Gothic version of the design of 1899 was rejected. In 1900, at the Kaiser's request, a version referring to the Gdańsk Renaissance was prepared which was completed in just four years after some amendments had been made. The inauguration ceremony was held on 6 October 1904. It was attended by Wilhelm II who spoke for a long time and reasonably about the role of technical sciences in life and economy, and then uttered the unfortunate sentence, which is repeated until today although it does not deserve it: „The university, erected on the land which was once incorporated by the German energy into the German culture, is to stand here and act like a tower, from which the German industriousness and the German spirit shall spread stimulating, supporting and fertilizing other lands". In one sentence, he emphasized the "Germanness" of this land four times. Apparently he was not sure of it.

11. What the University of Technology was supposed to look like

The edifices of the original establishment of the Gdańsk University of Technology are among the most outstanding achievements in architecture. Without any hesitation they can be placed as equal with the most famous universities of that period in the world. Even if we can see them in a shape impoverished by the war (especially the interiors), they still compel wonder and admiration - not only with the harmonious proportions, details of beautiful décor, but also with the care with which they were designed and with the exemplary functionality. However, not everyone knows that at the beginning they were supposed to look

differently. In 2000, in the PhD thesis by Hans-Dieter Nägelke entitled *The Construction of Universities in the Imperial Reich (Hochschulbau im Kaiserreich)* published in Kiel in 2000 we read: "When, following the Kaiser's intervention, it was decided at the beginning of 1898 that Gdańsk would be the place where the new university of technology would be built, on 16 March the design was presented to the Chamber of Deputies, plans continued to be prepared. It was already on 4 April that the Minister of Finance and the Minister of Public Works inspected the lot of land in Wrzeszcz (Langfuhr) that had been provided by the city of Gdańsk. At the end of the month, a spatial development plan was prepared with the participation of numerous learned experts. On the basis of such data, Hermann Eggert (1844-1920), the civil servant at the Ministry of Public Works responsible for construction, submitted the first concept with the Main Building and two of Chemistry/Physics and Electrical Engineering buildings on its sides, with a magnificent square, a courtyard of honour created between these three buildings with a spectacular view of the whole establishment. During the consultations held in the six following months which were attended also by specialists from Prussian schools of technology, this plan was abandoned to be replaced by the layout where all the buildings were situated in one row - the main arguments were that more backspace should be provided for extension and better connection with the power supply centre and with the Institute of Technical Engineering".

The documents and drawings can be found in the so-called Secret Prussian Archive in Berlin. Some of them were shown in Gdańsk at an exhibition on the occasion of the 100^{th} anniversary of the university in 2004. As it turns out, the style of the buildings was supposed to be different. A sketch of the original concept of the Main Building was published in 1899 by Elise Püttner in the guide to Gdańsk [Fig.8]. The body of the building is shaped in a similar way as today, however, the exterior design refers much more to the Gothic style, *inter alia*, in the stepped gables. The central avant-corps (with the main entrance) is completely different, with a gigantic single gable finished with an allegorical figure. The whole thing seems to be too massive and distant from the atmosphere of the old Gdańsk. It was later replaced with three gables with a fine turret added on the roof which was doubtlessly constructive as was the resignation from the neo-Gothic style in favour of the Gdańsk (Dutch) Renaissance, supposedly in accordance with the Kaiser's wish.

Nägelke continues: "Having been changed and approved in this way, the plans in the form of the first design, including a cost estimate, were adopted by the Chamber of Deputies in March 1899. When the Building Academy had expressed their opinion in May 1899, Eggert made some changes to the projections, and then left the Ministry of Public Works to devote himself entirely to the construction of the new Town Hall in Hanover. Thus, the task to oversee the plans was entrusted to Georg Thür (1846-1924) who had been in charge of University Buildings at the Ministry of Public Works since 1895. Albert Carsten (1859-1943) the former civil engineering inspector at the Government Presidium in Aachen

