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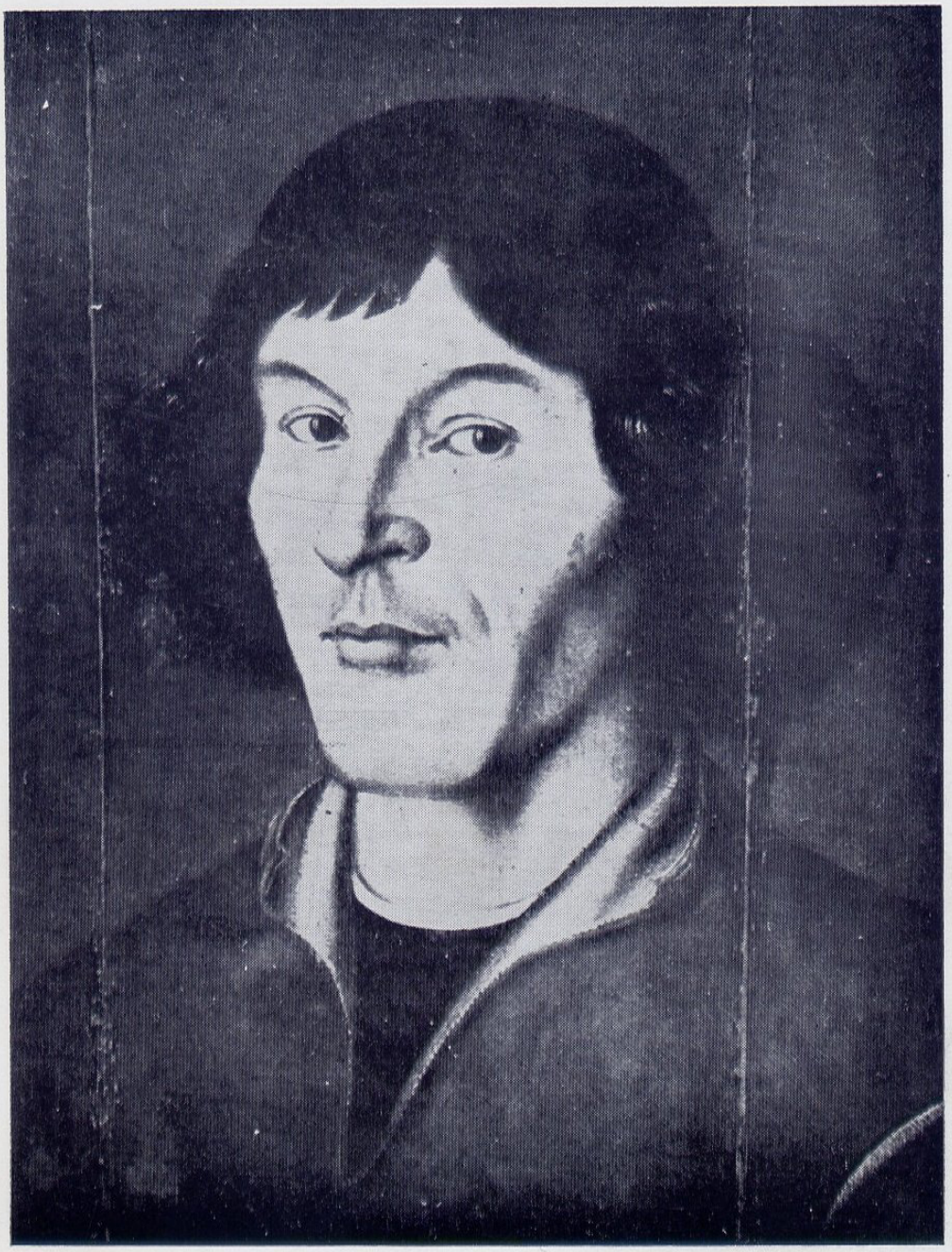
Copernicus and the Changing World



by

Wanda M. Stachiewicz

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Montreal—New York, 1973

Portrait of Nicolaus Copernicus, end of the XVIth Century, Collection of the city of Toruń, Poland.

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A Biographical Sketch

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INTRODUCTION

The origin of Astronomy is probably as old as the origin of civilization itself. When the human race became dependent upon the production of crops, knowledge of the length of the year was required, and this was obtained from observations of the sun and the stars. For thousands of years the sun, moon, stars and planets were observed and their apparent motions were the subject of much speculation and study.

If we look at the sky on a clear night, we seem to be at the centre of a vast sphere and the whole visible universe seems to revolve about us. In default of a better description, men clung to a direct account of the appearances. For century after century, a geocentric (one might even say egocentric) system of astronomy evolved which was not displaced until the publication of "De Revolutionibus" by Nicolaus Copernicus.

The following account of the life and background of Copernicus is told with great sensitivity, and should appeal to a wide group of readers.

April 19, 1972

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To Professor B. Zaborski of Sir George Williams University for having drawn a valuable historical map of Poland for this publication.

Montreal, April 1972 W.S.

COPERNICUS AND HIS WORLD

The fifth centennial of Copernicus' birth (1473) will be celebrated in 1973, and there are already preparations under way throughout the world to observe this event.

His native Poland, which he endowed with ever-enduring renown, is planning an impressive program[1] that will consist of international congresses, exhibits, building projects, films, contests, and multilingual editions of Copernicus' works, as well as of studies on the great astronomer. Scholars currently working on these editions will probably unearth new source material, casting more light on the hitherto little known facts of the astronomer's life which, of course would enrich the knowledge of Copernicus, the man and the scientist.

Almost everyone knows about Copernicus, the man whose revolutionary concept of the structure of the universe both overturned the long-existing system of astronomy, based on Aristotelian philosophy, and initiated a new scientific outlook. But how did this conception form itself in Copernicus' inquiring mind? What were the stimulating factors which led to his discovery? What was the part played by Polish learning in the development of Copernicus' scientific intellect and in the development of modern scientific thought in Europe? Was the pre-Copernican period in Polish science worthy of the great man it helped to form and inspire?

This biographical essay will attempt to present the Polish historical and intellectual background from which Copernicus emerged, his native land, his studies, the environment in which he grew up, lived and worked, and from which he undoubtedly must have drawn inspiration.

Mikołaj Kopernik best known by his Latinized name, Nicolaus Copernicus, lived at a time when the medieval world was beginning to disintegrate and when across Europe could be felt the first breeze of the new currents and ideas of the Renaissance. Humanity was freeing itself from the bonds of superstition and the harsh rules of the Middle Ages; human individuality began to flourish and embrace all branches of creativity. Specialization in a single branch of learning, which we wit-

[1] See Appendix.

ness today, did not exist at that time. Universality reigned. Awakened minds, eager for knowledge, absorbed all of the different kinds of intellectual stimuli which this glorious epoch made available to them.

Astronomy, the queen of sciences, began to rid itself of the superstitions of magic and augury. This was the age of discovery and genius.

Copernicus was not only one of the greatest astronomers of all time, but also a man of a highly original mind. A scientist, by God's gift; a churchman by the wish of his guardian uncle; a physician by training and predilection; an economist, statesman and soldier, by necessity. And besides, he was a man skilled in the technical sciences, mechanics, surveying, etc.

He drew up together with his Cracovian friend, Wapowski, one of the first maps of Poland, Warmia (Ermland) and Pomerania. When sea voyages became more frequent after the discovery of America, mariners needed more precise astronomical data and more accurate information than that contained in the old, defective Julian calendar. On the invitation of the Lateran Council extended to astronomers in 1513, Copernicus drew up new astronomical tables based on his heliocentric concept and submitted them before 1516. It was used to a considerable extent for the new Gregorian calendar (of Pope Gregory XIII), which was introduced toward the end of the sixteenth century and which still regulates our life today.

Copernicus was also a poet and painter for relaxation. However, his most important and universal contribution was the heliocentric doctrine, whereas his daily activities as a citizen and statesman and his economic achievements were limited to his own country. Truly, as befitting his epoch, he was the universal man of the Renaissance. A parallel could be drawn between Copernicus and another genius of this brilliant and challenging epoch, Leonardo da Vinci. Both were universal yet each was a master of his own realm.

HISTORICAL BACKGROUND

Country—Family—Motherland

Nicolaus Copernicus' family originally came from Silesia in Poland, where to this day there exists near Nysa a parish village by the name of Koperniki (Koppernig). This village, like others in Silesia, was inhabited by a Polish farming population for many centuries. Situated between Poland and Germany, it was a region of strong ethnic diffusion.

Etymologically the name of the village may be derived from the occupation of coppersmithing, in Latin "cuprum." Copernicus is a Latinized version of the name which he himself assumed and finally used, as well as its Polish version: Kopernik. His ancestors spelled

it variously—Copernik, Coppernik, Koppernic, Koppernigk, Kopernik; his father and brother spelled it still differently. Names in those days were not spelled uniformly and the scribes recorded them as they heard them; in copying, changes often occurred.

The patron saint of Koperniki was St. Nicholas, which explains the wide-spread use of the name in the village. The Kopernik family spread from Silesia to various towns in Poland, to Cracow (1350), to Toruń (1400), and as far east as Lwów (1439). The branch which moved to Cracow became wealthy merchants in the ancient capital of Poland, trading mainly through Gdańsk on the Baltic Sea. As early as the fourteenth century the name appears in the city records as that of a wealthy burgher family. The astronomer's great grandfather, also Nicholas, received the rights of Cracow citizenship in 1396. His father's name (Nicholas) is mentioned several times in the historical documents of Cracow. A merchant by profession, he later moved to Toruń in northern Poland.

THE TEUTONIC KNIGHTS

The city of Toruń which Nicholas the Elder made his home bordered on Pomerania or "Pomorze" i.e., the maritime province. Its history is extremely complex. This ancient land on the Baltic coast (in Latin, Borussia) was once inhabited by a pagan tribe of Baltic origin called the Prussians. They frequently raided and pillaged Poland's borderland.

The Order of the Knights of the Cross, a German military, religious order founded during the Crusades, was brought to Poland in the thirteenth century (1226) by Conrad of Masovia for defense against the attacks by the pagan Prussians who lived in the forests along the Baltic coast. Conrad granted the Order certain privileges and lands. By fire and sword the Teutonic Knights first exterminated the Prussians and then occupied their country, where they formed a monastic state and imported German settlers. In time, they adopted the name of their first victims, the Prussians. As the Order grew in strength, it turned against Poland, threatening her constantly.

The rule of the Order was ruthless and hindered the peaceful development of Pomerania and Warmia. Consequently, on a number of occasions the people were stirred to revolt and formed the League of Prussian Cities which rebelled against the Teutonic Knights. The League then turned to the king of Poland with a request for assistance and protection. This resulted in the Thirteen Years War in which the Pomeranian cities fought valiantly, side by side with the Polish forces, against the Teutonic Knights. After the victory in 1466 followed the peace treaty of Toruń, which restored to Poland Pomorze

(west of the Vistula, including Gdańsk, Malbork, Toruń) and the duchy-bishopric of Warmia where Copernicus was later to serve as canon. The official title of the Polish kings included "Ruler and Heir of Pomerania" *(Pan i dziedzic ziemi pomorskiej).* [*See map*]

The liberated Warmia, a tiny ecclesiastical principality, organized as a bishopric in 1243 under the patronage of the Pope, situated on the Baltic coast, almost entirely surrounded by the land of the Teutonic Knights, was part of the kingdom of Poland; a would-be neutral territory under the administration of the Prince-Bishop and the Chapter. The canons attached to the cathedral church were organized in a body known as the cathedral chapter through which they administered their affairs. The social structure of Warmia consisted mostly of peasants and a small number of rather poor gentry. The burghers were also impoverished by wars but they enjoyed a status of some prestige and participated in civic leadership. The chapter elected its canons and bishops mainly from their ranks.

These historic lands remained with Poland until the Partitions of 1772-1793 when they were incorporated in the new Kingdom of Prussia,[2] one of the partitioning powers. Prussia held these lands until 1918, when some of them were returned to Poland by the Treaty of Versailles in 1919. They are part of Poland today.

This geographical area was the regional homeland where the family of Copernicus lived, toiled and fought.

The father of Copernicus, Mikołaj Kopernik the Elder, a well-to-do merchant who moved from Cracow to Toruń (1456-58), was an enterprising man who soon became prosperous and several times was elected City Councillor. He married (c. 1461-63) the daughter of a patrician Toruń merchant, Lucas Watzenrode the Elder, whose spouse, Katherine née Modlibóg (Copernicus' grandmother), "was the pearl of all Toruń beauties." Copernicus' mother, Barbara, was the sister of the Warmian canon (later bishop), Lucas Watzenrode (Watzelrod, Waczenrod), 1447-1512, who was to play a very important and beneficial part in the life of his famous nephew.

