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JAN BROŻEK: MATHEMATICIAN, ASTRONOMER AND BIOGRAPHER OF COPERNICUS (1585-1652)[1]

On May 28, 1621, Jan Brożek, a 35 year old professor of mathematics and astronomy, or rather *Mathematicus Ordinarius et Astrologus* of the *Academia Cracoviensis* (University of Kraków, later renamed the Jagiellonian University) sent to Galileo Galilei a short, courteous letter.[2] The letter was dated from Padua, where Brożek had just arrived from Kraków to study medicine. Brożek addressed the letter to Galileo — *Mathematicus* at the Court of the Grand Duke of Florence and wrote *Mathematicus Ordinarius* under his name. Thus, a mathematician writes to a fellow mathematician with greetings from the university where his colleague lived and taught a few years earlier. Naturally Brożek also wanted to introduce himself to Galileo, with hidden hopes of establishing a more durable contact. He knew, of course, or at least must have learned at Padua, that Galileo's position at the Court of the Medicis was remarkable and prestigious. First, Galileo had a court position[3] and also held the title of

[1] A version of this paper was presented at the 67th Annual Meeting of the Polish Institute of Arts and Sciences of America, Jersey City, N.J., June 15th, 2009. The author wishes to acknowledge the debt he owes to Professors Krzysztof Tatarkiewicz and Andrzej Pelczar for numerous, most instructive discussions. He is likewise grateful to the director of the Jagiellonian University library, Prof. Zdzisław Pietrzyk, who made the Henneberg map available to him in digital form, and for his permission to reproduce it here. He thanks the Polygraphic Services of the Jagiellonian University library at Kraków and the Ossolineum in Wrocław, for the scans of several documents and for their permission to reproduce them here. Pictures with no reference are taken from public domain documents. Last, but not the least the author wishes to thank Dr. Norman Kelker for his help in preparing this essay for print and for presenting it at the 2009 Annual Meeting of the Polish Institute of Arts and Sciences of America.

[2] The letter is preserved in the *Biblioteca Nationale* in Florence in a collection of Galileo manuscripts. The Latin text was published by A. Wołyński in *Relationi di Galileo Galilei colla Polonia*, Firenze, 1873.

[3] See. e..g. Mario Biagioli, *Galileo, Courtier*, University of Chicago Press, 1993.

Philosopher in addition to that of Mathematician — this is notable in that mathematicians were treated on the same footing as artisans in XVIIth century Italy. Secondly, Galileo had already enjoyed a considerable notoriety as a scientist and inventor. All that, plus the age difference (Brożek was about 10 years younger), explains the distinct note of reverence in Brożek's style. However, a closer look at the letter shows that Brożek wanted to convey in it something more than the greetings or expressions of admiration that could pave the road to an encounter. The reader can judge that for himself examining the text given below,

Clarissime Domine S.P.

Ex ingenii tui praestantia Te novi Galileae, etsi nunquam viderim. Anni sunt XIIII cum circinum tuum in eoque praxim Geometrie facilimam monstrante Illustri Domino Martino Sborowski tuo discipulo primum conspexi. Haec prima notitiae rudimenta. Postquam vero Medicaeos Planetas detexisti incredibile est, quantum accesserit admirationis ob res novas et quibus omnis orbium soliditas antiquitas credita tollerentur. Hoc firmissimum argumentum nostris in Academia saepe opposui cum res veniret, ut fieri solet in scholis ad controversiam.

Audio extare alia de maculis solaribus, verum illa nondum licuit videre, ut de iis que per aquam reguntur. Rogo te fac me participem. Quando autem tuum systema Reipublicae literariae debis? An opinio rerum veritati impedimenta obiicit? Hoc est quod veremur omnes. Tu tamen perge. Philosophorum sententiae ab opinione multitudinis semper aliae sunt. Ego cum essem in Prussia multa in variis bibliothecis reperi, quae suo tempore postquam medicinae studia confecero in lucem prodibunt et te salutabunt.

Vale,

Datum Potavii XXVIII Maii 1621.
Clarissimae Tuae Dominationis Addictissimus
M. Joannes Broscius Curzeloviensis
Academiae Cracoviensis Ordinarius Matematicus.
Clarissimo Domino Galileo Galilei Florentino Magni Ducis Mathematico et Amico observatissimo, Florentiae

[Sir,

Although the brilliance of your talents makes you so known, Galileo, I have not yet met you. Fourteen years ago your

disciple, His Lordship Marcin Zborowski[4] showed me your compass I had never seen before and also demonstrated to me how it facilitates the practice of Geometry. Thus began our acquaintance. Later, when you discovered the Medicean Planets, you cannot imagine how much our admiration grew of the new facts that shattered the notion of the invariability of the skies inherited from Antiquity. I have often proudly presented this most powerful argument in disputes with my colleagues in the Academy and have thus instructed them whenever controversies arose.

I have heard about your discovery of sun spots, although it is said that they should not be there. I am also familiar with your work on flotation in water. Let me learn more about it, I pray. When will you finally disclose all the facts about your system and make them available to the literate public? Is it the common opinion on those issues that impedes it? This is something we all fear. Be firm in your perseverance. The opinions of a philosopher are always different from common beliefs. **When I was in Prussia I made numerous discoveries in various libraries. I shall publish them all, in due time, and will transmit them to you, but first I have to finish my studies in medicine** (*my emphasis, J.Ch.)***.**

I wish you good health.
Padua, on the 28th day of May, 1621.
Yours, most devotedly
Joannes Broscius Curzeloviensis,
Mathematician Ordinary of Kraków Academy,
to the Most Respected Galileo Galilei, Mathematician and a distinguished friend of his Highness the Duke, Florence.]

In the first part of the letter Brożek tells Galileo that his, i.e.,

[4] In about 1608 Brożek was a tutor of Marcin Zborowski's son, Stanisław (1598-1614). The Zborowskis, as other Kraków Lords (*Panowie Krakowscy*) throughout the centuries, played the roles of influence and power in the Commonwealth of Poland and Lithuania. Contacts with the Zborowski family so early in Brożek's career must have significantly contributed to his intellectual development. The episode of the compass may serve as an example. The compass mentioned here, called "*compasso militare*" in Italy, was a rather complex instrument that could be used for land survey measurements and some calculations. It was developed and manufactured by Galileo, although it was not invented by him as it was believed, just like the telescope.

Galileo's, works are known and admired even in remote Kraków. He then implores Galileo to publish more and not to hesitate to express his opinions openly. We should remind ourselves that Galileo had already entered into open conflict with the Church authorities. In 1616 he was summoned to Rome by Robert Cardinal Bellarmine and was formally notified that Copernicus' work *De Revolutionibus* [*On the Revolutions*…] had been placed on the list of books prohibited by the Church, the Index, and further, he was ordered to abandon heliocentrism. Brożek must have been aware of these facts and perhaps for that reason the closing paragraph of his letter (given above in bold) has a distinctly cryptic flavor. Brożek does not say exactly where he traveled, what he found and what he was looking for. However, those "numerous discoveries in various libraries in Prussia" could have been perceived by Galileo as a quest for Copernicus' papers, although Copernicus' name was not mentioned. Evidently, Brożek preferred not to commit to paper anything that would compromise him or his addressee.