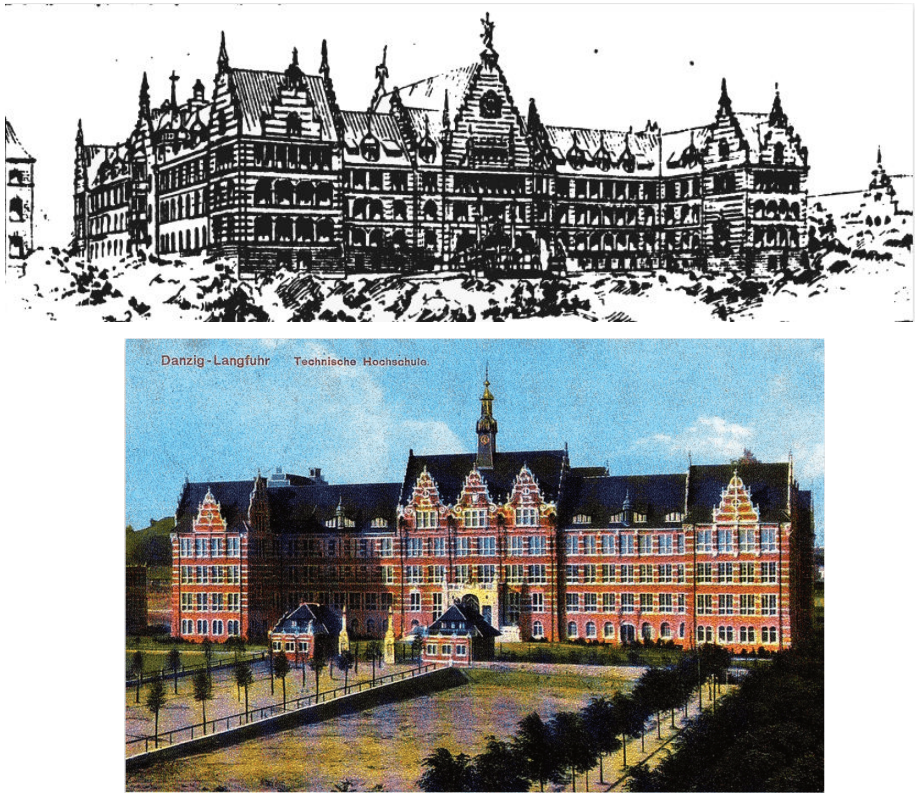

Figure 8. First concept of the Gdańsk University of Technology (acc. to Püttner E.)

was appointed as the third architect already in April 1899. However, his activity was limited to working out the details and to locally manage the construction of the entire complex which started in the autumn of 1900".

The author clearly diminished Carsten's role. The names of Eggert or Thür are nowhere to be found on the preserved for-construction drawings, however, the drawings contain a note "Fig. (gez.) by Carsten " [Fig. 8]. The drawings themselves are masterpieces of accuracy. Both architects, strongly involved in the ministry's activities, were certainly more famous and influential than their younger colleague (Thur was later a co-designer of the buildings of the Wrocław (Breslau) University of Technology), who, however - as we believe - - did the most important job. We can be practically sure that it was Albert Carsten who gave the buildings of our university their final near perfect shape.

12. Albert Carsten

Professor Albert Carsten - we know him as an outstanding builder, creator of the edifices of the Gdańsk University of Technology, however, we know very little about him apart from this. Much effort is required to find scraps of information to depict his character. In the personal files, partially preserved at the University

of Technology we read that he was born on November 1, 1859 in Berlin and was of the Evangelical faith. In 1878 he studied the history of art and mathematics at the University of Berlin, in 1878-1883 he was a student of the Construction Academy and it was there where he became a secret construction consultant (Geheimbaurat) on 26 June 1884. From 1890, he worked at the Ministry of Public Works. He came to Gdańsk in 1899 from Aachen, where he was a domestic construction inspector (Landbauinspektor). At the time when he was admitted to the position of professor (27 July 1904) he was a widower raising two sons. We know the places of his residence: first at 5 Pawłowskiego Street (Parkweg in those times), and from 1910 - at 10 Batorego Street (Steffensweg), in a house which has survived until today, and which may have been designed by himself. In the catalogue of professors in *Contributions and Documents (Beiträge und Dokumente)* to the history of the Gdańsk University of Technology, published in 1979 in Hanover, we read: On 1 May 1933, he retired and applied for a pension." Today we know that it was an anti-Semitic purge carried out upon the order of the Nazi authorities of Gdańsk. The "voluntary" quitting probably looked similar as in Poland in the times of the communist Polish People's Republic. If we look in the address book from 1934 we can still find him at Batory Street, however, in 1935 he is not to be found there, but he is still listed as the owner, with the note: Berlin. In the years 1937-1939 the villa belonged to his son, Hans Carsten, Ph.D., P.Eng. (Berlin). When Gdańsk had been annexed to the Reich, the house was taken over by a housing company. The professor's apartments were inhabited by a barber and four labourers. Hans, the above mentioned son of the professor was born in Berlin. He studied at the Faculty of Mechanical Engineering at the Gdańsk University of Technology (his name is on the list from 1913) and probably received his Ph.D. degree there. Later he returned to Berlin. The second son, Georg, a student of architecture, died on the front line in 1918.