Evidently Copernicus' paternal and maternal families were both well known contemporarily.[3] They were prominent in the city-state of To-

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[2] The German kingdom of Prussia rose from the combination of the March of Brandenburg, a hereditary duchy (part of East Germany today) and the state of the Teutonic Order after its dissolution. It finally recognized the German Emperor as a ruler. In 1657 it gained independence from Polish suzerainty and in 1701 the Elector of Brandenburg assumed the title of "King in Prussia".

[3] A local German historian, Godfried Centner (1712-74), who studied the history of prominent Toruń families, found in the city records that Lucas the Elder was a "devout and honest man" and "a faithful servant of the Polish king." He must have been well-to-do, since he advanced money for the defence of the city against the Teutonic Knights.

ruń, helping to shape the course of its history, and rendered great services in the struggles against the Teutonic Knights.

At that time the concept of nationality, as we know it today, had not yet developed. However, among Poles there always existed a deeply felt and almost fanatical attachment to their place of birth, to the town or village and the surrounding environs. The more inclusive patriotism—to Poland as a whole—appeared only in times of trouble. The patriotism of the more prominent people can be judged by their deeds and activities.

Toruń, founded in 1233, a rich mercantile city, was part of the Hanseatic League and had wide contacts with all European centers. The affluence of the city was the basis for its cultural development. Beautiful Gothic buildings were the feature of this city, as were three-story colorfully painted private dwellings of three windows at each level. Such was Copernicus' family house, presently reproduced on an exquisite stamp.

Here, on February 19, 1473, at the height of the city's prosperity, Nicolaus Copernicus was born in a wealthy burgher residence as the fourth and youngest child. [*illus. 14*] Very little documented information has come down to us about his childhood and youth. Most of his belongings and mementoes, books, records and documents were carried away to Sweden during the Swedish invasion of Poland in 1626. However, we may assume that from his mother he inherited his features, his contemplative nature and his love for intellectual pursuits; from his father vigor and his efficient and pragmatic character. He grew up in Toruń, at first at 17 St. Anne's Street (presently Kopernik Street), and then when he was seven years old his parents moved to 36 Market Place, which Nicolaus remembered as his family home. In the prosperous home of his parents, much care was devoted to his upbringing among a circle of enlightened people. Nicolaus was acquainted early with art, music and letters. He attended the parochial school of St. John's church and subsequently the "higher" cathedral school, probably in Toruń. When he was ten years old his father died and the orphans came under the guardianship of their maternal uncle, Canon Watzenrode, an enlightened man who subsequently became Prince Bishop of Warmia and a Senator of Poland. This great humanist who was educated in Bologna was a fervent and efficient politician, who loved political intrigue.

"Patria" in the Middle Ages had a narrow meaning; it was primarily the place or region of birth. Copernicus throughout his life considered Borussia as his homeland.

He spent most of his life in Warmia, a country where the forests soughed as the wind roared in from the fierce Baltic, where the people

labored hard to clear the woods and to till their land in the clearings, and where they lived in constant fear of attack from the Teutonic Knights. These arduous conditions of life affected the molding of the Warmian character, making it unbending, stubborn and steadfast. Nicolaus Copernicus shared this character.

When Nicolaus completed his studies at the Cathedral School, his uncle, who then had assumed the role of guardian, decided to send him and his older brother, Andrew, for further studies to the university of Cracow.

Cracow University

The University of Cracow was founded in 1364 by King Casimir the Great, the last descendant of the first Polish dynasty, the Piasts. It is the oldest institution of higher learning in Poland and the second oldest in Central Europe. [*illus. 4*] It was founded after the University of Prague (1348). The universities of Vienna (1365), Heidelberg (1386), and Cologne (1389) were established later.

The Cracow "Studium Generale" of King Casimir was organized along the lines of the Italian schools, with an orientation toward law, liberal and autonomous and with more lay influence than any European university. Students and teachers formed one community. At the head of the University — *Universitas Scholarium et Professorum* — was a rector, who was elected from among the fellows in residence.

The first European universities grew up between the eleventh and twelfth centuries; they were founded on the territory of the old Roman Empire, in what is today Italy (in Bologna, Padua, Naples), and in France (in Paris), Spain and England. The task of establishing a university in a relatively remote area, such as East-Central Europe, was much more difficult. Not only was an adequate economic and cultural milieu necessary, but the persistence and personal influence of the founder, usually the king, was also essential. Permission to establish a university, not willingly or easily granted, lay with either the Pope or the Emperor of the Holy Roman Empire, the two highest authorities of the time. Poland and Bohemia were fortunate enough then to have two rulers of true greatness: King Casimir and Emperor Charles IV, respectively.

The king, whose castle was probably the original site of the university, had construction of new buildings begun in his newly founded town of Kazimierz, now a part of Cracow, but there is no record that they were ever finished or occupied.

In the Middle Ages universities were institutions of international importance and degree recipients could teach anywhere in Europe. For years there were friendly relations and interchange of professors and

students between Cracow and other European universities and particularly with the neighboring university of Prague. Many of the professors, as well as students were foreigners from Bohemia, Hungary, Austria, Germany and Italy.

After the childless death of the great king, his cherished university fell into decline. New life was instilled into it by the endowment of his enlightened grandniece, the girl-queen, Jadwiga, who bequeathed her royal jewels to the revival of Cracow University. Her widower, king Władysław Jagiełło reopened the University in 1400. In the course of time, the Casimirian Cracow Academy in the late nineteenth century assumed the designation, Jagellonian, in honor of King Władysław.

The King was the first to inscribe his name in the *Album Studiosorum,* the registry of the University, in which ninety years later appeared the name of Nicolaus Copernicus.

Jagiełło donated a building on St. Anne's Street to the new University; it was later enlarged and called the Collegium Maius. [*illus. 6*] In 1410, one of the theology professors donated a large house as a student residence. This became the first student hostel.

The University was an urban institution, and the professors and students were mainly of burgher origin. The towns and cities of Poland enjoyed great prosperity at the time and the wealthy Cracow burghers, who hosted many foreign kings, princes and dignitaries that visited the city on the occasion of treaties or university ceremonies, dazzled their guests by the splendor of their receptions and their places of habitation. The sons of the gentry, who did not expect to become professors, usually went abroad. There were also very few students of peasant origin at Cracow University, since a peasant could attend only if his landlord wished him to and was willing to pay for him. [*illus. 5*]

Professors and students shared an almost monastic existence. Meals were taken together, attire was prescribed, and there was common lodging in the College. Celibacy was obligatory for students and only toward the end of the fifteenth century did married professors appear.

Students lived mostly in community lodgings called "bursae," where life was strictly regulated under the supervision of a professor, the "Rector bursarum," and rather monotonous. Since the "bursae" were usually overcrowded, some professors took richer boarders into their homes.

The population of Cracow was very friendly and generous towards the students. It was customary that a student could knock at the door of any burgher during meal times and be given a generous serving of food. In return, Cracovians drew enjoyment from the students' pranks and frolics on holidays. Their popular song: "There is no life better than a student's life" resounded gaily on the streets of

Cracow. Copernicus probably sang this song with his fellow students.

The Jagellonian University, in contrast to Casimir's "Studium Generale," was organized along the Parisian ecclesiastical model, where theology played the dominant role.

It was autonomous but the rector was elected from among the professors only and, together with the deans, ruled the university. It retained a far greater degree of independence than many medieval universities in other European countries, due to its swift growth and the strengthening of the rector's authority. The first rector was the able Stanislas of Skarbimierz.

Instruction continued the year round, since the younger professors held classes during the summer.

Law, philosophy and theology were the main subjects of instruction but the students first received a general education in the Arts. There were also lectures in geometry, optics, astronomy, arithmetic, together with theory of music. Mathematics was considered the greatest and the real science.

After two years of study in Liberal Arts, a student was eligible to take the examination leading to the Bachelor's degree. The Master of Liberal Arts was awarded after another two years and further examinations. It took several more years to obtain the Doctorate in Law or Medicine and about eight or nine years for the Doctorate in Theology. The line between "scholars" (students) and professors was not clearly defined. For example, it was quite common for a Master in Liberal Arts to teach in his own faculty and at the same time study in another faculty for the Doctorate.

Soon the university took a leading part in public life, its professors were active in all aspects of public affairs. They drafted treaties at peace conferences, negotiated agreements for the State and served as diplomatic envoys. The theologian Paulus Vladimiri (Paweł Włodkowic, 1370-1435), one of the most outstanding rectors of the university, won renown at the great Councils of Constance (1414-18) and Basle (1431-49) where he represented Poland. The treatises presented by him were masterpieces of legal knowledge and, because of their progressive and new ideas, were of significance to the whole of Europe.

Next to law, mathematics and astronomy grew in importance. The university excelled not only in the mathematical sciences, as did Oxford in England, but above all in astronomy.

A special chair of astronomy, the first of its kind in Central Europe, was founded as early as 1410, when a rich and wise Cracow burgher, Jan Stobner, offered to the university a substantial endowment for this purpose. The high academic standing, as well as the broad scope and intellectual zeal of its scholars were responsible for its growth. When

Adalbert of Brudzewo (1445-97), an eminent mathematician and astronomer, occupied the chair, its fame reached far beyond Poland and was praised by eminent German scientists.[4]

Many students from German lands, Hungary, Scandinavia, Wallachia, Switzerland and even Italy, came to Cracow to study under Adalbert of Brudzewo, the head of the school of Cracow Astronomers, and legend has it that Faust made his way to Cracow to complete his education. [*illus. 3*] Out of the students inscribed in the *Album studiosorum,* about 46% were from abroad.

Toward the end of the fifteenth century Cracow was a great center of culture and one of the most important cities in Central Europe. It was the capital of the illustrious Jagellonian dynasty, which made Poland one of the greatest powers in Europe. The Jagellonians had just succeeded in creating a free commonwealth of nations (Poland, Lithuania and Ruthenia) and were building up a federal system in East-Central Europe from the Baltic to the Black sea. It was also a stormy time of constant assaults by the Teutonic Knights who were harassing Poland. Cracow's cultural atmosphere at the time was almost without equal. Here in the traditional center of Polish culture, the kings of Poland were crowned and here they erected their castles and churches, many still standing. Here, nobles and merchants built their richly embellished palaces. Here was the Royal Court emanating political thought and organizational proficiency; here, at the beginning of the fifteenth century, the Jagellonian University flourished and reached the height of its greatness, respected by the whole country and protected by the Kings. Its attraction was enormous at that time. Polish learning extended Western culture far into the lands of Lithuania and Ruthenia with Kiev, the cradle of Russian civilization.

The humanistic spirit which had been emanating from Italy was one of the chief sources of the growing intellectual life of Poland. The Italian Renaissance was responsible for the beginning of modern European culture.

Humanists throughout Europe formed, as it were, one family and their elite generally knew one another and exchanged news and opinions on scholarly matters. Minds had just been stirred by the news of the discovery of the new continent — America. Itinerant humanists, poets, scholars and teachers travelled from one center of learning to another, driven by curiosity of the world, breaking down the bastions of scholasticism and struggling for a new world outlook. They strove to obtain the right to lecture in the university lecture halls and, having gained this, they thundered forth from the rostrum against the univer-

[4] Hartman Schedelius, Jacob Middendorpius and others.

sity and the moribund scholastic learning. They awakened thoughts, sowed unrest in the minds and searched for poetry, beauty and knowledge.

Women who desired an education were attracted into the humanist movement and so it is not surprising that many famous women, noted for both their beauty and culture, became ardent disciples of these messengers of the new order. They were fascinated by the ideas which were being propounded by the humanists, who were proclaiming a loosening of the harsh bonds imposed by the mediaeval customs. Indeed, it was the humanists who devised the concept of "platonic" love, a spiritual love that enraptures the soul and is the source of beauty. Letters and poetry of this period abound with womens' names: Elsile, Agneta, Ursula, Pachna and Hasilina have passed into history on the wings of a poet's fancy. The humanists also received support from the large mass of students and the affluent cultured burghers.