By some good fortune, browsing through an old book store, I stumbled across this intriguing letter in a volume entitled *Selected Writings*[5] of then-unknown-to-me Jan Brożek. I was until that moment unaware that Polish scholars had corresponded with Galileo.[6] I was also intrigued by what Brożek might have found in Prussia that was worth communicating to Galileo. "Thus began our acquaintance," to paraphrase Brożek's words, and that acquaintance has been well worth cultivating. It turns out that the literature on Brożek is surprisingly abundant. That is to a great extent due to the fact that Brożek willed his collection of books and writings to the *Academia Cracoviensis,* where he served for some time as the librarian. He was thus in a position to make sure that this entire collection, of no less than two thousand volumes (some rare and precious), remained intact. Actually, Brożek's collection ended up, after some peregrinations, in the prestigious *Biblioteka Jagiellońska* (Jagiellonian University Library) and is accessible for research and literary studies. The first to undertake a serious examination of these documents was, as far as we know, Jan Nepomucen Franke, when

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[5] *Jan Brożek, Wybór Pism* (*Jan Brożek*, Selected Writings); Vol. 1, Edited by Henryk Barycz, Vol. 2, Edited by Jadwiga Dianni, PWN, Warsaw, 1956.

[6] It was not an isolated event. Zborowski is mentioned in Brożek's letter to Galileo. E. Stamm (*Wiad. Matemat.*, Vol. XL, Warsaw 1936) mentions an encounter of Stanisław Pudłowski with Galileo in Rome in 1633 and later in 1639. Pudłowski, a mathematician and a friend of Brożek's, traveled to Rome to seek support of the Vatican for the *Academia Cracoviensis* in the conflict with the Jesuits. See also, A. Wołyński, *Relationi di Galileo Galilei colla Polonia*, Firenze 1873.

he was preparing a book on Brożek[7] in 1884. It was his contribution to the commemoration of the 300th anniversary of Brożek's birth, in 1585 at Kurzelów. From his birthplace stems the last segment of his Latinized name, *Joannes Broscius Curzeloviensis*.

At this point it is worthwhile to remark that all the available documents in which Brożek's name is mentioned are written in Latin. In printed ones, Broscius is generally used, while in manuscripts a distinction between Brożek, Brzozek, or Brożek is hard to make. Perhaps the parish books, where his baptism was registered, would help to resolve this question, but these perished in unknown circumstances. In the absence of such documents controversies arise as to the spelling and pronunciation of his family name. We use Brożek, the version which was most frequently used, including in the title of Franke's monograph.

Franke presents Brożek not only as one of the most eminent members of the *Academia Cracoviensis* but also as one of the most outstanding Polish mathematicians of his time. He also emphasizes the importance of Brożek's contribution to our knowledge on Copernicus' life and work. Franke was the first to provide some details on Brożek's voyage to Prussia, mentioned the Galileo letter, emphasizing that it provided a first-hand account on Copernican documents, when Copernicus' memory was still fresh in Warmia. The Copernican studies of Brożek, as Franke implies, had a degree of reliability as they were the work of a man of science. Although Brożek's accounts of Copernicus are dispersed, his concise biography of Copernicus was preserved and is included in Barycz's selection of Brożek's writings.[5] He also argues that the Copernicus biography in the first Polish *Who's Who*, Starowolski's[8] *A Hundredworth of Polish Writers*, should be attributed to Brożek. This first appeared in 1627 and was perhaps one of the items Brożek promised Galileo that he would publish. An amusing element of Franke's book is a Latin poem "In Ptolemeum et Copernicum due naturae miracula" [["Ptolemy and Copernicus, two Miracles of Nature"] that Brożek composed probably (according to Franke) just before the "voyage to Prussia." Brożek was certainly a better

[7] J.N. Franke, *Jan Brożek (J. Broscius) Akademik Krakowski, 1585-1652*, Jagiellonian Univ. Press, Kraków 1884.

[8] Szymon Starowolski, „*Scriptorum Polonicorum Hekatontas,"* Venice 1627, pp. 158-161. Its modern equivalent is "*Polski Słownik Biograficzny*" ["Polish Biographical Dictionary"] PAU, Krakow 1937, with its successive additions. The reader might be interested in consulting there an article on Brozek, by Aleksander Birkenmajer, one of founders of this compendium.

mathematician than a poet.[9]

In 1900 Ludwik Antoni Birkenmajer published a monumental book entitled *Mikołaj Kopernik* wherein he summarized the results of his own studies on Copernicus' work and presented the biographical material then available.[10] In 1924 he published its sequel. *Stromata Copernicana*,[11] complementing his former work by results of his novel bibliographical search carried out in Scandinavian and German libraries. As is well known, the Polish provinces lying on the Baltic seaboard were invaded by the Swedes several times, first in 1626 during the first Swedish-Polish war, then in the "Swedish Flood" years of 1655-60. The most devastating was probably the 3rd Northern War in the first decade of the 1700s, when the armies of Charles XII chased the Saxon troops of August II "The Strong" all over Poland. According to Birkenmajer[11] and Czartoryski[12] the Frombork Chapter Library, where most of Copernicus' books were kept, was taken to Sweden by Gustav II Adolf in 1526. The treaty of Oliwa ending the second Swedish war, signed in 1660 stipulated the restoration of the war loot to the Polish Kingdom. Although Poland was still a major power in Central Europe and could execute such a resolution, the Copernicus papers remained in Sweden. They were first examined there by L. Prowe in 1853, followed by M. Curtze in 1875 and L.A. Birkenmajer[9, 10] during several research visits, the last ones in company of his son, Alexander. According to Birkenmajer,[10,11] the Lidzbark castle library was captured by the Swedes in 1704, when Charles XII's army wintered in Warmia, the king himself residing in Lidzbark. What should be emphasized in the context of this paper is that the Birkenmajers found in Sweden some documents and books that

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[9] Translated into English, together with another Copernican poem of Brożek, by Owen Gingerich in the "*Annotated Census of Copernicus' De Revolutionibus, Nuremberg 1543 and Basel 1566"* Leiden, 2002. The "*Census*" also contains transcriptions of annotations on the known copies of the earliest editions of *De Revolutionibus*, with precious comments and abundant bibliographical material. See also "O. Gingerich, "*The book nobody read*" Walker Publishing Company, 2004.

[10] L.A. Birkenmajer, *Mikołaj Kopernik, Cz. I, Studia nad pracami Mikołaja Kopernika oraz materiały biograficzne* [Nicolaus Copernicus, Part 1, Studies on Nicolaus Copernicus works and biographical material], *Kraków* 1900, Skład Główny Księgarni Wydawniczej Polskiej.

[11] L.A. Birkenmajer, *Stromata Copernicana*, P.A.U., Kraków, 1924. The reader may appreciate the elegance of the title: *stroma* means a layer in Greek, hence stromata are the foundation layers.

[12] P. Czartoryski, *The Library of Copernicus*, Studia Copernicana XVII, Ossolineum 1979

Brożek examined in 1618 during his voyage to Warmia.