The professor can be found in the Berlin address books. Until 1942, he lived in the exclusive district of Dahlem, at Rheinbabenallee 36, and his son in Charlottenburg, at Neidenburger Allee 5. In 1943, both disappeared from the register of residents. Knowing that the professor was taken away to the Theresienstadt camp, we find an appalling document: a certificate of death occurring on 3 September 1943 at 9:10 hours [Fig.9]. The causes of death were described as "senile weakness" and "heart failure". The place of death in the camp: Berggasse 15, room 12. The personal details of the parent: Ferdynand Cohn (not Carsten!) and Klara, née Jakoby. The box under the heading "nationality" has the entry: "Stateless person". The family status of the deceased: "widower, two children from the last marriage", date of marriage: 1891. Anna Taurs, his cousin, also imprisoned in the camp, was mentioned. Carsten's profession was described as "builder" (Baumeister). It was not mentioned that he was professor, Ph.D. P.Eng. and that he was a secret government construction consultant from 1914, awarded with high orders of the Reich in 1904 and 1907. The religion was mentioned: Evangelical - but a Jew – it was the latter fact only that mattered to the Nazi criminals.

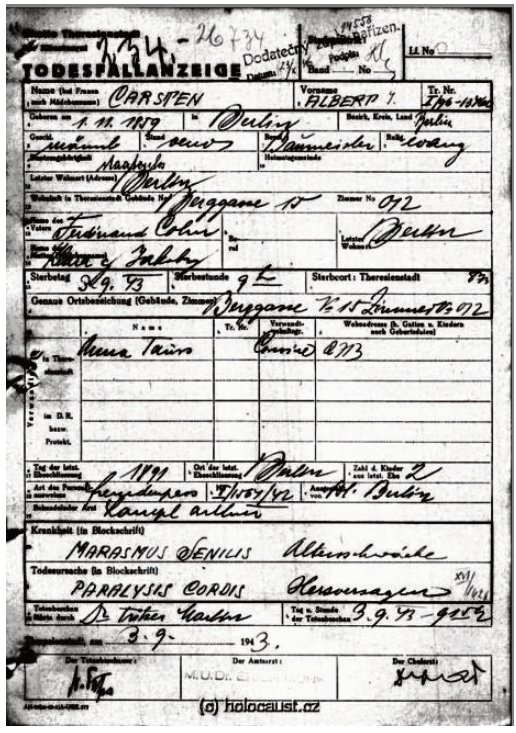

Figure 9. Albert Carsten, Death Certificate.

The document also contains information about the transport: No. I/1564 in 1942. The age of over 80 did not save Professor Carsten from deportation and extermination.

The greatest mementoes of Albert Carsten are the edifices of the Gdańsk University of Technology. As has been mentioned earlier, he was not their general designer, but he gave them the final shape and worked out the details. A plaque with an inscription in German has survived in his former office in the Main Building: "To Albert Carsten who built this edifice and taught in it for 29 years, 1933" [Fig.10]. In the times of the Polish People's Republic, attempts were made to hack it off (!), then it was covered with plaster, which was removed after the fall of communism. The plaque commemorates the professor's retirement. As we can see, his associates did not respect the Nazi ideas. A memento is also the house on Batory Street, waiting for renovation, on which a suitable plaque could also be placed.