STUDENT LIFE — HUMANISM

"No better life than student life"

Copernicus was not quite nineteen years old when he arrived in Cracow in 1491 [*illus. 1 and 2*] and enrolled at the Jagellonian University. His name in the *Album Studiosorum* can still be seen at the university museum: "Nicolaus Nicolai de Thuronia," and beside this — the note "solvit totum," which means that Nicolaus, son of Nicolaus of Toruń had paid full tuition.[5] Next to the name of Nicolaus, someone else in a different hand later added his surname "Copernicus."

In Cracow, Copernicus found himself among students from various lands who came to Cracow attracted by its renown. They listened to enlightened lectures, as the professors knew how to arouse interest and encourage students in independent, logical thinking. Young Nicolaus immediately fell under the spell of Cracow's spiritual climate.

There is very little detailed information on his life in the capital. We do not know where he lived, probably with the Wapowski family, whose son became his close friend, or with the Swidniczer family, or possibly in one of the common lodgings. The best of these was called the "bursa Hierosolonyma" (of Jerusalem), near the Collegium Maius where astronomical instruments were located.

Young Copernicus enrolled in the "Seven Liberal Arts" which was the usual preparatory course (leading to the baccalaureate) before the

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[5] The fee was one quarter of a "grzywna" (the "grzywna" comprised 200 grams of silver and was divided into 240 "denars").

advanced studies of medicine, law or theology. He was an eager student, particularly in astronomy.

According to Ludwik A. Birkenmajer, *Stromata Copernicana,* (Cracow, 1924, p. 78), Copernicus attended the following lecture courses in astronomy:

1491 Winter term — De Sphaera (According to Sacrobosco)
1492 Winter term — Geometry of Euclid — Bartłomiej of Lipnica
1493 Summer term — Planetary Theorem (According to the Commentary of Adalbert of Brudzewo)
1493 Summer term — Tables of eclipses — Bernard of Biskupie
1493 Summer term — Astrology — Adalbert of Szamotuły
1493 Winter term — Tabulae Resolutae — Michał of Wrocław
1494-5 Winter term — Tetrabilion of Ptolemy — Adalbert of Szamotuły.

These lectures embraced the whole of astronomic and astrologic knowledge of the time, but Copernicus with his open, inquisitive mind attended also other courses: Latin classics, philosophy (Jan of Głogów, Adalbert Brudzewski), even painting and drawing, perhaps also music which was part of the *Quadrivium* and the influence of which is noticeable in Copernicus' concept of the perfect order or harmony of the cosmos. He absorbed knowledge wherever he could, and studied everything which attracted his imagination. He learned the fundamentals of mathematics, accuracy of observation, sharpness of vision. At the university he was captivated by astronomy. He studied under great scholars and the education he received in Cracow formed a sound basis for his future work. He acquired a critical sense, and also gained many faithful friends among colleagues and professors. Throughout his life Copernicus maintained close scientific relations with the university and its professors. There are indications that Copernicus also took part in the literary life of the capital.

At that time the most famous astronomer in the world was Johann de Regio Monte or Regiomontanus (1436-76), a distinguished professor at Vienna University. His predecessor George Puerbach (1423-61), an Austrian mathematician who wrote a textbook in which he pointed out the inexactitudes of the Ptolemaic system, prepared the ground for the great astronomer.

In Cracow the first great scholar in astronomy was a pupil of Regiomontanus, Wojciech (Adalbert) of Brudzewo (Brudzewski 1445-97), a bold talented man of broad horizons and a born teacher. He formed a school of astronomy which was regarded for a time as the best in Central Europe and which supplied professors to leading universities in Germany and even in Italy. He wrote a Commentary to Puerbach's

Textbook and a book of tables for finding the position of planets, the *Tabulae Resolutae.* The Commentary (published in 1491 and in 1495 in Milan) was used by astronomers in Poland and in Italy for many decades. Brudzewski was a dedicated teacher and eloquent lecturer. He introduced Puerbach's and Regiomontanus' findings to Cracow University and employed completely new teaching methods, being one of the first to use models in his demonstrations. He used to hold weekly symposia with students on Saturdays.

At the time when Copernicus studied in Cracow, Brudzewski ceased to teach astronomy to take up Aristotelian philosophy. However historians suppose that Copernicus had scientific contacts with him outside the university and that he attended his philosophical courses. Whatever the case, he certainly gained experience from the scientific teachings of the school of astronomy and the dynamic atmosphere created by Brudzewski and other eminent minds of Cracow. [*illus. 3*]

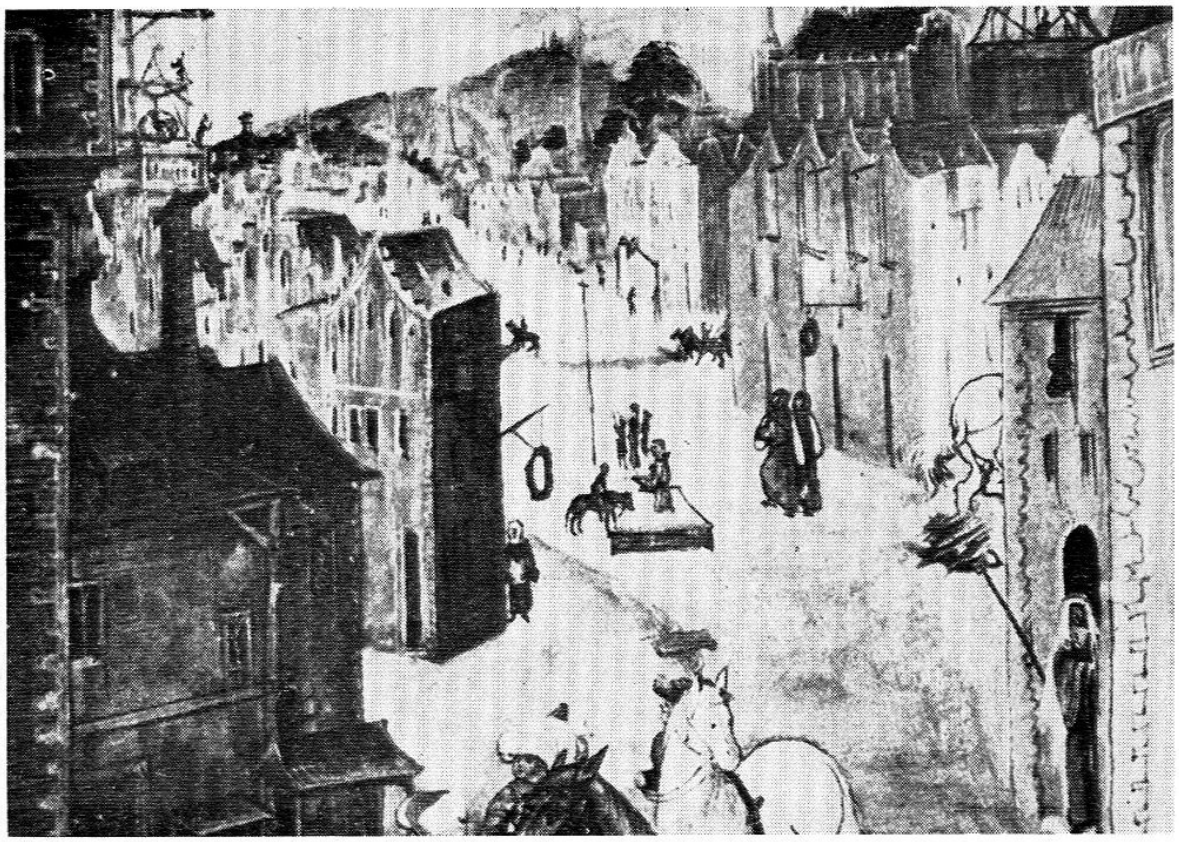
Among these were the meteorologist Martin Biem, whose lectures he might have attended, and Martin Król who developed the first practical geometry, corresponding to our present "surveying." At the university there was also great interest in geography when only the most enlightened minds supposed that the earth is a sphere while most believed that this is only a hypothesis, and that the earth is flat. The discovery of the new world by Columbus gave a new impetus to the study of geography.

The professor of geography was Mathias Miechowita (1457-1523), who became widely known by his book on the two Sarmatias *(De duabus Sarmatiis),* which was long considered as the most authoritative work on the subject and was translated into many languages. The Emperor Maximilian I ordered his envoys in Moscow to check Miechowita's description of Russia, the other "Sarmatia," which proved to be very accurate.

A few men exercised a tremendous influence on the cultural life of Poland outside the University. Among these was Philip Buonacorsi (1437-1496), also known as Callimachus. He had fled from his native Italy fearing the anger of the Pope, as he was involved in an intrigue against the Papacy, and found shelter in Poland, in Lwów (1470), at the court of the illustrious humanist, Archbishop Gregory of Sanok, whose biography he later wrote. After the Pope's death, Buonacorsi, "the poet of Florence," as he called himself, was free to move. He came to Cracow and lectured at the university (1472) under the name of Callimachus. King Casimir (Jagiellończyk) called Callimachus to Cracow as tutor to his sons, to assist the older historian, Długosz (1415-1480) who had been their preceptor for several years previously.

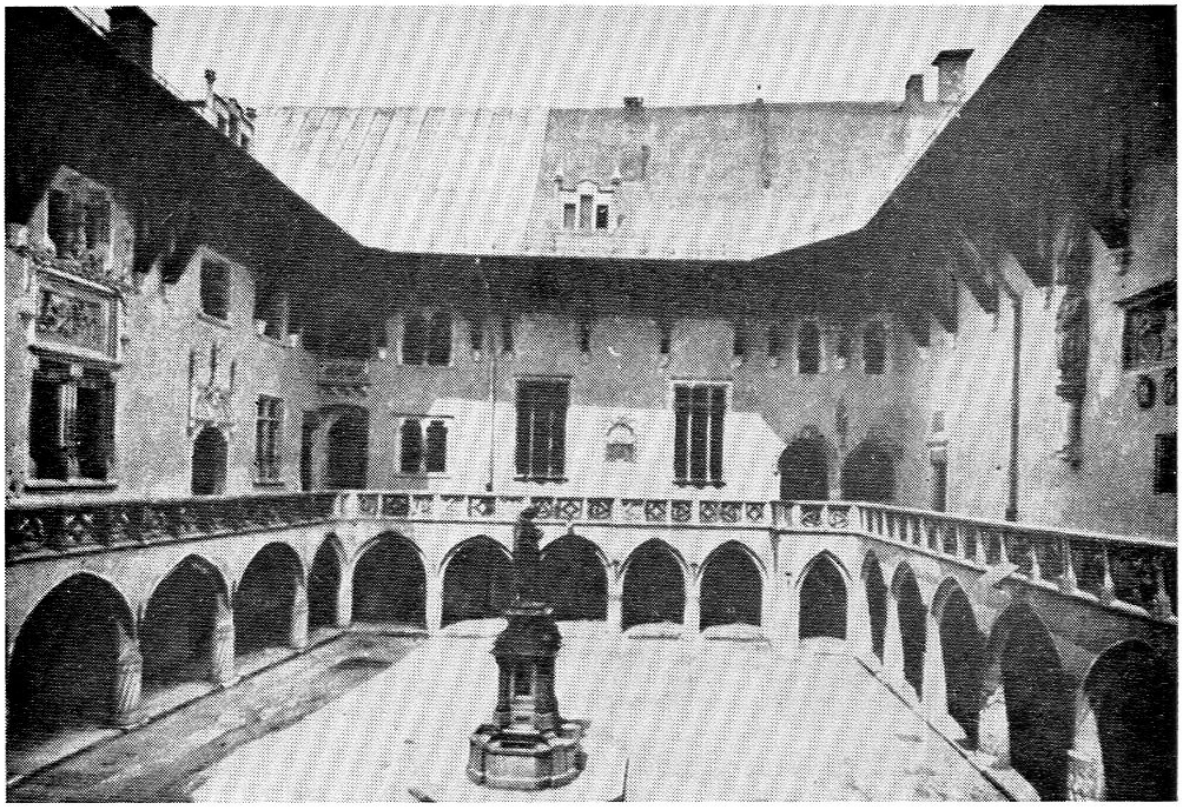
When the princes grew up and three of them, in turn, succeeded to