Birkenmajer[10,11] quotes Brożek's writings extensively, but as he addresses principally Copernicus' heritage, these remarks, biographical details on Brożek, are dispersed through the text. He used principally the memoirs of Brożek (*raptulare*) which provide rich historical material, interesting *per se* and precious for cross-referencing with the data from other sources. For example, Birkenmajer points out that Brożek passed to us the names of Copernicus' teachers in Kraków, where Wojciech z Brudzewa[13] is mentioned as his astronomy professor. Further, the quest for Copernicus papers in Warmia, the description of his findings, and in particular the annotations in the copies of *De Revolutionibus* belonging to the Copernicus inner circle, are abundantly commented on. In several places, Birkenmajer remarks that some letters that Brożek collected during the Warmia voyage have been lost because of Brożek's negligence. He was not alone in pronouncing such a verdict and the fate of these papers remains a mystery to these days. Another detail worth mentioning is Birkenmajer's interest in Rheticus, "the only disciple Copernicus ever had," to whom he devoted an entire chapter in his *Mikołaj Kopernik.*[10] The role of Rheticus in the editing of *De Revolutionibus* is commonly known. Less known, however, is the story of Rheticus' stay in Kraków, which, according to Birkenmajer,[10,11] lasted "at least twelve years." This he calculated from the date of the earliest letter sent by Rheticus from Kraków (1563) and the year when he left for Košice, coinciding with his death (1576). More recent publications show that Rheticus lived in Kraków longer, at least sixteen years (some even mention twenty). Whatever the case may be, it was a span of time long enough to make Rheticus an established part of Kraków's scientific landscape. Birkenmajer's interest in Rheticus seems to be a reflection of the fascination Brożek shows for that enigmatic itinerant scholar. As Rheticus left Kraków many years before Brożek's matriculation at the University (1604), they could not have met, but the memory of Rheticus probably still lingered during Brożek's days in town. In his heritage one can find a few letters exchanged between Rheticus and other known and less-known persons. Some of these letters (or their hand-made copies) were brought by Brożek from Warmia but others must have been acquired somehow later, in Kraków. One of them, as Birkenmajer points out, deserves particular attention. It was sent to Rheticus by some unknown Lauterbach who remarks

[13] Known also as Adalbert of Brudzew, born in 1445, educated in Kraków, he was a mathematician and astronomer, professor of *Acad. Cracoviensis*, later served as a secretary of Alexander Jagiellończyk, King of Poland and Grand Duke of Lithuania, died in Vilnius in 1497.

that Copernicus' work met with a very negative reception at the *Lutherstadt* Wittenberg. Brożek also writes in his *raptulare* about the obelisk Rheticus constructed in Kraków, in the garden of a Kraków patrician Jan Boner's house. That construction, "forty-five Roman feet high" served as a *gnomon* for solar observations. Brożek and Rheticus shared a certain penchant for obelisks, as they both put them as ornaments in the opening pages in their books, as in *Arithmetica Integrorum* and *Ephemerides*, respectively. Coincidence or a hidden message? Rheticus' *Ephemerides* were published in 1551 in Leipzig and Brożek bought the book in 1620 while crossing Germany on his way to Padua. It was, therefore, not a recent scientific publication, but rather a collector's item. Brożek was a book lover, but this purchase was certainly due to his interest in Rheticus and Copernicus. He was ready not only to buy the book, but to carry it with him all the way to Padua and then to Kraków.

Needless to say, several biographical notes on Copernicus appeared in the half-century separating Copernicus' death from Brożek's times. The first biography, now lost, was written shortly after Copernicus' death by his — probably only — friend, Tiedemann Giese. It is a great pity that it has not survived, because it probably was as personal as was Giese's letter to Rheticus, sent from Lubawa on July 26, 1543, just two days after Copernicus' death. In this letter Giese informs the addressee that "our dear Copernicus" died and suggests that Rheticus should prepare a new edition of *De Revolutionibus* and should include there a biography of Copernicus that Rheticus "so beautifully composed." Unfortunately that biography has not survived either. The next, written by Kromer[14] in about 1580 was short and eulogized Copernicus excessively, but such was the style of the times. It also attributed to Copernicus several non-verified works, such as *Septem Sidera* [Seven Constellations[15]], a poem in which Copernicus allegedly proposed Christian names for novel constellations (actually their number was some

[14] Marcin Kromer was a personal secretary of two Polish kings, Sigismund III, "The Old," and his successor, Sigismund August. From 1580 as bishop-prince of Warmia he was engaged in Copernican studies. He funded an epitaph plaque for Copernicus (not preserved) in the Frombork cathedral, whose text Brożek reproduced. He was a diplomat (envoy to the Austrian Emperor and to the Pope), historian and cartographer. He and his successor, Cardinal Hosius, were prominent counter-reformation figures in the Commonwealth of Poland and Lithuania.

[15] Birkenmajer in "*Mikołaj Kopernik*"[10] remarks that "s*idus*" (plural s*idera)* should be translated here as a constellation although it also means a star as used in *"Sidereus Nuntius"* of Galileo.

combination of the number seven). That inexactitude was later perpetuated by Brożek mainly as an attempt to reinforce the image of Copernicus as a Catholic during the Counter Reformation.

A short biography of Copernicus was included in the third (1617) edition of *De Revolutionibus*, entitled "*Astronomia Instaurata*" by the editor, Mulierus (Müller, who also signed himself as "Regiomontanus"). Brożek was familiar with it, as the annotations on the margins of his own copy of that book indicate. He must also been aware of its inaccuracies and errors. Finally, we should mention another biography of Copernicus that is often quoted, the *Vita Copernici* published in 1654 in Paris by Brożek's contemporary Petrus Gassendi (1592–1655).

So, one might ask, what makes Brożek so special?. Brożek is the first biographer of Copernicus in the modern sense of this word. He proceeded, as a contemporary researcher would, by familiarizing himself with the existing biographical material, consulting original sources and — what previous biographers were perhaps not in the position to do — visited places where the man he intended to write about, Copernicus, lived, worked and left his most precious possessions, i.e. his books and notes. Examining these was a prime objective of Brożek's travel to Warmia.

That voyage, or rather its results, were discussed by Franke and Birkenmajer. However, many most interesting details became known only later, in the 1930s. We owe that to Edward Stamm, a mathematician himself, who searched through the archives of the Biblioteka Jagiellońska to collect information about Polish mathematicians living in the 1600s for his *History of Polish Mathematics in the XVII Century*.[16] At the end of his work he devoted an entire chapter to Brożek, depicting him not only as one of the outstanding Polish mathematicians of his time but also as a prominent member of Academia Cracoviensis. But more on this later.

In 1956 a two-volume work entitled *Jan Brożek, Selected Writings* was published.[3] That work occupies a distinguished place in Brożek's bibliography and deserves a comment. The first volume was edited by Henryk Barycz, a recognized medievalist. He presented Brożek's life and his non-scientific writings. The second volume, edited by Jadwiga Dianni, a historian of science, is devoted mainly to Brożek's mathematical works. The *Selected Writings* not only present Brożek's work in the editors' own translations from the Latin, but also provide an excellent introduction to the history of XVIIth century Poland through numerous comments, annotations, and references to source material.

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[16] Edward Stamm, *Wiadomosci Matematyczne*, Vol. XL, Edited by S. Dickstein, Warsaw 1936.

More recently, Brożek's mathematical works have been discussed, commented upon and explained in numerous publications and in abundant biographical detail by Krzysztof Tatarkiewicz[17] and Andrzej Pelczar,[18] professors of mathematics at the University of Warsaw and the Jagiellonian University, respectively.

Although one can find streets named for Brożek in both Kraków and Warsaw, and perhaps elsewhere, he is known only to a handful of people interested in the history of Polish science and the culture of mid-XVIIth century Poland, Kraków, or the history of the Jagiellonian University. Fortunately, thanks to their initiative, one of the colleges of UJ has been named after Brożek; it is called *Collegium Broscianum.* However, this multifaceted, brilliant personality deserves more exposure.