13. Buildings

At first, magnificent neo-Renaissance buildings were created, referring to the architecture of the old Gdańsk, with Art Nouveau interiors, with the cubic capacity totalling c. 200,000 m^3 [Fig.11]. The Main Building alone occupied 122,000 m^3 containing - not counting the basements and attics - 210 rooms, 17

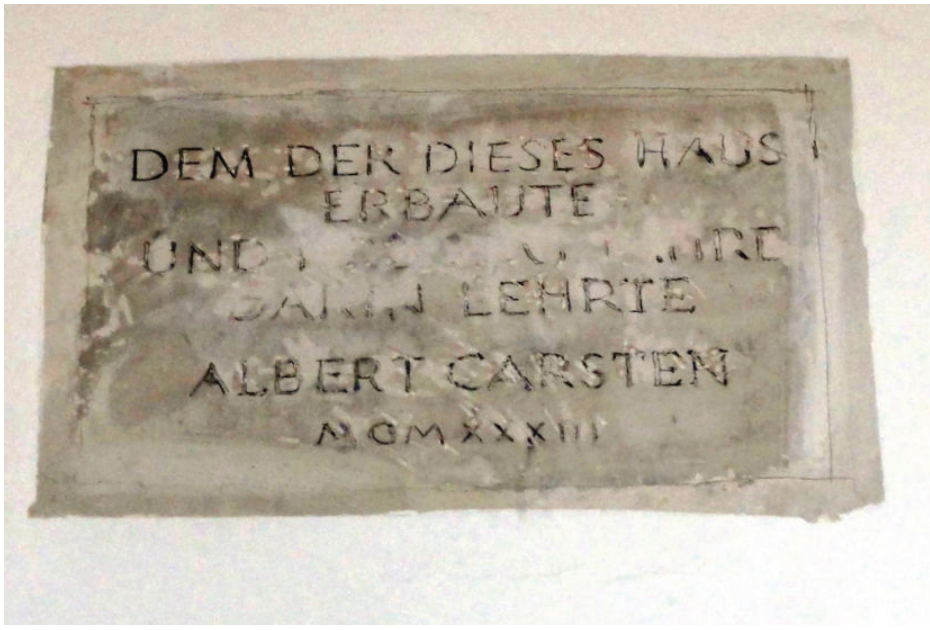

Figure 10. Commemorative plaque of Prof. Carsten from 1933 (Photo: Januszajtis A.)

Figure 11. Gdańsk University of Technology, entrance gate and Main Building, 1904 (Photo: archives)

lecture rooms, 24 drawing rooms, 36 professor's offices, 11 junior lecturer rooms, 11 rooms with research collections, laboratories, etc. The most beautiful interiors - the lecture theatre, the Senate hall and the central staircase - had an impressive

Art Nouveau décor which was unfortunately destroyed in 1945 [Figs. 12a, 12b, 13]. Equally rich, though smaller, were the Chemistry, Electrical Engineering and Machine buildings, luckily preserved until today. To this day, we admire the grand scale, solid workmanship and functionality of the buildings and rooms. In 1909 the complex was extended by the Strength of Materials Laboratory. Some apparatus was brought from America, from the World Exhibition in Saint Louis.

14. Development

In the beginning, there were six faculties at the University of Technology (called Departments): Architecture, Construction, Mechanical and Electrical, Shipbuilding with Ship Machinery Building, Chemical and General Sciences. In the years 1904-1914 the staff consisted of 28-31 professors, 12-26 associate professors and 44-55 assistants (including four teachers). The first rector was Hans von Mangoldt, a mathematician, author of excellent textbooks. The most prominent professors included: Albert Carsten, the previously mentioned constructor of the University of Technology buildings, the offices of the Fire Insurance Company at Wały Jagiellońskie Street (nowadays the Public Prosecutor's Office), a villa at 8 Sobótki Street and many other edifices; Friedrich Ostendorff, a theorist of architecture; Conrad Steinbrecht, the conservator of the castle Malbork [Marienburg]; Adalbert Matthäi, an architectural historian; Reinhold Krohn, a famous designer of bridges; Otto Ruf, a chemist Max Wien a physicist; Hermann Föttinger, a shipbuilder, and many others. A honorary degree of the University was awarded (in 1914), *inter alia*, to Walter Nernst born in Wąbrzeźno (Briesen), a Nobel Prize winner, the author of the 3^{rd} law of thermodynamics.