1. Contemporary woodcut of XVI century Cracow, then capital of Poland.



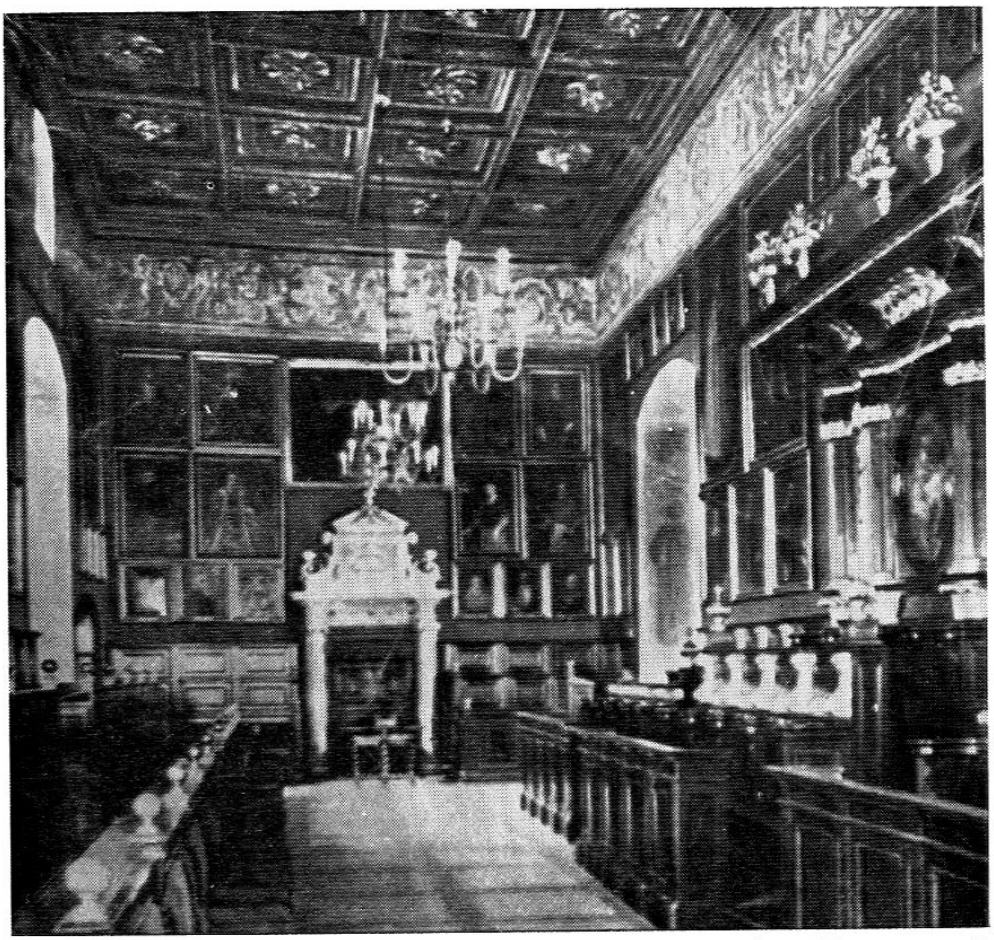
2. Urban scene in Cracow at the turn of the XVI century. Watering of horses at the well and shoeing (center). Two monks with sacks begging for alms. Top left: *weathercock. From B. Behem: "Codex picturatus," 1505.*

3. Teaching at the University. Lecture.



4. The courtyard of the Cracow University building, COLLEGIUM MAIUS. It has retained its original XV century form and is one of the few remaining Gothic colleges of Europe. In the center the monument of Copernicus, relocated after 1945.

5. Teachers and students ("scholars") at the time of Copernicus, painting by Jan Matejko (1838-93).



6. One of the Halls of the COLLEGIUM MAIUS, the oldest part of the University in which Copernicus studied from 1491-95.

7. Sumptuous feast at the house of a rich Cracow burgher, attended by Kings and princes who came to a convention at the invitation of the King of Poland. By Jan ***Matejko.***

the throne of Poland, they were men of the Renaissance. Particularly admired by the humanists was King Jan Olbracht. Callimachus became his advisor, as it were — minister without portfolio. The long reign of the youngest of them Zygmunt I (Sigismund), who married an Italian princess, Bona Sforza, became the "Golden Age" of Poland's Renaissance.

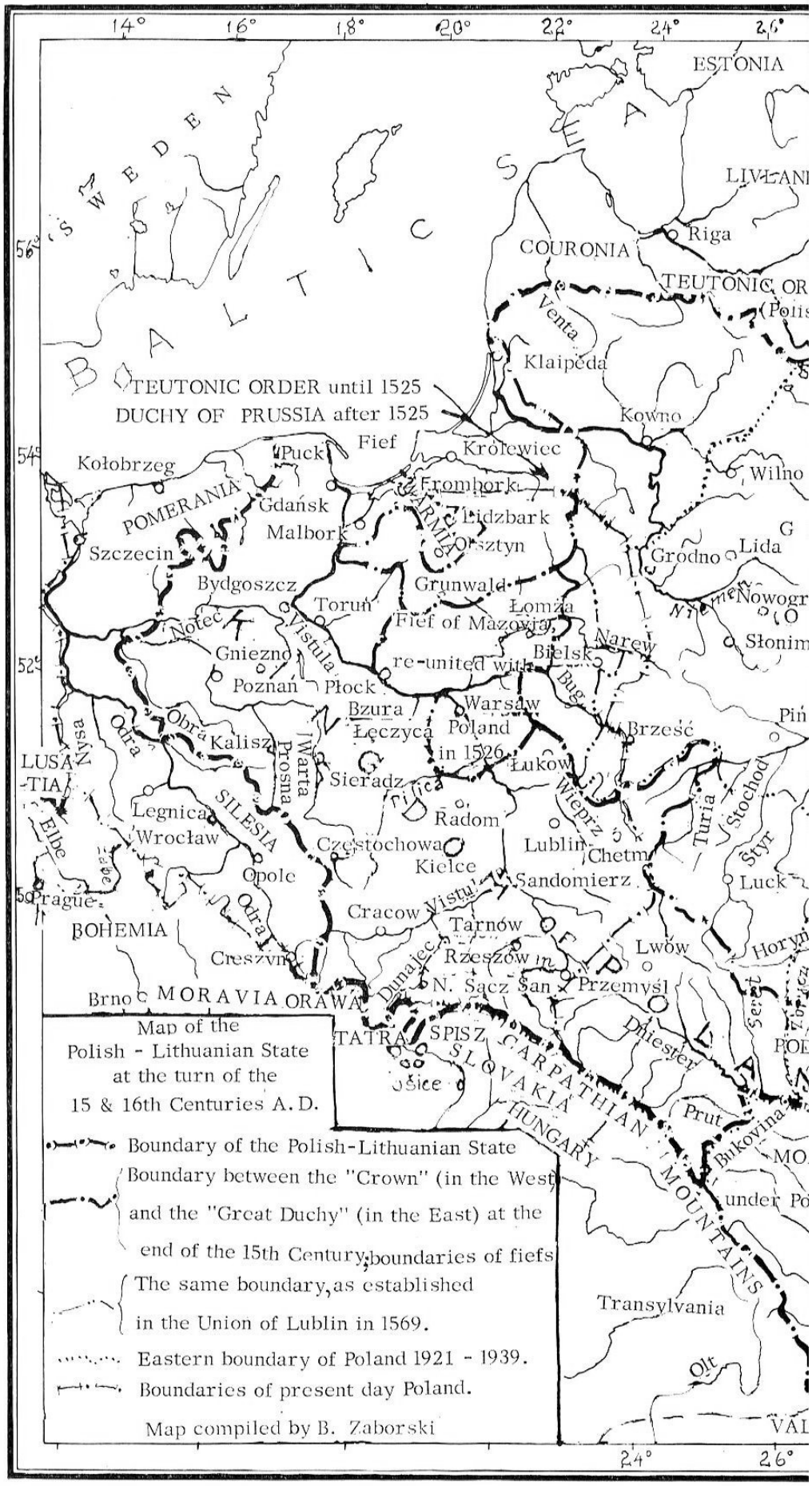
Callimachus considered Poland, the country that hosted and sheltered him, as his motherland. His powerful mind exerted an enormous influence on the development of Polish Humanism, which indeed also grew out of the native soil, from the prosperity of the burghers, the patronage of the king and the light of Polish learning radiating from the University of Cracow.

Another enlightened humanist was Conrad Celtes (Celtis, 1459-1508), a Latin poet from Franconia (Germany), who stayed in Cracow only for a few years but left a long-lasting trace. With a few others he created a literary society, the "Sodalitas Litteraria Vistulana", where art, Platonic philosophy and literature were ardently discussed and argued. In these symposia, Celtes and other poets read their poems, stimulated interest in classic literature, spread the idea of joy of life. Also Rudolf Agricola, the Swiss poet spent a few years in Cracow, teaching at the university. The medieval approach to life and learning was shunned and the gloomy medieval world was breaking down under the rays of the Renaissance.

In Cracow Copernicus witnessed several important historical events: the solemn funeral of the old king, the splendor of the coronation and the colorful ceremony of greeting the new king by the whole University community. The parade was led by the Rector in his ceremonial robes, the beadles carrying the University insignia, followed by the deans, professors and students in gowns worn in Cracow for 600 years, until our time.

Wealthy Cracow burghers played host to foreign kings, princes and dignitaries, dazzled their guests by the splendor of their receptions and residences. [*illus.* 7] In 1493 a pageant took place when a Turkish delegation paraded through the cobbled streets of Cracow with camels and all the exoticism of the East. It must have impressed Nicolaus' receptive mind.

After the defeat of the Teutonic Order, free access to the Baltic sea was restored and Poland enjoyed a period of relative peace and prosperity which provided the economic basis for the Golden Age. Gold poured into the country from the lucrative grain export, from the sale of timber, furs, honey and amber and made possible the promotion of the arts and the purchase of jewels, pictures, elegant garments and tapestries.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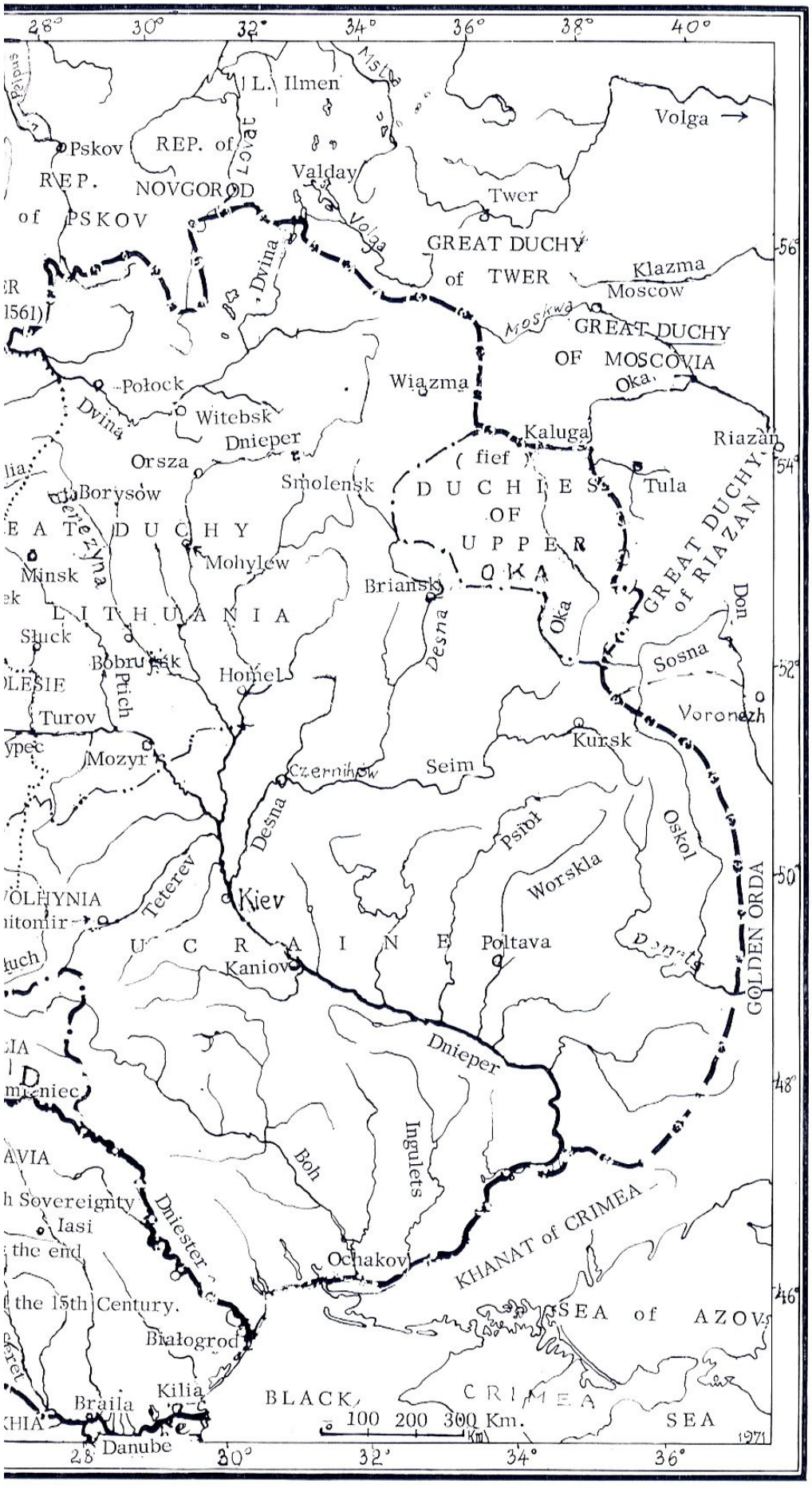
BALTIC SEA
SWEDEN
ESTONIA
LIVLAND
COURONIA
Riga
TEUTONIC ORDER until 1525
DUCHY OF PRUSSIA after 1525
Venta
Klaipeda
Kowno
Wilno
Fief
Królewiec
Puck
Kołobrzeg
Fromhork
Lidzbark
Gdańsk
POMERANIA
Malbork
ERMLAND
Olsztyn
Grodno
Lida
Szczecin
Bydgoszcz
Grunwald
Toruń
Łomża
Fief of Mazovia,
re-united with
Gniezno
Poznań
Płock
Bielsk
Narew
Nowogr
Słonim
Notec
Vistula
Bug
Niemen
Bzura
Łęczyca
Warsaw
Poland
in 1526
Brześć
Pińsk
Kalisz
Prosna
Warta
Obra
Odra
Nysa
LUSATIA
Sieradz
Łuków
Wieprz
Turia
Stochod
Styr
Luck
Legnica
Wrocław
SILESIA
Elbe
Radom
Częstochowa
Lublin
Chełm
Kielce
Sandomierz
Opole
Prague
Cracow
Vistula
Tarnów
Lwów
BOHEMIA
Ostrava
Dunajec
Rzeszów
N. Sącz
San
Przemyśl
Brno
MORAVIA
ORAWA
TATRA
SPISZ
CARPATHIAN MOUNTAINS
SLOVAKIA
HUNGARY
Dniester
Prut
Bukovina
Transylvania
Olt
Map of the
Polish - Lithuanian State
at the turn of the
15 & 16th Centuries A.D.
Boundary of the Polish-Lithuanian State
Boundary between the "Crown" (in the West)
and the "Great Duchy" (in the East) at the
end of the 15th Century; boundaries of fiefs
The same boundary, as established
in the Union of Lublin in 1569.
Eastern boundary of Poland 1921 - 1939.
Boundaries of present day Poland.
Map compiled by B. Zaborski