Brożek's entire life was intimately linked to the Academia Cracoviensis. He was enrolled there as a student in 1604 and a year later he passed his baccalaureate. Then, in 1610, he became a *Magister Artium* and obtained the degree of *Doctor Philosophiae* at the Academy. Both of these degrees are more or less equivalent to a modern-day PhD. But let us note that Brożek obtained these degrees when he was just 25 years old. Therefore his talents must have been recognized and appreciated by his teachers. It should be emphasized at this point that in those creative student years he listened to lectures by several eminent Kraków astronomers and mathematicians. I shall mention only one, Walenty Fontana (*Fontanius*), who was probably the first in Europe to give a course on the Copernican theory, which he taught in the years 1578—1580, thus before Brożek's matriculation. A few years later such lectures were eliminated from the university lecture lists in the same way that the study of *De Revolutionibus* was prohibited, following its appearance on the list of banned books, the *Index*, in 1616. Fontana's lectures must have left a lasting impression on the young student since many years later, in 1643, he quoted him in a letter written to his fellow-mathematician, Stanisław Pudłowski. Fontana's words, cited here in the XVIIth century Polish, exemplify Brożek's entire life: *Siela rzeczy nie umieją i pojąc nie moga, ktorzy nie uczyli sie matematyki* [A great many things are inaccessible and incomprehensible to those who didn't learn mathematics].

In 1611 Brożek was ordained, receiving minor orders. Until 1620 he

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[17] Krzysztof Tatarkiewicz, p. 132 in *Roczniki Pol. Tow. Matemat.*, XXXVIII, Warsaw, 2002.

[18] Andrzej Pelczar, *Stromata Brosciana*, in Proc. of the XX School on History of Mathematics, (2006). The title is an intended replica of *Stromata Copernicana.*[11]

taught in Kraków in various institutions of higher education, including the *Collegia Artium Minoris* and *Maioris (*called now *Collegium Minus* and *Collegium Maius).* In 1620 he left for Padua, as mentioned above, where four years later he received the degree of doctor of medicine. That degree was a stepping stone that led to a professorship in theology, the most prestigious position a scholar could expect at that time. In 1629 he was ordained a priest. Between 1632 and 1638 he was nominated a "custodian" of the Collegium Maius library. As a book lover he must have appreciated this appointment that offered him the opportunity for quiet studies. From that period of Brożek's life date many interesting comments of inestimable value for historians of Polish science and literature. Birkenmajer's work is a prime example of that. Brożek's notes have often a form of marginalia or of loose notes pasted inside the covers of his books. Luckily, his book collection has been preserved almost intact. Many of the books are rare and must have been expensive. Brożek must have bought these late in his career when he had attained a high ranking position among the Kraków élite. But we must not forget his modest origins and that in the first years at the Academy he lived on a meager teacher's salary. In fact, the yearly income of a university professor was only slightly higher than that of an average city-dweller. However, Brożek's talents were recognized and utilized. A tutorship at Zborowski's house was certainly a result of a recommendation from some highly placed personality in the Academy. Also during his early years at the Academy he was appointed a book censor, and he also edited (and censored) calendars. Calendars were widely read by the Polish land gentry, the *szlachta.* We should not forget that the literacy level in the Polish Kingdom (the Crown) at that time was approximately 10%, while in France it did not exceed 8%. The calendars in the Baroque period were essentially compendia of useful, often practical instructions, contained horoscopes and texts providing distraction by giving description of *curiosa*, real or imaginary, interlaced with pious readings. In short, it was something of the *Reader's Digest* of the time, probably with comparable printing volume and popularity, thus bringing good money to the publishers, authors and also reviewers — the censors.

Later Brożek became a canon of various collegiate churches in Kraków, and this brought him some income. In the succeeding years he advanced in his ecclesiastic career and drew a sizable income from several parsonages (*beneficiae* or *prebendae*), and he was nominated canon in the chapter of Wawel cathedral, a position that provided considerable income. During this time he also taught at the University, and his scholarly career culminated with the rectorship of the Kraków Academy in 1652, but, unfortunately, only for a brief time. He died that year when the "black

plague" decimated the town's population. On his portrait (Fig. 1A) that now hangs in *Stuba Communis* [Common room] of the *Collegium Maius* in Kraków, we read that "he died in 1652, having reached the age of 72" (*obit MDCLII, aetatis suae 72*). Thus the year of his birth would be 1580**,** in contradiction to 1585, known from other sources, such as Franke's monograph on Brożek. However, the portrait must have been repainted as in Franke's book one can clearly read the words *"aetatis saue 70"*in the reproduction of the same portrait. Accordingly, Brożek should have been born in 1582, at the best in 1583. A puzzle, but there are other mysteries in his life to explore.

Fig. 1A. Portrait of Brożek in the Rectoris Academiae Cracoviensis purple.

Fig. 1B. A current picture of the Collegium Majus, where Brożek lived and lectured.

It is difficult to evaluate precisely the importance of Brożek's contribution to European mathematics, or even to rank him against other mathematicians. Undoubtedly he cannot be compared to some of his contemporaries such as Descartes, or the most well-known Polish mathematicians, such as Sierpiński or Banach. However Brożek certainly was one of Poland's most eminent mathematicians of his time, and Franke ranks him as the most outstanding. In science the crucial criteria for evaluating an individual's work are its originality and novelty. Tatarkiewicz[15] attempted to assess Brożek's mathematical work with regard to what was indeed original and what was secondary. His conclusions are too technical to quote here, but he distinguishes at least seven non-trivial elements of originality in Brożek's mathematics, primarily in the domain of the theory of numbers. Most of his work is summarized in his *Arithmetica Integrorum*, edited in 1620 (frontispiece shown in Fig 2A), and in some other relatively minor publications. *Arithmetica Integrorum* has the form and

format of a handbook. It is a pocket-size volume (about 4x6 inches) with much of its text devoted to presentations of calculation methods. It is illustrated with numerous woodcut prints and a large number of examples provided with an intended redundancy. Some of these examples will be discussed below.


ARITHMETICA
INTEGRORVM
EDITA
à M. IOANNE BROSCIO Cv-
RZELOVIENSI, Ordinario Academiæ
Cracouiensis Astrologo.
Virgil. FELIX QVI POTVIT RERVM
COGNOSCERE CAVSAS.
CRACOVIÆ,
Prælo NOVODWORSCIANO.

Fig 2A. "Arithmetic of Integers", 1620. The picture in the center shows a gnomon. A similar picture appears in the frontispiece of Rheticus' "Ephemerides", published in 1551 in Leipzig. Courtesy of Jagiellonian Library, by permission.


PROBLEMA
GEOME
TRICVM

Fig. 2B. "Problems in Geometry", printed in 1611 at the Andrzej Piotrkowczyk's shop in Kraków. Most of Brożek's books were printed there. Note the excellent quality of the printer's work in both volumes shown in this figure. Courtesy of ZNiO, Wrocław, by permission.

The theory of numbers deals with such issues as the divisibility of numbers, relations between numbers, finding prime (and other specific) numbers and other related mathematical problems. These may seem of little importance to a layman. In 1810 a certain professor of law at the Jagiellonian University called this part of Brożek's work *arytmetyczne igraszki* [arithmetical playthings]. However, even the most abstract research in mathematics can have far-reaching consequences. For example, in the 1960s Hewlett Packard and other computer firms started using a system that shortened the execution of arithmetic operations by entering numbers into a short memory stack **followed** by the execution commands (operands: +, —, *, and /). It turned out that the essential elements of this procedure had already been described in 1920 by Jan Łukasiewicz[19] who showed that

[19] Jan Łukasiewicz (1878 [Lwów]-1856 [Dublin]) is known for his work on mathematical logic. He was first associated with the University of Lwów and after 1915, with several Warsaw higher education establishments. He

placing the operands **before** the number entries can eliminate the use of parentheses. The Hewlett Packard computer scientists, wanting to give credit to its inventor, named this procedure the "Reverse Polish Notation, RPN" (the *reverse* came from the change in the operand-number sequence). The RPN is used in certain computer languages and in residing programs of some handheld calculators. Łukasiewicz certainly never dreamed of having his name associated with the computer industry, nor could he have imagined the amounts of money his invention generated.