The number of students increased from 592 (including 191 regulars) to 675. 640 engineers and 62 PhDs had been promoted by 1914. Poles from Gdańsk, the so-called West Prussia and Greater Poland were also among the students. In 1913, they formed the first secret organization - the Union of Gdańsk Academics (later called "Wisła" (Vistula)).

World War I. During the war, the activity of the university was halted, nonetheless, it did not cease entirely. In 1917, a distinction was made between full and associate professors. The number of students varies between 116 and 170. 99 engineering diplomas and 25 Ph.D. degrees were awarded. The end of the war restored independence to Poland. From 1919, efforts were made to give the Gdańsk University of Technology (Politechnika Gdańska as it was officially called in Polish) to Poland. They were ineffective due the need to defend the Homeland against the Bolshevik onslaught.

Interwar period. In 1921, it was recognized that the University of Technology belonged to the Free City of Gdańsk, created a year earlier, which formally guaranteed equal rights to Polish students. A course of Polish and lectures of economic geography of Poland were introduced. In 1922, the structure of the University changed. The number of departments was increased to eight and grouped into

Figure 12a. Upper Hall with the entrance to the Lecture Theatre

Figure 12b. Lecture Theatre in 1904 (paintings on the walls from a later period)

three Faculties. The Faculty of General Sciences included the Humanities, Mathematics with Physics and Chemistry, the Faculty of Civil Engineering - Architecture and Construction, and the Faculty of Mechanical Engineering - Mechanical Engineering, Electrical Engineering as well as Shipbuilding and Aviation Technology. In addition to that, the so-called External Institute conducting classes for students from outside the University of Technology was established. Owing to the construction of the Physics wing with the lecture theatre *(Auditorium Maximum)*, the Hydromechanics and Aerodynamics Laboratory, the Student Dormitory, etc., the cubic capacity of the buildings reached 222,000 m3. In the years 1920-1929, the numbers of professors and associate professors increased from 60 to 66, assistants from 50 to 77, and students from c. 1,000 to 1,650. 77 to 202

engineering diplomas were awarded each year, and 17 or 18 Absolvents received PhD degrees. Owing to the beneficial scholarships, university students were most often of German origin - from 43% to 63% with only 14% to 28% coming from Gdańsk. The second largest group were Poles, who accounted for up to 36%. Their most important organization was the Brotherly Help Association of Polish Students of the Gdańsk University of Technology. Its name and statute were confirmed by the authorities of the University of Technology on 11 November 1921, and later by the Senate of the Free City, thus recognizing that the Polish equivalent of the German name of the University was **Politechnika Gdańska** (Gdańsk University of Technology). In addition to the Brotherly Help Association, the Polish students had 15 other organizations, including four corporations, three sports associations and six science circles; the official name of each of them included the Polish name of the Gdańsk University of Technology. This ostentation in naming was important for Poles studying there as it emphasized their rights to the University and Gdańsk. The attempts to weaken this position observed some years ago (*ex post* after so many years!) are hard to understand.

Let us return to the professors, among whom there were many outstanding scientists. The first mention should be given to the biochemist Adolf Butenandt who received the Nobel Prize in 1939 for his research conducted in Gdańsk. Carl Ramsauer, Walter Kossel and Georg Hass were the most famous in the field of physics, Wilhelm Klemm in chemistry, Karl Kupfmüller in electrical engineering, Karl Gruber and Otto Kloeppel in architecture. The value of the output of the historians, Erich Keyser and Wolfgang La Baume who were related to Gdańsk should not be denied despite the contamination with nationalist tendencies. The guest lecturers were such celebrities as Swante Arrhenius, Max von Laue, Ludwig Prandtl, etc.