28°
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L. Ilmen
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REP. of
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of PSKOV
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Twer
Volga
GREAT DUCHY
of TWER
Klazma
Moscow
Moskwa
GREAT DUCHY
OF MOSCOVIA
Oka
Dvina
Połock
Witebsk
Wiązma
Kaluga
Riazan
Dnieper
Orsza
Smolensk
(fief)
DUCHIES
OF
UPPER
OKA
Tula
Borysow
Berezyna
Mohylew
Minsk
Briansk
Desna
Oka
GREAT DUCHY
of RIAZAN
Don
Sosna
Slutsk
Bobruisk
Homel
Ptich
Turov
Mozyr
Voronezh
Kursk
Seim
Czernihow
Desna
Psioł
Worskla
Oskol
Teterev
Kiev
Poltava
Kaniov
Dnieper
GOLDEN ORDA
Ingulets
Boh
Dniester
Iasi
Ochakov
KHANAT of CRIMEA
SEA of AZOV
Białogrod
Kilia
Braila
Danube
BLACK SEA
CRIMEA
100 200 300 Km.
1971
56°
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The newly discovered art of printing with movable type gave impetus to the spread of knowledge. Cracow became a printing center in 1473 and since 1474 housed the press of a roving printer, Casper. The first permanent printing shop was established in 1503. A printer and militant humanist, Florian Ungler, undertook the pioneer work of printing the first books in Polish. He encouraged scholars to prepare manuscripts for him, correct erratic spelling and establish a uniform orthography. As a result, religious, literary and popular science books were published. Magnificent volumes, liturgical as well as secular, which were adorned with the exquisite art of book illumination, were printed in the sixteenth century by Jan Haller, Wietor and Ungler. The town secretary of Cracow, Balthasar Behem, a pupil of Cracow University, commissioned a book on the status of Cracow Guilds. This *Codex Picturatus* has become a priceless collection of magnificent colored pictures of Cracow's contemporary life. [*illus. 2*]

Leonard Coxe, the English humanist, who travelled to the Continent as a young man "to learn and earn," spent some time in Poland and left a written description of his stay, *De Laudibus celeberrimae cracoviensis academiae* (1518), in which he praises the University of Cracow and the high standing of its professors.

During Copernicus' first year in Cracow, several astronomical instruments arrived from abroad, a gift of a former pupil of the university, Martin Bylica, professor of astronomy in Buda. The arrival of these instruments, primitive by present standards but the last word in scientific equipment in those days, created such a sensation that the Rector called a special student convocation to demonstrate these wonders. These and other astronomical instruments were housed in the Collegium Maius. This collection included one of the oldest celestial globes and later, in 1510, acquired the first terrestrial globe on which the newly discovered America was indicated: "America terra noviter reperta." It is called the "Jagellonian Globe" and is still preserved in the university museum.* The first thrill that came to Copernicus from the handling of astronomical instruments and observation of the heavens was experienced in this city of "living stones." [*illus. 8*]

While in Cracow, Copernicus witnessed a series of heavenly phenomena. In Januaury, 1491, a great comet appeared in the heavens, which nearly caused a panic among the population. In late December a fascinating phenomenon occurred, when next to the disc of the sun two other discs appeared at noon, as well as a halo — a ring of light around the sun. In 1492, another comet dashed across the skies just at the time when Christopher Columbus reached the shores of a new continent — America. The superstitious believed that it announced the death of the old King which actually occurred shortly thereafter.

* A replica of the Jagellonian Globe is in the University, in Pittsburgh, U.S.A.

On October 10, 1493, teachers and students observed a partial solar eclipse. In 1494 there were three eclipses, one of the sun and two of the moon.

A total eclipse of the moon occurred on Good Friday in 1494, evoking awe and fright among the people and heated discussions among the theologians, astronomers and astrologers. All of this must have had a strong influence on the imagination of the young student. The evident disparity between observation, mathematics and the Ptolemaic system stirred up doubt, intellectual ferment and the desire to delve deeper into the secrets of astronomy.

How and when did the heliocentric system take shape in Copernicus' mind? Since childhood he was fascinated by the question as to what was the real structure of the world? Did it have finite bounds as was believed up to that time. Was it limited to the eight spheres as the Greek astrologers maintained? Was the earth static? In Cracow he might have heard from Jan of Głogów, a great scholar who taught for forty years and wrote treatises on astronomy and philosophy, that the sun was the first and most important of all the planets and that it governed the motions of the others. The text of Cicero's *Somnium Scipionis,* which mentions the revolving motion of Venus and Mercury around the sun, was commented on in the university lectures, as well as in the "commentaries" of Adalbert of Brudzewo, who contributed greatly to the criticism of Ptolemaic theory.

Many authorities consider that the intellectual atmosphere at the Jagellonian University was to some extent responsible for bringing about the Copernican revolution. The teachings of the Cracovian philosophers and astronomers aroused the interest in the Classics and in the study of ancient learning; they enabled Copernicus to distinguish correctly between philosophical speculation and the subject matter for exploration based on reason.

The impulse may have come from outside the university, as humanistic societies sprang up and flourished in Cracow and itinerant humanists brought in fresh ideas. Copernicus certainly drew much inspiration from his extracurricular activities and relations.

Under the influence of Jean Buridan, a Parisian philosopher of the fourteenth century, who criticized Aristotelian philosophy and had several ardent followers in Cracow, stronger emphasis was placed on research, especially in physics, than on metaphysical speculation. This created more favorable conditions for the development of the exact sciences. The way to find the truth was not based solely on his own observations of the skies. He saw the discrepancies in the Ptolemaic, traditional system, he read much, especially ancient Greek literature and the writings of the Pythagoreans, in which ideas on the motion of

the earth could be detected. He studied the medieval philosophers Oresme, de Cusa, Buridan. All these concepts, however, were only elaborated suppositions. They could fertilize Copernicus' mind but there was no proof, not enough scientific backing to them. Yet Copernicus believed he was on the right path and dedicated his whole life to think over and try to prove the validity of his hypothesis on the basis of mathematical calculations.

One of the marks of Humanism was the revival of platonic philosophy, with its certain emphasis on the sun cult, so different from the Aristotelian philosophy which was still taught at the university. This revival inspired a sense of cosmic harmony.

This was a time when a newly printed book was still a sensation and precious books were often chained to the desk. Marsilio Ficino, a neo-platonist, published his *De sole et de lumine* in 1489 in Florence, and sent a copy to his friend in Poland, Callimachus. It may be that Copernicus met Callimachus in Cracow and could have borrowed the book from him. Certainly there is some indication that Callimachus was acquainted with the Copernican family, since in 1495 he bought the house at 35 Market Place in Toruń next door to Copernicus' home. There is some indication that Copernicus read Ficino's book and took notice of the growing neo-platonic emphasis on the cult of the sun.

PRE-COPERNICAN ASTRONOMY

The Geocentric System

At the time of Copernicus, and for more than 1500 years prior to this, it was firmly believed that the earth was the fixed center of the universe. Among the ancient Greeks, Pythagoras (582-507 B.C.) and Aristarchos of Samos (310-230 B.C.) had proposed that the earth and other planets circled around the sun.[6] The so-called Egyptian doctrine speaks of Venus and Mercury moving around the sun. However, these views did not gain credence and were largely ignored. Most of the ancients, including Aristotle (384-322 B.C.) and Hipparchus (190-120 B.C.), who justly deserves the title of Father of Astronomy, accepted the concept of a centrally positioned earth, around which the sun and planets revolved. In the second century A.D., Ptolemy of Alexandria presented a detailed account of the geocentric system in his *Almagest* and it was this Ptolemaic system that served as the basis and central dogma of astronomy for the next fourteen hundred years.

This static geocentric concept dominated not only astronomy but also all the philosophic thought of the time. It supported the idea of earth and man as the center of creation. It was ackowledged by the

[6] Sir T. L. Heath, *Aristarchos of Samos, the Ancient Copernicus,* Oxford, 1913.

authority of the Church, as it suited its doctrine, and remained virtually unchallenged until Copernicus.

It is true that a few faint voices of dissent had been raised in the intervening years. For example, John Erigena (815-877), an Irishman at the court of Charles the Bald, spoke of the planets describing circles around the sun. Arabs, who had to observe the stars to practice their religion speak in the tenth century of the motion of the heavenly bodies. Later, Nicholas Oresme (ca. 1330-1382), Nicolas of Cusa (1401-1464) mentioned the motion of the earth but did not elaborate further. However, none of these dissenting voices had been able to loosen the geocentric doctrine from its firmly entrenched position in the minds of men.

The one who finally succeeded in bringing about this revolution in human thought was Copernicus, who not only proposed the daring new conception of a heliocentric universe but made this concept penetrate into the minds of men by the power of his logic and his mathematical proof. Copernicus reversed the hierarchy, he showed that the sun was the center of our system and that the earth was merely one of the planets which revolved around it. This idea seems so self-evident today that it is difficult to realize how revolutionary it was at that time.

BOLOGNA — ROME — PADUA — FERRARA

After four years of study and hard work Copernicus graduated from the Jagellonian University. Examinations were quite rigorous and Nicolaus obtained the baccalaureate, although there is no record of it. He fervently wished to continue his studies in Italy where access to Roman and Greek sources was easier.

Copernicus, probably, had a well prepared plan of study to further his knowledge of astronomy. It may not be too bold to assert that the heliocentric theory crystallized in the mind of Copernicus during his studies at the Jagellonian University, but there is no doubt that, at that time, Copernicus was already convinced that the Ptolemaic system was false and was determined to embark upon the search for the true structure of the world. The idea was born and engaged Copernicus' mind until the end of his life.