Fig. 3A. A page from a chapter in Arithmetica Integrorum explaining some rudiments of finger calculation. Courtesy of Jagiellonian Library, by permission.

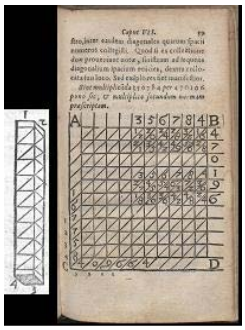

Fig. 3B. Brożek's drawing in Arithmetica Integrorum showing the Napier's calculating board with an example of the multiplication of 356784 (side AB) by 470196 (side BD). The 12-digit result is in the corner marked C. Inset shows a single "stick" with the 4 sides numbered. Courtesy of Jagiellonian Library, by permission.

In some of his other work Brożek addressed problems of surface coverage by regular polygons and of the filling of space by regular volumes, both matters related to topology. His results were published in *Problema Geometricum* in 1611 (Fig. 2B). This particular book also contains a dissertation entitled "Why do bees build honeycombs of regular hexagonal cells?" Brożek's solution of that problem, difficult, as it turned out, is considered rigorous and original (Tatarkiewicz[15]).

Surprisingly, the memorization of the multiplication table was not a part of the elementary school curriculum until the 1700s, despite the ever growing need for performing quick single-digit calculations, both in

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participated actively in the reorganization of Poland's educational system, and after the First World War he became a Minister of Education (in 1920). He should not be confused with Ignacy Łukasiewicz (1822-1882), the father of the Polish petrol industry and the inventor of the petrol lamp.

everyday life and in commerce. The University recognized that need, and Brożek, perhaps on his own initiative, taught a course on finger calculations. The hand, that natural precursor of the digital computers, is an amazingly efficient calculating tool if one knows how to use it. Figure 3A shows a page from *Arithmetica Integrorum* illustrating an execution of some hand calculation. However, Brożek included the multiplication table in his textbook, emphasizing merits of its memorization.

Needless to say, our ten digits are not sufficient for multiplication of larger numbers, and hand calculations could not meet the needs of mathematicians, astronomers and, of course, astrologers. An interesting note in regard to astrology is that Brożek derived a good part of his income by calculating horoscopes for Kraków patricians. For all those reasons Brożek propagated the use of the first computational digital device ever constructed.[20] It was invented by Napier[21] in Scotland in 1613. It consisted of a system of four—sided rods, or "sticks" as Brożek called them, with numbers as shown in Fig. 4A. The sticks were arranged on a board, or tray, (as shown in Fig 4B where they are set up for multiplication of a two six-digit numbers). Figures 4A and 4B explain the procedure for multiplication in some detail.

[20] The abacus was invented in Antiquity, but it is (i) not a digital device and (ii) it serves principally for adding and subtracting small numbers. It is still used for this purpose in commerce in some countries, in parallel with calculators.

[21] John Napier of Merchiston (1550–1617), who also signed as Neper, or Nepair, was a Scottish nobleman interested in theology, mathematics, physics and astronomy, in that order. He is the inventor of logarithms and of the first digital computing aid, Napier's bones, described in the text and shown in Fig 4. He popularized the use of the decimal point and published tables of decimal logarithms with his fellow-countryman, Briggs.

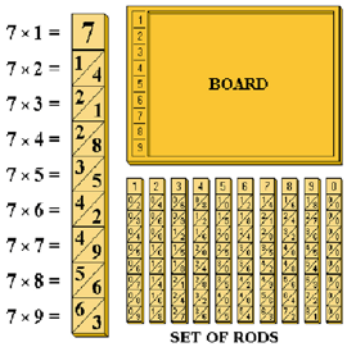

Fig. 4A. Napier's calculator consists of a set of 10 rods or "sticks", numbered from 0 to 9 (bottom) and a board (top) with the rows numbered on the left. The layout of numbers on a single (number 7) stick is shown on the left. The nine fields on a stick contain products of multiplication of the stick number by the numbers 1 through 9, with a diagonal line separating the tens and units. All four sides of a stick are so engraved, which gave 4-fold redundancy in the set, needed if the same number in the multiplicand appeared more than once.

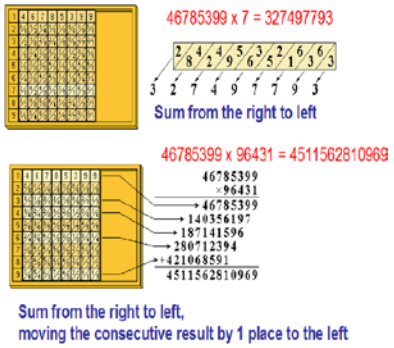

Fig. 4B. (Top) Example of the multiplication of an 8- digit number (46785399) by 7 using Napier's sticks. The multiplicand is formed by arranging sticks so that 46785399 reads in row 1. The answer (327497793) is read off from the 7th row (lighter background) by summing the numbers from right to left, as shown. (Bottom) Example of a multiplication of two multi-digit numbers. The products of multiplication of the multiplicand (top row) by individual digits of the multiplier (procedure given above) are written on a side and are added, with a shift to the left by one decimal place for each digit of the multiplier.

Because the "sticks" were often made of bone, the British called them "Napier's bones." They were widespread in Europe, and they must have found considerable use in Poland as evidenced by the familiar name that they acquired, *prędko-łatwia*, which can be translated as "fast-and-easy." Brożek had his own set of "sticks" fabricated in Kraków, and he wrote a "User's Manual" for them that he included in his *Arithmetica Integrorum*, where he also gave precise indications on the arrangement of the numbers on the "sticks." Since the *Arithmetica* was printed in 1620, Brożek must have become familiar with Napier's inventions shortly after their publication. This is one of many examples on how efficiently the scientific communication system functioned in that period, and even earlier, in Copernicus' time, even though this consisted entirely of letter-writing.

Andrzej Pelczar[16] has taken a closer look at Brożek's work on integer numbers, some of which is presented in *Arithmetica Integrorum*. He provided several algorithms that explain, or rather replace, Brożek's verbal descriptions of mathematical operations. That part of *Stromata Brosciana* provides many examples showing how much the use of symbols simplified

the communication of mathematical results and facilitated calculations. In particular, Pelczar explains Brożek's demonstration of how the multiplication of integers close to 10, 100, 1000 etc., could be replaced by simple addition and multiplication of small numbers equal to the complements of 10, 100 etc., or of other round decimal numbers (Fig. 5). Such techniques certainly helped to execute calculations of big numbers, but some skill was still required. Napier's bones were certainly easier to use and they remained popular until the mid 1650s when they were totally eclipsed by the use of logarithms.