Changes came in the Nazi times. The Nazi-propagated principle of "leadership", i.e. one-man leadership was introduced – in fact under the party's dictate. The Jewish professors and those who did not agree with Nazi ideology were eliminated slowly but systematically. Carsten, the distinguished creator of the University buildings was not the only one forced to retire. Professors Wohl, Wartenberg, Jellinek, and Doeinck who was popular among young people as well as many others were made redundant. In 1935, the number of professors and associate professors decreased to 63, and the number of assistants to 56. All students organizations (except for the Polish ones which were not subject to the Nazi authorities) were dissolved and replaced with one National Socialist Union of German Students the membership of which was obligatory for Germans. The curricula were modified to include racial theories. The number of subjects decreased drastically - from 435 to 335. With time, political and national conflicts began to escalate, especially between Poles and Germans. The climax was in 1939: on 24 and 27 February, Nazi militias with the participation of some German students (about 200) forcibly removed Polish students from the University. After many endeavours, they were allowed to return, however, it was practically impossible to make up for the los-

ses, and their return in the conditions of increasing international tension – was even dangerous. In this situation, no Polish student continued studies.

World War II. In September 1939, Gauleiter Forster, illegally appointed by the Gdańsk Senate "Head of State", broke the constitution of the Free City and passed a law to include Gdańsk in the Third Reich, which, of course, willingly approved it. The Gdańsk University of Technology was subordinated to the authorities in Berlin, which introduced stricter discipline. The students were required to provide a certificate of the Aryan origin. Facilitations were introduced for those called to the army. Until January 1945, classes had been held to a limited extent, later they were completely suspended. The Main Building was turned into a military hospital. Numerous workers, the most valuable books and some apparatus were evacuated by sea. A substitute university of technology was to be established in Schmalkalden, Thuringia. On the morning of 26 March 1945, the last German rector, Prof. Martyrer, left the University heading for Stogi [Heubude] via Nowy Port [Neufahrwasser] to take a cutter to Hel [Hela] to set off for Germany from there.

Figure 13. Main Building in 1945

In his dramatic memories, he described a column of fire and smoke seen above Gdańsk from the deck of the cutter. In the afternoon, the Russians took over the University of Technology and set fire to the Main Building. They killed some of the wounded German soldiers, others were taken as prisoners. Fire consumed the central part of the Building with most of the book collection in the Main Library. It was estimated that the buildings were destroyed in 16%, the Main Building – in 60% [Fig. 13]. This was the condition in which the University of Technology was returned to Poland. The legal act of 24 May sealed the return declaring that "the Gdańsk University of Technology (namely the university existing under that name) was becoming a Polish public university". In this

way, many years of efforts to have the Polish Gdańsk University of Technology were crowned with success. In 2000 the legal wording used helped, *inter alia*, recover the most valuable part of the collection of the Main Library, taken away to Germany, in the form of over 850 old prints, manuscripts and other materials of the famous Natural Science Society of Gdańsk.

15. Gdańsk University of Technology Today

The Gdańsk University of Technology, transformed into a Polish university in 1945, is now four times larger than before the war and has several dozen more students, and many of its professors have gained international recognition. The Main Building, which regained its winged turret in 2012 has been considered as a masterpiece of architecture [Fig. 14]. Post-war concepts of reconstruction of Gdańsk and innovative methods of shipbuilding were born within the walls of the University. It was here that the Gdańsk School of Liquid Dielectrics and many other research groups were established whose contribution to the world science and technology is indisputable. The scientific base is also incomparably larger than before the war. Today, the University has, *inter alia*, the most powerful non-distributed supercomputer in Poland, called Galera (Galley), with a computing power of 50 teraflops (50 trillion operations per second). Smart buildings have been created, where heating, lighting, air conditioning, ventilation and security are controlled by one electronic management system, programmed in a central computer. There are modern lecture theatres and specialized research and development laboratories, filled with multimedia. In 2013, the Nanotechnology Centre was commissioned, and the *Engineer of the Future* innovative program was launched, and in 2014, the Immersed Spatial Visualization Laboratory exceeding the limits of imagination was opened. There are no reasons to have any complexes indeed!

The development of the University of Technology is evidenced by the fact that it has been achieving high positions in various rankings for three years: it is the second Polish university in terms of interest of candidates to study and second among the most pro-PhD universities, also third in terms of graduate earnings, it has been also awarded for the third time the Leader University title for educating creative, ingenious and innovative graduates. The Gdańsk University of Technology is ranked eighth in Poland in many rankings of universities of various types.

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