Thus it seems that the rich and well grounded knowledge that Copernicus received in Cracow University laid the foundation for his heliocentric theory. Certainly Copernicus acknowledged his debt to the Jagellonian University. In a letter written to Bishop Maciejowski in 1542, Adalbert Caprinus, a friend of the astronomer reports Copernicus as saying that it was entirely due to the Jagellonian University that he was what he was.

Lucas Watzenrode, now Prince-Bishop of Warmia and Senator, one of the first dignitaries of the Polish Kingdom, a highly educated alumnus of Cracow and Bologna Universities, had great hopes for the future of Copernicus and wanted to make him his successor and continuator of his political activities. Despite the high costs involved, he decided to send Nicolaus and his brother Andreas to one of the oldest of the Italian universities, the famous University of Bologna, to gain doctorates in Law.

Nicolaus and Andreas left their native land for Italy, travelling across the Alps mainly on foot. Legend has it that they were robbed on their way and arrived in Bologna penniless. In the invigorating atmosphere of Italy, Nicolaus spent ten fruitful years at various universities. He matriculated as a student of Canon Law but did not give up astronomy which was his passion. He also studied Greek eagerly.

Students in Bologna lived a joyful, carefree life and Copernicus was often in debt. To assure him an independent income, his guardian, the Bishop, made two attempts (the first, unsuccessful), to have Nicolaus elected in absentia to the Canonship of the Chapter of Warmia. It was a benefice often bestowed on patricians of the city for reasons of merit or nepotism. The Canonry did not impose any obligation to advance in holy orders beyond the first vows, which Nicolaus very likely received from his uncle. He probably never passed that stage.

When Copernicus arrived in Bologna he was twenty-three years old. The dogma of the earth being the center of the universe was still unshaken. Copernicus remained in Bologna for four years and pursued his astronomical explorations. He observed in particular the star Spica Virginis and Aldebaran and witnessed an occultation of Aldebaran by the moon and a conjunction of Jupiter with Saturn.

In Bologna he became aquainted with Domenico Novara (1454-1504), professor of astronomy, a brilliant man with an independent, critical mind. After a short time these two were united by bonds of cooperation and friendship despite the large difference in their ages. Working with Novara and taking advantage of various heavenly phenomena which occurred during his stay in Bologna, Copernicus carried out fruitful research which more and more convinced him that Ptolemy's system could not be valid. He could support these guesses with calculations and confided them to Novara. Copernicus remembered Novara and his work with him with affection and sincere gratitude to the end of his life.

In the jubilee year of the Church, 1500, at Easter, Copernicus travelled to Rome, probably to lecture on astronomy and mathematical calculations to groups of learned and prominent men. [*illus. 10*] At the same

time, he was working in the Papal chancellery, where he was acquiring practical experience in Canon Law, though he never excelled as a jurist. All over Italy he encountered unprejudiced teachers, modernists and courageous humanists. We do not know if he met Leonardo da Vinci and Michelangelo, but he met numerous pilgrims to Rome. In Florence he saw Savonarola. In Rome he observed a lunar eclipse on November 6, 1500. He returned for a short visit to Warmia, probably in connection with his election to the Chapter, perhaps to visit his mother who was approaching the end of her life. On this occasion he was granted an extension of the period of his studies, as well as special permission and a recommendation by the Warmian Chapter to study medicine, a profession badly needed in the country where there was a serious lack of physicians. He joyfully welcomed the extension of the period of his studies.

For the study of medicine, he chose the university of Padua, which had the best medical school at that time. Yet, it is worthy of notice that there was hardly any teaching of anatomy. Not until forty years later did Andreas Vesalius, the founder of modern anatomy, publish his revolutionary book, *De corporis humani fabrica,* in Basle 1543. When Copernicus studied, only a few times a year were there demonstrations on a human corpse, at a special entrance fee and solely for students who had finished two terms. But practical training was coming more and more into use. The students visited hospitals and the patient himself became the object of study.

Copernicus had not intended to make medicine his profession. He enrolled also in Philosophy, Classic Literature and Greek, in which he widely read books on the stars and astronomical texts, since the Latin sources were insufficient.

In his leisure time he used to write poetry and translated freely from Greek into Latin. He left only one work of a purely literary character, a result of his philosophical studies. It was a Latin translation of the Greek *Letters* of the Byzantine poet Theophilactus Simocatta (ca 610-639) which he dedicated to his uncle. This collection of eighty-five pagan epistles of pastoral and erotic poetry greatly honor the courage of the author and the Bishop to whom they were dedicated. It seems likely that he wished to draw attention to his newly acquired skill. This book later appeared in print, when Copernicus returned to Poland and was on a diplomatic trip to Cracow (1509), in a beautiful edition gilded and hand-wrought in the famous printing shop of Jan Haller. It was the first translation from Greek to Latin in Poland.

Copernicus later also did some drawing and painting and left, among other paintings and sketches, his self-portrait, holding a flower in his hand (the emblem of the medical profession). It was re-

produced (about 1571-1574) on the famous clock tower of the Cathedral of Strassbourg in Alsace. This is the only existing copy and it served later as a model for his portraits by many painters and printers. The original portrait has been lost.

When he mastered medicine, he probably received the "licentiate" to practice medicine. He proved later to be an able doctor — sought out by many notables.

The doctor's degree of "Both Laws" (canon and civil) was conferred on him in 1503 by the University of Ferrara in a solemn, picturesque ceremony, customary on such occasions. It was a costly affair and Copernicus travelled to Ferrara to receive the degree because it was considerably cheaper than in Padua.

His studies terminated, Copernicus returned to Poland in late autumn 1503, after a decade spent in Italy. He carried in his imagination and in his mind a definite concept of the universe ruled by the unmoving sun. However, many long and arduous years of astronomical checks and mathematical calculations lay still ahead to confirm his theory more precisely.

Copernicus returned to Poland imbued with Italian culture, a humanist to the core, an oustanding Greek and Latin scholar, deeply read in classic literature as well as in philosophy, believing firmly that: "He who desires to have understanding, should be of a free spirit."[7] He was well versed in the Western system of ideas and terms, grown into the inter-European world of scholars — yet, not aloof and distant, but eager to be an active citizen of his home country as well as of the Polish Kingdom under whose sovereignty Warmia was included.

BACK IN POLAND

When he returned home in late 1503, Copernicus assumed his duties as Canon of the Chapter of Warmia, at the same time assisting his aging uncle as his private secretary, legal advisor and personal physician. They lived in the stately residence in Lidzbark (Heilsberg) which was the seat of the Prince-Bishop of Warmia. [*illus. 12*] The administration of the Chapter was located in Olsztyn (Allenstein). He accompanied the Bishop on his frequent journeys, not only around Warmia but also to Poland, and carried out diplomatic missions for him. His uncle introduced Nicolaus into the affairs of his anti-Teutonic activities, in which he was playing a leading role as this was a time of constant conflicts with the Teutonic Knights.

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[7] Alcinous, motto of Rheticus "Narratio Prima" (Gdańsk, 1540, Basle, 1541).

It was also part of Copernicus' duties to draft memoranda, reports and addresses to the deputies of the local, regional and national assemblies, and also to the King of Poland, who took note of them.[8] By royal invitation, Nicolaus and his uncle went to Cracow for the coronation of King Zygmunt I (Sigismund). On that occasion Nicolaus was amazed by the sumptuous life of the capital. He certainly took part in the subsequent travel of the Bishop who accompanied the King through the main cities of Pomerania, where the whole population spontaneously welcomed the sovereign and the burghers and city councillors paid homage to their ruler. In the following years, he travelled with the Bishop on several inspections and to convocations, also to Gdańsk and to Malbork, the residence of the Grand Master of the Teutonic Knights, as the Bishop was entrusted with a mission to reach agreement with the Order on legal matters. From documents we know that Copernicus often acted wisely in advising and appeasing his impetuous uncle at meetings in Malbork. All these events must have confirmed in Copernicus' mind the belief that the future and prosperity of Warmia should be bound with the kingdom of Poland.

In his rare free moments, Copernicus continued to carry out his cosmic observations. Wherever he stayed for a longer while—in Lidzbark, in Olsztyn or in Frombork, there are indications that he constructed an observatory for himself on a terrace, in a tower, or even in a courtyard ("pavimentum"). Thus passed probably ten years of life at his uncle's side.[9]

The Bishop's death in 1512 was a severe blow to Nicolaus. He was left alone. His older brother Andrew, a frivolous adventurer, did not live up to the expectations placed in him and died young in Italy.

Though the bishop was a despotic man, and life with him was not easy, and Copernicus often disagreed with his uncle's feuds with the Chapter, he was nevertheless an enlightened patron and true benefactor of his nephew. This ambitious and persistent politician had confided to Nicolaus his most secret plans — to transplant the Teutonic Knights from Prussia to Wallachia to fight the Turks and Tartars. It was also his intention to found a university in Elbląg but he did not find support for this idea.

The "NEW AESCULAPIUS"

Copernicus took up residence in the canonry at Frombork, a small coastal town, and dedicated himself to the modest duties of a canon. He was entrusted with the administration of the estates in the remote

[8] One of Copernicus' addresses to the King has been published in the series of Copernican studies in Poland in 1971.

[9] Although a recent biographer says that he left two years earlier.

parts of the diocese, which entailed many travels. He continued his heavenly observations and practiced medicine, treating the people around him, the rich and the poor. During his lifetime he was known more as a successful physician than as an astronomer. [*illus. 11*] He seemed to relate mathematics, "the queen of all disciplines," to medicine in a practical way. He prescribed doses of medications to his patients according to their weight, which was a novelty. He possessed the art of dealing with the patient in such a way as to give him solace and relief. He probably believed that the role of a doctor is, to some extent, to be a *consolatio animi* and that many illnesses of psychoneurotic type could be remedied by a competent, sympathetic person. He drew up a collection of health rules of a preventive type based on the Salernitan school.

The people called him a God-sent "New Aesculapius". The astronomer's fame came only after death. He personally prepared special remedies and applied them successfully (Starowolski 1627). These medicines may seem very "medieval" and inefficient to us, ("pilullae imperiales")[10] but, as he helped the people, he must have been a dedicated physician of a rare intuitive gift of diagnosis and insight. Some of Copernicus' medical books have been preserved together with prescriptions written on the margins in his own hand. His fame as a physician reached far beyond Frombork and Warmia. He was frequently summoned by patricians and bishops (Faber, Dantiscus, Giese) and even by Duke Albrech to Królewiec, where he consulted with the King's private doctor, the famous Solfa. Bishop Fabian Lusianis turned to him for a remedy for liquidating the plague of cholera (1519). He gained the respect and love of the people for his freely donated help to the poor of the coastal region. He was a peaceful, humble man who, despite his brilliant mind, did not seek great rank or power but worked, observed the skies, and thought.

THE STATESMAN

On several occasions he was recalled to act as Secretary and Chancellor to the Chapter (in 1511-13, 1519-20, 1524-5, 1529). In 1516-19 and 1520-21 he acted as the administrator of the estates of the chapter, and he took part in the regional assemblies and travelled around the country on tours of inspection (65 in two years). After a few years (in 1523) he was named Administrator General of the entire Capitular estates (during the vacancy of the bishopric). He was then based in Olsztyn (Allenstein) which was one of the larger towns in Warmia, with a fortified, imposing, Gothic castle. [*illus. 13*] He

[10] E.g. "pilullae imperiales" which had a "healing effect on every disease."

took part in the political and social events of the day and carried out diplomatic missions for the Chapter, particularly to Grand Master Albrecht, to the burgomasters of Gdańsk and Toruń and to the Court of Poland.

In his tours of inspection he saw the difficult situation of the country which was being continuously raided by the Teutonic Knights. In the villages, the overwhelming majority of the inhabitants comprised autochthonous peasants, German colonists and, since the end of the fifteenth century, Polish settlers, peasants from neighboring Masovia. In these borderlands, both languages of the two neighboring peoples were spoken; the population was a mixture of the two elements. The language of the educated people and of officialdom was Latin. Hence, the controversy as to which language was spoken by Copernicus, has no significance. Without a doubt he spoke both of the languages of the country, but probably used Latin primarily, particularly in drawing up reports, memoranda, instructions etc. However, the political and public attitude of Copernicus is important. From his activities, political, civic and scientific it is clear that he faithfully and loyally served Poland and carried on his uncle's policy. Throughout his life he defended Warmia's independence from the Teutonic Order.