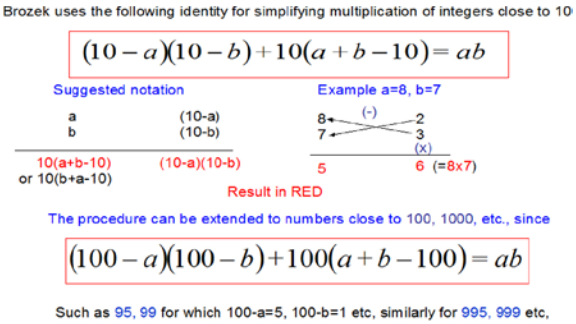

Fig. 5. Multiplication of numbers close to 10, 100 etc. can be reduced to much simpler operations on the complements of round numbers integers, 10, 100 etc. Brożek explained this procedure in words, because the use of symbols was very limited in his time. The explanation is equivalent to the mathematical identity shown at the top (after A. Pelczar[16]).

Brożek must have followed the novel developments in computational techniques very closely, because he was also responsible for the appearance of logarithms in Poland. In fact, he devoted an entire chapter to logarithms in his *Arithmetica Integrorum*. What is remarkable is that logarithms were invented in or about 1613, at the same time that the use of "Napier's bones" was proliferating in Europe. Thus Brożek must have been one of the earliest promoters of this invention. Another remarkable fact is that Brożek's approach to logarithms involved a binary system that relates a linear series of integers, *n*, to a geometrical series of 2^n. In other words, he introduced the logarithms of the base of 2. He also provided a method for the deconvolution of integers into a sum of 2^ns, proposing an algorithm that is still in use today. Is this not something of an introduction to modern computer science? Furthermore, he explained how logarithms can be used for the multiplication of numbers, the extraction of squares, cube roots and more. It is worthwhile to emphasize here that logarithms, logarithmic tables

and their handier equivalent, the slide rule, were all used until the explosive spread of electronic calculators in the mid 1960s. Logarithms lived, therefore, for more than four centuries.

Brożek's propensity for applied mathematics, as we now refer to this discipline, is illustrated by the front page (Fig. 6A) of his book on geodetic measurements for the purpose of providing practical methods for land surface measurements. The book enjoyed enormous popularity, had several editions, and was widely used by the *szlachta*, although the book was written in Latin, the scholarly language of that time. That is an interesting example showing that Latin texts were accessible to a sizable percentage of the population of the Commonwealth of Poland and Lithuania.


GÆODESIA
DISTANTIARVM
sine instrumento,
&
POLYBII LOCVS OBSCV-
rior geometrice explicatur.

A M. IOANNE BROSCIO Curzeloviensi.

CRACOVIÆ.

Fig. 6A. A handbook on geodetic measurements, Gaeodesia Distantiarum, with practical examples of land measurements. Courtesy of Jagiellonian Library, by permission.


DISSERTATIO
DE COMETA
ASTROPHILI.

Scripta à

Ex permissu Mag: Dñi Rectoris.

CRACOVIÆ.

Fig. 6B. Comments on the nature of comets, published following the appearance of Cometa Astrophili in 1618. Courtesy of Jagiellonian Library, by permission.

Finally, we should not forget that Brożek was also an astronomer. Apart from his own work in that field, he maintained wide contacts with European astronomers in Germany, the Netherlands and Gdańsk with whom he exchanged letters on astronomical events. For example, the comet that appeared in the skies of Europe in 1618, the Cometa Astrophili, was the subject of his correspondence with a Gdańsk astronomer, Krüger, and the subject of a separate publication (Fig. 6B).

Before entering into details of Brożek's astronomical work and his studies on the Copernicus' heliocentric theory, let us recall a few basic facts regarding the evolution of ideas on the solar system. The problem that had confronted the ancient astronomers was that the movements of the planets, as viewed against the background of immobile stars, are irregular. The planets execute a progressive motion with small retrograde elements, with the apparent result of the formation of loops in their paths (see Fig. 7).

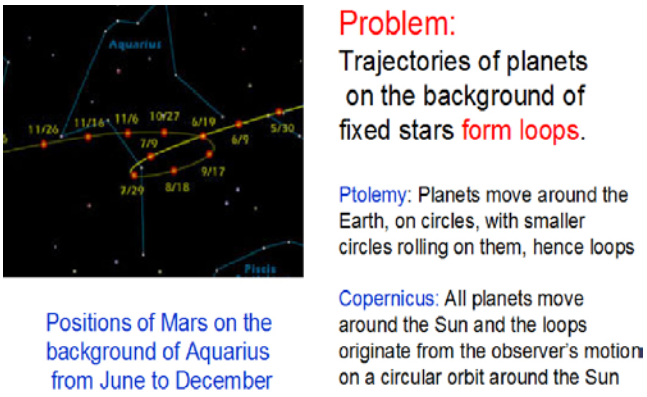

Fig. 7. Projection of the trajectory of Mars on the background of the Aquarius constellation. The planet's path is seen to have loop-like segments.

For the ancients, the immobility of the earth was indisputable. Therefore, the loops observed in the planetary motions had to be real. The simplest way to account for them was to add small circular orbits to the progressive, circular movement of the planets encircling an immobile earth, (think of a wheel rolling on a rail). The smaller circles were called epicycles and the big ones deferents. This model of the universe was constructed by Ptolemy and described in his *Almagest*, written in about 140 AD.[22] The book was the foundation for all of medieval astronomy, and it was used for calendar and horoscope calculations. With some other additional elements in planetary orbits, the system accounted quite precisely for the positions of the planets. What was essential to this interpretation was that the velocities of the celestial bodies were perfectly constant, the elements of the orbits were circular (a circle is also a perfect figure), and all was invariable and invariant. This clockwork universe was set in motion at the creation and was supposed to function until God's hand should stop it. All this made medieval man comfortable; the universe was as invariable as the society he lived in, where each human being had his or her place and a role to play under the benign eye of Providence. The geocentric world also agreed with common sense, as it seems plain to our eye that the sun moves across the sky.

The idea that the earth moves around the sun and turns on its own

[22] The book reached us through the Arabs, who by adding the prefix *Al* to the abbreviated Greek *Magiste Syntaxis* called it *Al-Magiste*, hence, our *Almagest.*

axis had already been advanced in antiquity. However, for Christians, humankind was the object of the Creator's singular attention and it was unthinkable not to place it in the very center of the universe. Later, when controversies appeared, heliocentrism was argued to be inconsistent with some passages in the Bible, where it was explicitly stated that the sun moved or stopped. Copernicus argued that we cannot be conscious of the earth's movement, just as a sailor on a ship leaving the harbor has the illusion that the land is moving away from his motionless vessel. As to the loops in planets' trajectories, his idea was simple; if the observer moves on a circle, then a projection of some object located outside of that circle would oscillate back and forth to the rhythm of the observer's motion. If the observed object also moves, its trajectory on the remote screen, i.e., the starry background of the night skies, would form loops. In order to account for the sun's movement in the sky it was also necessary to assume that the earth turns on its own axis.

Naturally, this was a revolution of earthshaking proportions, and it was the main reason why Copernicus was so reluctant to publish his work. He was also aware of some flaws in his system, of secondary importance, but their presence could also deepen his indecision. As Copernicus says in his "*Praefatio in Libros Revolutionum*" [Preface to *On the Revolutions*] he was admonished by many learned men to publish his work which had lain in his study "not only for nine years, but four times nine."[23] The pressure on Copernicus to publish intensified as he aged. Letters were written by eminent people, some cardinals and bishops (including Tiedemann Giese) intervened, but all efforts were in vain. However, when Copernicus reached the age of sixty-eight, a very advanced age for that time, a miracle occurred. A young mathematician, Rheticus, came from remote Wittenberg to see Copernicus at Frombork, at the *limes Germaniae*, as he wrote somewhere, describing his voyage. He ended up staying with Copernicus throughout the years 1539—1542, returning to Wittenberg just once, so as to attend to some university business. Rheticus worked with Copernicus through two and a half years, correcting the manuscript of *De Revolutionibus*, making amendments, adding and editing because the text was not ready for publication when he had arrived. Traces of the editing work can be seen on the original manuscript of the book, handwritten by Copernicus, which we shall refer to here as the Autograph. Finally, having assured patronage of some eminent personalities, such as the Duke of Prussia, for the publication

[23] Why did Copernicus use a multiple of nine? This is a classical reference to the advice Horace gave to young writers, to put their work away for at least nine years, after which they would be better able to judge if it were worth publishing.

of *De Revolutionibus* in the Lutheran part of Germany, he left for Nürnberg with a clean, rewritten copy[24] under his arm, to have the book printed.

Brożek was familiar with Copernicus' work, not only on astronomy but also on mathematics, as he used Copernicus' book on spherical triangles in his own publications. That work is less known than *De Revolutionibus*, because it was addressed to specialists. It was Rheticus, himself who extracted that technical section from Copernicus' *opus* and published it separately. Brożek was also familiar with Rheticus' role in the publication of *De Revolutionibus* and also with his *Narratio Prima* [The First Account] on Copernican theory. He was introduced early to the heliocentric theory (by Fontana, as mentioned above), and in his mind the universe was undoubtedly heliocentric. In spite of that his lectures on astronomy were based on the geocentric system of Ptolemy, as shown in an entry in Brożek's diary made in the winter semester of 1618. What is remarkable, after the Warmia voyage mentioned in the Galileo letter, which must have reinforced his heliocentric views, he lectured not on the heliocentric theory but followed the *Almagest* of Ptolemy. It might seem puzzling, but the explanation is simple. *De Revolutionibus* was at that point already on the Index. Therefore, a course on the heliocentric theory could not be taught in European universities because of their strong ecclesiastic links. Curiously, the Lutherans were even more rigid in this regard and rejected the Copernican theory *in toto* because it disagreed with the Holy Scripture.[25]

Brożek's 1618 journey to Warmia was not dictated solely by his interest in Copernicus. It was also a mission, inspired and planned by the Kraków scientific community. Brożek traveled with recommendation letters from the Rector of the *Academia Cracoviensis*, and the trip was sponsored by the bishop of Kraków and the archbishop of Gniezno. The primary objective of the mission was to locate the Autograph, and also to recover some other of Copernicus' papers and letters. Why, one might ask, would such an effort be undertaken, and why at that very moment? First, we should note that a mere seventy-five years separates the year 1618 from that of Copernicus' death in 1543, the year coinciding with the publication of *De Revolutionibus*. Furthermore, northern Europe was enjoying a rare period of peace at the beginning of the XVIIth century, although conflicts simmered in the northern Baltic area. Also, time was pressing as the Counter Reformation

[24] Called "Rheticus copy" now lost, it was also printer's copy, cf. A. Birkenmajer in preface to "*Nicolaus Copernucus, De Revolutionibus Orbium Caelestium*," PWN, Warsaw, 1953.

[25] For example, Martin Luther in *Tischreden* (Table Talks) makes a rather crude joke about Copernicus, cf. p. 2260 in the Walch edition.

advanced through the Commonwealth of Poland and Lithuania. Any unorthodox ideas such as heliocentrism were in danger and the burning unorthodox books was commonplace. It must also have been evident that the conflicting interests of Poland, Sweden, the German states, and the rising power of Muscovy, would eventually ignite a war in the Baltic lands. Also, the relations between Poland and her southern neighbors were strained and a chain of events known as the Thirty Years' War, had already been initiated by Habsburg succession conflicts. Saving Copernicus' heritage was important for the Kraków scholars and finding the Autograph was its key element. It was known at that time that its first edition had been altered by Andreas Osiander, a Wittenberg theologian who supervised the last stage of the printing of *De Revoltionibus*. One could reasonably assume that the Kraków scholars wanted to have access to the original because they thought of publishing at some opportune time a revised edition, with all the appropriate corrections.

Fig.8 Google Earth picture of the north-east Baltic coast of Poland, with town names in Polish and German. The horizontal line to the right is the Polish-Russian frontier (Kaliningrad is written in Rusian). The pins show Frombork and Lidzbark, the towns where Copernicus lived and made his observations, They were both were visited by Brożek.

Fig.8B. The same Baltic region as depicted on a 1602 map (by Henneberg) that Brożek used in his voyage to Warmia. Brożek drew the paths of his voyages with a red line. They have been enhanced for here clarity (broken line, trip by boat to Gdansk, Dash-dot, from Gdansk to Frombork, dotted home trip from Frombork-via Braniewo and Lidzbark, probably on horseback. Courtesy of Jagiellonian Library, by permission.

Brożek left for Prussia, or more exactly to the bishopric-duchy of Warmia, the *Dominium Warmiensis*, in June of 1618. We know how and when he traveled, and we also know the route he took. As mentioned, Stamm[14] carried out a bibliographic query on Polish mathematicians from the XVIIth century at the Biblioteka Jagiellońska. On that occasion he found in its map collection a Mercator Atlas with a map of Prussia that Brożek himself used on his trip to Warmia. Figure 8A shows a satellite image of the

north-east Baltic coast area of Poland[26] where Brożek traveled. A map of the same region drawn by a XVIIth century geographer, Henneberg is shown in Fig. 8B. The paths of Brożek's voyages were traced by him directly on the map with red ink. The margins are covered with notes and geographical coordinates of the towns he visited. German names dominate, but sometimes a Polish equivalent is given, indicating the coexistence of both languages in the province of Warmia.

Brożek also jotted on the back side of this map (paper must have been expensive) the draft of a letter to the Rector of the *Academia Cracoviensis*, Piotr Goliński (Golinus). It is a short report on the trip that lists the libraries he visited at Frombork, Braniewo, Lidzbark and other towns where Copernicus was known to have lived or worked. Brożek also mentions some retrieved or copied Copernican documents but repeats several times, almost obsessively, that he could not locate the Autograph.

The history of the peregrinations of the Autograph is another story worth telling in detail, but it must be condensed to a few lines in an article of this size. As mentioned, Rheticus prepared the printable version with Copernicus, and left with it for Nürnberg, where the printing started right away, under his supervision. However, Rheticus had to leave town, and had no choice but to pass the task of completion of the editorial work to somebody whom he could trust. He chose Andreas Osiander, who had previously corresponded with Copernicus. As mentioned above, *De Revolutionibus* appeared in 1543 with a short introduction that Osiander included on his own initiative. He not only changed the title of the book but his introduction also blunted the impact of the novel concept of the cosmic structure, by presenting it as a hypothesis. When the first copies arrived in Warmia, late in 1543, Copernicus' friends Giese and Donner were enraged on seeing the alterations of the text they certainly knew well. Brożek wrote in his letter to Golinus that in both Giese's and Donner's copies (which he had located in the Warmia libraries) Osiander's preface had been crossed out. Brożek also crossed them out from an exemplar of the 1543 edition belonging to the university library (shown in Fig. 9B). A note at the top of the page was written by Brożek. It says that in the Braunsberg (Braniewo) and Heilsberg (Lidzbark) libraries the preface pages were also crossed out. These were precisely the volumes that used to belong to Giese and Donner.