The State of the Teutonic Order which was a vassalage of Poland, was headed at the time by Albrecht von Hohenzollern (1490-1568), the last Grand Master of the Order. The Teutonic Knights were harassing Poland and fomenting internal dissensions and disorders in the Polish provinces, especially Warmia, which was surrounded by the lands of the Order on three sides. In 1520, with the support of German troops, they attempted again to conquer Warmia and its capital Olsztyn, where Copernicus was temporarily stationed. He remained in the city while most of his colleagues left for safer places, and so Copernicus, churchman and astronomer, became governor of the beleagured city in 1521. He fortified Olsztyn castle as well as Frombork cathedral and bravely held out against the assaults on the besieged city. The Teutonic Knights had to withdraw after plundering and looting the surrounding countryside.

At the peace conference, following the 1521 armistice between the Teutonic Knights and the King of Poland, Copernicus distinguished himself at the Provincial Diet in Grudziądz (1522), where he presented an extensive memorandum containing the claims of Warmia for war damages and accusing the Grand Master Albrecht and the Order of invading and devastating Warmia in spite of the armistice treaty. Written in Latin, it became one of the legal documents used by King Sigismund I as a basis for peace negotiations. At the same time Copernicus tried to improve the economic situation of Warmia as much as he

could. He attempted to restore prosperity to the war-stricken Estates and to the people with whom he was closely linked, sharing their cares and dedicating his abilities to their most vital needs. He introduced concessions to the population in order to encourage the people to rebuild the devastated farms, and he allocated free stock.

He devised a scheme of standards for baking bread ("Panis coquendi ratio") and also a fixed price to keep the cost of living steady.

It has been said that Frombork owed its fresh water aqueducts to Copernicus. However, recent biographers in Poland cast doubt on this. This period of Copernicus' life is best known, because of the recorded documentation in Church registers, and Court and City records.

In this post of Administrator-General of the church property of Warmia, at a time of crisis and armed conflicts, Copernicus proved himself to be a successful organizer and a strong man with high qualities of leadership and resourcefulness. It is amazing that, in spite of such a busy life, Copernicus was able to continue with his scientific work. Much of it was done during these stormy days.

THE ECONOMIST

Apart from the problem of the Teutonic Order, there was a second issue which was of great importance to Warmia and Poland — the question of currency. From the end of the fifteenth century, the burghers in European cities, craftsmen, artisans and producers became more and more prosperous through more efficient means of production and expanded foreign trade facilities. The type of production slowly changed from that of individual work to small company enterprises. Little workshops became only links in a more complex economic structure. Thus, new institutions sprang up, banks were established, the first Stock Market in Antwerp was organized in 1531, facilitating contacts with the outside world. Warmia, situated at the mouth of the Vistula, on the Baltic sea, was closely linked through her grain export with the large international mercantile and monetary trade system. Therefore the problem of currency was of great importance.

Copernicus also made an important contribution to economics and to our knowledge of monetary laws.

As an administrator of the extensive capitular province of Warmia, inhabited half by native Poles and half by German settlers, he had to deal with the economic affairs of the country. Owing to war and destruction, a disastrous inflation took place in Pomerania. The Prussian towns had the right to mint money, and when in financial difficulties, or sometimes for purposes of speculation, they minted coins with less and less silver, debasing the money and introducing chaos

into the market, which undermined the economy of the country. Copernicus considered this problem of debased currency and noted that when bad money is in circulation with good money, the bad regulates the overall value and drives out the good. This is the law of bad money which Copernicus formulated with clarity thirty-two years before it was devised by Gresham and became known as Gresham's Law. The quincentenary might perhaps be an appropriate time to grant Copernicus his due and substitute Copernicus for Gresham in text-books of Economics.

Though Copernicus did not use the word "inflation," he realized its meaning and described the consequences. The monetary situation was a key problem for the Polish State as well as for Pomerania. Copernicus often served as adviser to the Polish Court on economic and fiscal problems, also on matters of the home market and foreign trade.

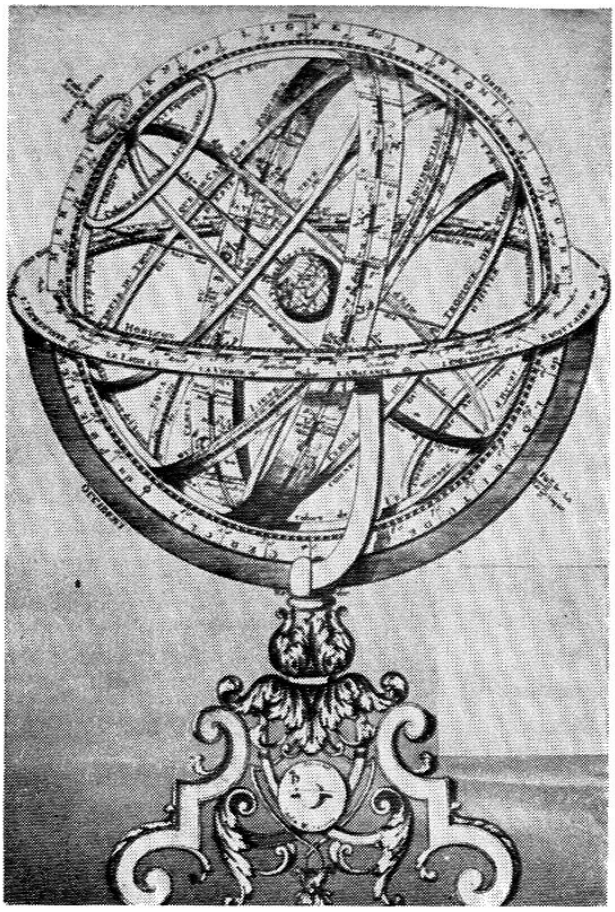
Taking part in regional assemblies of the Warmian Chapter at the request of the ruling Bishop, he worked out a plan of reforms for the currency of Warmia and the neighboring provinces. He wrote, among other works a treatise "on Money" *(Monetae cudendae ratio)* in which he advanced the principle of uniform currency for the entire Polish Commonwealth. In this he saw a means for improving the welfare of the people, which was his constant concern. This was the idea of centralization of state power and closer economic union with Poland. In the Diet of Piotrków (1526-1528), uniform coinage for all Poland and Lithuania was introduced, in conformity with the proposal of Copernicus.

The novelty of the treatise on money, according to J. Taylor, (an American professor of economics, 1954) is, that it is a purely empirical and practical essay on the dangers of inflation and its destructive effect on commerce and on the whole financial situation. This little treatise, says Prof. Taylor, is one of the "great milestones in the progress of economic thought, but by pure mischance — perhaps because most economists do not read Latin with ease — it is today virtually unknown. Yet, it is so up to date that the opening paragraph might as effectively be dealing with social and economic troubles of the mid-twentieth century as with those of the early sixteenth century"!

The significance of his economic works and his bold program of reforms puts Copernicus among the ranks of the most prominent socio-political thinkers of the Polish and European Renaissance.

In 1521, the Prince-Bishop bestowed on Copernicus the title of Commissioner of Warmia, which was a mark of great distinction.

Meanwhile profound changes were taking place in the Order of the Teutonic Knights. Under the influence of Luther and Melanchthon, the Grand Master Albrecht of Hohenzollern and the whole Order accepted Lutheranism, and Albrecht proclaimed himself the first Duke

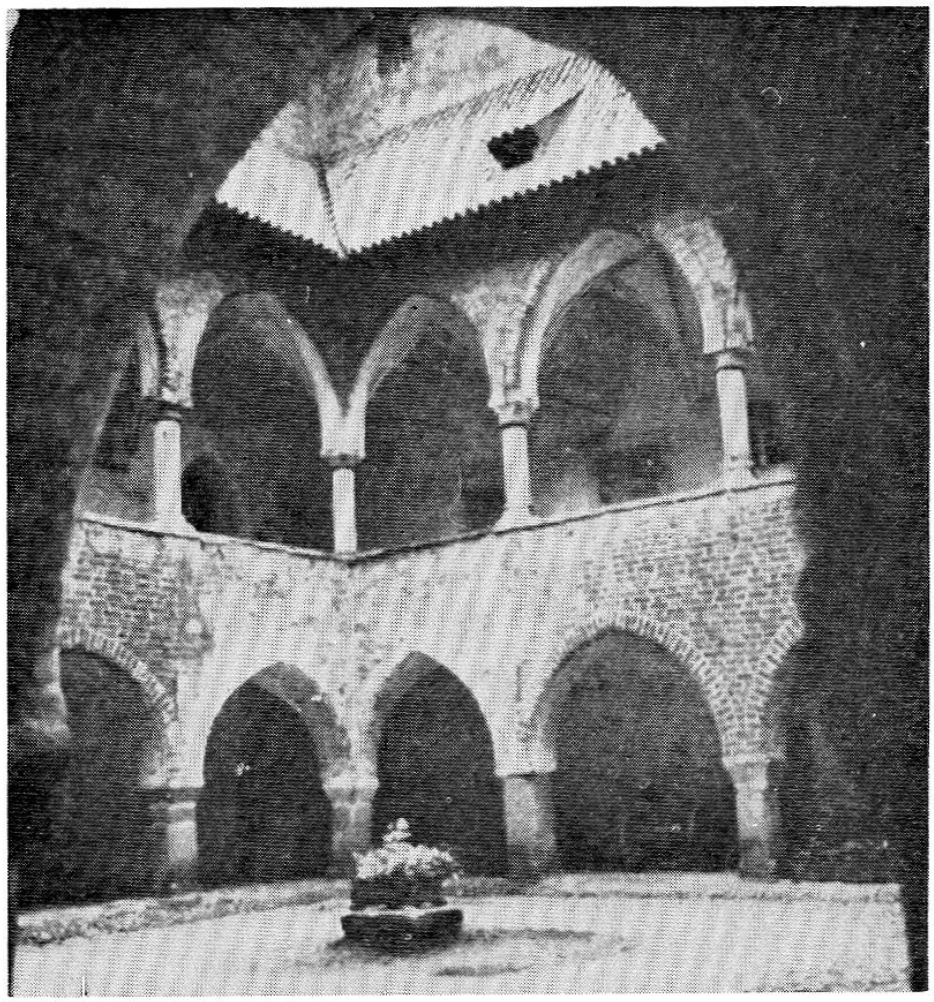


8. An old astronomical instrument with circular map, zodiacal center used for determining the positions of heavenly bodies.

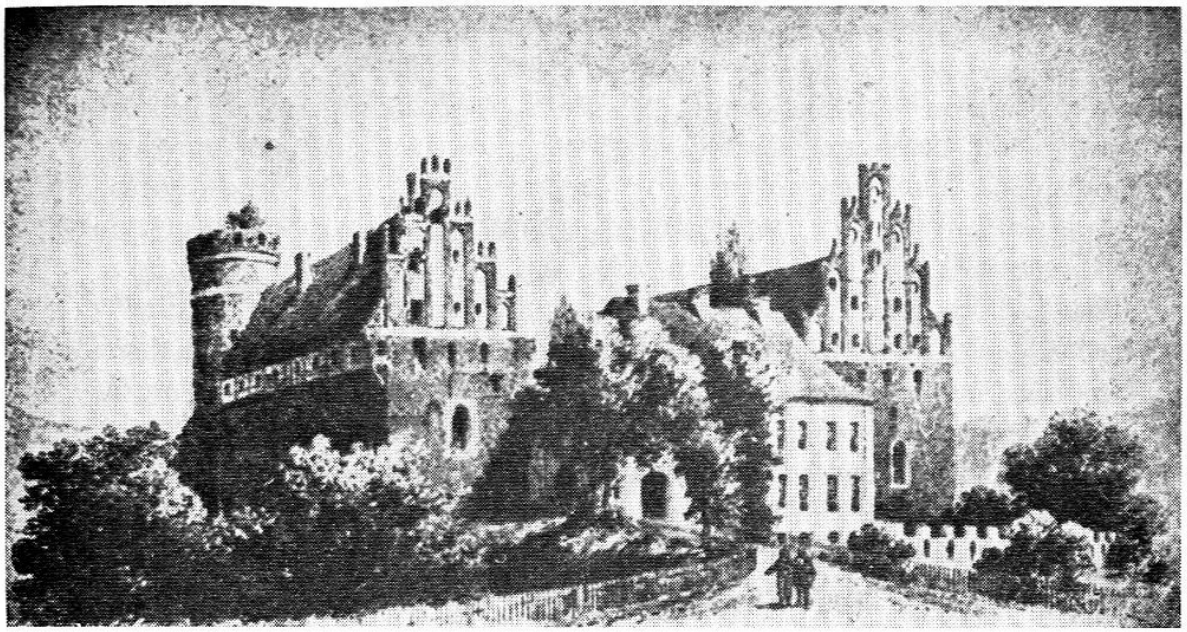
9. Copernicus on the tower of Frombork cathedral which he used for his astronomical observations. Painting by Jan Matejko.