But what happened to Copernicus' original handwritten copy, the Autograph? Copernicus probably put it back in the same old chest where it had rested for nearly forty years. After his death, it must have been Tiedemann Giese, the one and only friend Copernicus ever had, *vir meus*

[26] Accessed via the program "Google Earth."

amantissibus ("the man closest to my heart," as he referred to him in his own preface to *De Revolutionibus*), who was charged with sorting out the Copernican heritage. He gave the *Autograph* to Rheticus.

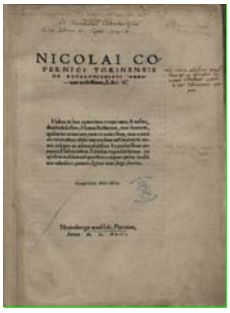

Fig. 9A. The title page of the first, Nürnberg (1543) edition of De Revolutionibus with annotations of Brożek. The words orbium caelestium in the title were crossed out by his own hand. From Treasures of the Jagiellonian Library, available in the Library's web page. Reproduced by permission.

Fig. 9B. "Praefacio" to De Revolutionibus, written by Osiander was crossed out, just like his additions to the title. Brożek did that after having seen Donner's and Giese's copies in Warmia, where the preface was angrily crossed out by the owners.Courtesy of Jagiellonian Library, by permission.

Fig. 10A. A woodcut print presumed Joachim Rheticus "Without me De Rev would not see the light of day". From the blog, Concordia Theological Seminary, Il permission.

Fig. 10B. Tiedemann Giese, bishop of Che "the man closest to my heart" as Copernicus him in his "Praefacio".

Why to Rheticus? Simply, because Rheticus' enormous contribution to the preparation and publication of *De Revolutionibus* had not been acknowledged by Copernicus in his preface, although other less deserving (but eminent) people were explicitly mentioned. That preface, in Copernicus' own hand, probably arrived in Nürnberg when Rheticus was no

longer there. Giese, by giving the *Autograph* to Rheticus certainly wanted to appease his indignation at this incomprehensible and unjustified omission. Rheticus must have been born under an unlucky star. Traumatized in his youth by his father's decapitation for sorcery, he wandered throughout Europe, unable to find a place of his own and peace of mind. His hasty departure from Nürnberg in 1542, in the midst of the printing process, is explained by his appointment to the mathematics chair at the University of Leipzig. But a few years later he was charged with homosexuality, which was punishable by death in Germany. Condemned to banishment, he fled Leipzig in 1551, to settle later in Prague, from where, three years later, he moved to the more tolerant Poland, and lived in Kraków for many years. In 1574 he left Kraków rather hastily, probably escaping his debtors (perhaps not only his debtors), and moved to Cassovia, (now Košice in Slovakia), where he died the same year. The Autograph was found in his possession, to be sold later, and changed owners a few times. When Brożek traveled to Warmia to retrieve it, it was most probably in the hands of Jan Amos Komenski, the towering figure of the Czech renaissance. After some 300 years of quiet shelf life in Bohemia, the manuscript was given in deposit to the Biblioteka Jagiellońska, and then, in 1956, bestowed upon Poland by the government of the Czechoslovak Republic. Figure 10 shows the godfathers of *De Revolutionibus,* Rheticus and Giese.

When Brożek returned to Kraków from his Warmia trip in the autumn of 1618, he must have been a confirmed heliocentric. But, as previously mentioned, he taught a course on geocentric astronomy, and we know that it was because of the Index. He also was in no hurry to publish all of the documents that he had found in Warmia. Some letters from the Copernicus correspondence, a part of his recorded notes from his 1620—1624 stay in Padua and the four following years, and some other papers, are conspicuously missing. I believe that the explanation lies in Brożek's involvement in the conflict between the Academy and the Jesuits that inflamed the minds of many during that period.

With a doctorate in medicine from Padua and as a professor in the Collegium Maius, Brożek's position in the *Academia Cracoviensis* had acquired considerable weight. He used his novel influence in defending the University against the Jesuits who had started opening their own colleges in numerous towns, including Kraków. The Academy defended its rights and royal privileges, well aware that the education level offered by the Jesuit colleges was inferior to that provided by the university. The Kraków scholars must also have been worried of the ultra-Catholic tenor of Jesuit education.

In 1625, an unsigned pamphlet was printed and distributed in Kraków. It opened with the word *Gratis*. The pamphlet deals with the allegedly free (*gratis*) education offered by the Jesuits. The author argues that the claim of a free education is false. The author was, as it turned out, Brożek, and the pamphlet was his contribution in the struggle against the Jesuits. However, this episode ended badly. The city guards raided the printer's shop, the owner was arrested, flogged at the pillory and banned from Kraków. *Gratis* was also burnt at the pillory but Brożek was spared because the Academy defended him firmly. The Jesuits replied by publishing *Gratis Plebański* [The Parson's Gratis]. That awkward but venomous text was written by Fryderyk Szembek, a well-known Kraków Jesuit theologian disguised under the pen name of *Pięknorzecki* (which can be roughly translated as *Goldentongued*). The Kraków students staged a public *auto da fe* of *Gratis Plebański,* burning it at the stake in one of the city's squares. This incident shows once again how heated the conflict between the Academy and the Jesuits was. Brożek continued for some time to participate in the struggle. He wrote several memorials in defense of the Academy, traveled many times to Warsaw, already a capital at that time, and petitioned the royal court to defend the university against the Jesuits.


GRATIS
Albo
DISCVRS I.
Ziemiánina z Plebanem.
Ziemiánin, Pleban.

Fig. 11A. The front page of Brożek's Gratis, a pamphlet against Jesuits, exposing their methods of luring students in their colleges, allegedly requiring no tuition (gratis). Note that the author's and printer's names are conspicuously absent.


GRATIS
PLEBANSKI
GRATIS WTCWICZONT
W IEZVICKICH SZKOLACH
KRAKOVVSKICH.
TO IEST
IOZEPHA PIĘKNORZECKIEGO
VVPOZNANIV.
1627.

Fig 11B. Gratis Plebański, the Jesuits' reply to Bozek's Gratis, was written by a Jesuit, Fryderyk Szembek, but published under a pseudonym of Pięknorzecki. Kraków students burnt it at a stake. Courtesy of Jagiellonian Library, by permission.

How long did this rebellious period in Brożek's life last? It is hard to tell. He probably came to the conclusion that he could achieve more by

assuming the orderly path of a scholarly career than the path of a rebel. Also, one must make account for the mellowing effects of maturity. Near the end of his life, Brożek had become one of the most influential people in the city of Kraków and a man of considerable income. His donations to the university are impressive. He founded a scholarship and, as mentioned, willed his books to the Jagiellonian University library. Brożek scrupulously listed the items he intended to leave to the university, but the Copernicus papers were not mentioned. He has been accused by several historians (e.g. L.A. Birkenmajer, as mentioned above), and also by his contemporaries, of losing them. It is, however, inconceivable that a man with a mathematician's mind, a scholar and a man who would *vendere pallium, emere librum* [sell a cloak to buy a book] to quote Barycz, should have lost these documents through sheer negligence. It is more plausible that Brożek simply hid them, and he hid them somewhere in Kraków. He hid all the papers that could compromise him and his friends during the days of the Counter Reformation. Perhaps they will be found in the Collegium Maius where Brożek lived for many years.

Note added in proof.

When this paper was in print the author learned that Professor Andrzej Pelczar has passed away on May 18th, 2010 in Kraków, in the age of 73. This outstanding mathematician, historian of science and ancient Rector of the Jagiellonian University was still involved in teaching, research, and activities of the European Mathematical Society. This paper is dedicated to his memory.