10. In the year 1500, Copernicus went to Rome where he lectured on mathematics and astronomy to prominent contemporaries. The painter, W. Gerson (1831-1901) included such celebrities as Pope Alexander VI, Leonardo da Vinci, but it cannot be proved that all of them were present.

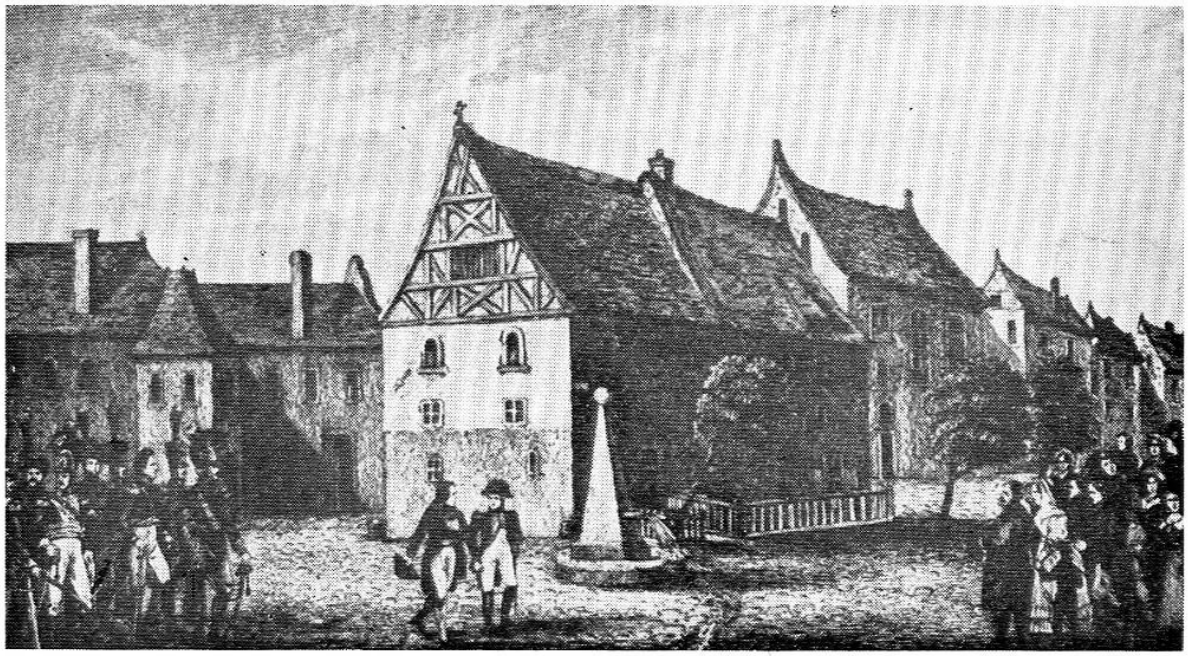
11. The medical studies in Padua made Copernicus unofficially the chief physician of Warmia, whose services were in great demand. A contemporary woodcut showing the three main therapeutic methods of the time: urinalysis, healing bath (balneology) and blood-letting (right).



12. Fragment of Lidzbark castle, residence of the Prince-Bishop.



13. Olsztyn castle by F. V. Quast. The art of warfare was not unknown to Copernicus. He had to defend the castle of Olsztyn, the site of the Administration of Warmia against the Teutonic Knights in 1521.



14. The house in Torun in which Copernicus was born was visited by Napoleon who came especially to see the birthplace of the great astronomer. He expressed surprise that Copernicus had so far not been honored by a suitable monument. Soon afterwards a monument of Copernicus was erected in Warsaw, the work by Thorwaldsen (1770-1844), a Danish sculptor of great renown.

of Prussia. However, Albrecht remained the vassal of Poland and was obliged to pay homage to the Polish King. A solemn ceremony which was held in the Market Place in Cracow in 1526, was depicted by the renowned Polish painter Jan Matejko.

DE REVOLUTIONIBUS

Alone with himself and the unknown...

When peace came to Poland after the end of the war, Copernicus returned to the routine canonical duties in Frombork and spent the remaining years of his life in this remote small town on the Baltic coast. In the solitude of Frombork he could devote more time to astronomy, which had absorbed his mind for so many years. Using crude hand-made tools and primitive instruments, a triquetrum of his own make, he carried out a multitude of astronomical checks and mathematical computations. He studied, tabulated data, calculated, scribbling even on the walls whenever a new idea came to him. It was a gigantic work, with no help whatsoever, far from all scientific centers, with inadequate equipments.

The tower of Frombork, believed to be one of his observatories for thirty years, is still standing to this day. [*illus. 9*] In the museum which has been established there, and known as the tower of Copernicus ("Turricula Copernici"), one can see, reverently preserved, some of the extremely primitive instruments which Copernicus used: a few tools, a set of astronomical tables and a piece of a rusted tube, which he used as a "telescope", also several of the Greek books from his library,[11] including the Greek dictionary of Chrestonius, the most recent at the time, which Copernicus had bought in Italy. It bears an inscription, in Greek, that it belonged to Copernicus.

In Olsztyn castle in the attic where Copernicus lived during his visits, there are scribblings, astronomical notations and drawings still visible on the walls, and one instrument which according to recent biographers (T. Przypkowski) was certainly made by Copernicus himself.

Lately, Polish biographers suppose that Copernicus' observatory was in the courtyard of his house, which apparently stood outside the fortified walls of Frombork. Copernicus, who cherished privacy, lived and worked there during the summer but, as it was unheated, he moved for the cold winter months to common lodgings near the Cathedral. This house does not exist at present but was visited in 1584 by a

[11] Most of Copernicus' documents and belongings were looted by the Swedes when they occupied Western Poland and Warmia in 1626. At the end of the nineteenth century they were discovered in Uppsala by Polish biographers of Copernicus.

Dutch scientist, an assistant of Tycho de Brahe, E. Cimber, who left a record of his visit.

Copernicus was well aware of the revolutionary nature of his doctrine and expected to meet with violent opposition, he wanted therefore to provide a firm and accurate mathematical foundation for his theory. He also did not want to enter into conflict with the Church, of which he was a faithful son. To him his discovery was firmly linked with his religious, moral and philosophical beliefs, which he later convincingly expressed in the Preface dedicated to the reigning Pope.

It is generally believed that Copernicus' "magnum opus," his monumental book *De revolutionibus orbium coelestium libri VI* on the heliocentric structure of the universe, was written between 1515 and 1532. Copernicus probably returned from Italy having a general concept ready in his mind, but it took him thirty years to elaborate it and great intellectual courage to put it forth. He saw the disparities between his observations and mathematical calculations which could not be resolved, since he still based his concepts on the preconceived idea of the ancients, that "perfect" and celestial motion is a motion in circles. It was not till almost a century later, with Kepler's introduction of the notion of the elliptical movement of planets that Copernicus' observations could be better fitted to his heliocentric theory and the disparities were resolved.

When the first draft was ready, he checked and re-checked his observations verifying all the details, realizing that a number of them had yet to be worked out. In his modesty he never completely refuted the existing system; he gave full credit to his predecessors in astronomy though he was also influenced by the empirical currents of the new epoch. In 1532 he again revised his manuscript but apparently made no attempt to publish it. As he himself acknowledged, he was "afraid of scorn and contempt on account of the novelty and unconceivableness" of his theory. Audacious as a thinker, he was timid in advancing his concept, he knew perfectly well that his discovery would meet with disapproval and would be repudiated. He preferred to keep the precious results for himself and the chosen circle of a few scholars and friends.

His life in the small provincial town, among the same dozen of colleagues, preoccupied with trifling events, litigations, local politics, must not have been rewarding were it not for the "divine science" he was dedicated to. He had only a few friendly colleagues at the Chapter: Canons Sculteti, Donner, and his trusted friend Tiedemann Giese from Chełmno (Culm). The Baltic fog was also a natural impediment in his watching of the stars. He often wrote how he envied

those who had the opportunity to observe the wonderful skies of the Mediterranean.

In 1537 Jan Dantyszek (Dantiscus, Jan of Gdańsk) became the Prince-Bishop. Copernicus had favored the candidacy of the learned bishop Giese. Probably as a result of the pre-electoral animosity that arose, Dantiscus who had been a friend of Copernicus from youth, became an antagonist in his old age on assuming power. He harassed Copernicus and attacked his liberal ideas and deeds, embittering the last years of the astronomer and even stooping to intervene in his personal life.

In Frombork lived a distant relative of Copernicus, Anna Schilling (Schillings), a person of great culture who looked after the aging astronomer and acted as his housekeeper. From the scanty information which has been preserved, it is known that she was the daughter of a goldsmith from Cracow, who was a cousin of Copernicus' mother. Anna had been brought up among the affluent Cracow bourgeoisie in an atmosphere of militant humanism. She was well educated, talented, pretty, and was interested in astronomy from early youth when she played an active role in the humanist movement in Cracow. Apparently, during this time she had gained Copernicus' friendship and the memory of this survived the long years of separation. When she heard that Copernicus was ill, the now widowed Anna came to Frombork to look after and nurse the sick astronomer. However, due to the interference and pressure of Bishop Dantiscus, under the pretext of protecting moral standards, Anna was forced to leave. When she left Frombork, Copernicus was deprived of this remaining source of comfort, and his life became that of a hermit.

Copernicus was an uncommon, withdrawn and solitary individual. He lived under the obsession of an idea which directed his whole life. Possibly the spell of the heavens, the fascination with the stars and the infinite, the feeling of being an integral part of the universe made up for his lonely way of life.

It is often the fate of a genius to be lonely, estranged, and little understood. Only after death do his thoughts and ideas find the true glory that they deserve.

For many years Copernicus carried on a lively correspondence with a few European astronomers, and at one time sent them manuscript copies of a brief outline of his heliocentric planetary scheme, entitled *Commentariolus.* It is not known exactly when the *Commentariolus* was written; Ludwik A. Birkenmajer speculates that it was between 1507 and 1510, but it was never printed. Only two manuscripts have survived.

In the course of time, the news that in a distant country there lived a scientist working out a new, incredible astronomical theory, began slowly to penetrate Europe.

In 1533 the news reached Rome. Copernicus' theories were presented to Pope Clement VII by his secretary J. A. Widmanstadt, a man of broad education. The Pope received them favorably and rewarded his secretary for bringing this news to him. Recently, in the Munich Library, it was discovered that one of the Greek manuscripts bears an inscription signed by J. A. Widmanstadt: "Pope Clement VII presented this Codex to me as a gift in 1533 in Rome, when I explained to him, in the Vatican gardens, the views of Copernicus on the movement of the earth." Widmanstadt also drew Copernicus' work to the attention of Cardinal Schoenberg of Capua, who on November 1, 1536 wrote the famous letter in which he encouraged Copernicus to publish his findings. The cardinal became his prominent, strong supporter. The bishop of Chełmno, Tiedemann Giese, the best friend he ever had, also urged him strongly to release his work for publication. Yet, he still refrained from doing so.

Copernicus' great work might not have appeared in print had it not been for the intervention of Rheticus, a youthful idealistic humanist, a mathematician and professor from Wittenberg,[12] who was lured to the distant Baltic town by the growing fame of the astronomer. The young scholar, bursting with energy, at once won the confidence and affection of the aging astronomer. He spent two years as a guest in Frombork, studying Copernicus' astronomical work, and was enchanted by his mathematical genius and by the power of his personality. He became Copernicus' most ardent disciple and propagator.

Invigorated by Rheticus' enthusiasm, stimulated by the letters of the learned bishop Tiedemann Giese and Cardinal Schoenberg from the Vatican, Copernicus set about revising and preparing his work for publication. He later placed the letter from Cardinal Schoenberg at the beginning of *De revolutionibus.*

Meanwhile Rheticus, wishing to pave the way for an acceptance of the innovatory Copernican theory, compiled an abstract of Copernicus' treatise and published it in Gdańsk, in 1540, under the title of *Narratio prima de Libris revolutionum.* It was reprinted next year in Basle. He also wrote the first and only contemporary biography of Copernicus. Bishop Giese advised him to append this to the *Narratio* as an introduction, but unfortunately this was not done and the biography has been lost.

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[12] Georg Joachim von Lauchen, called Rheticus, from his birthplace Rhetia in Helvetia, 1514-76.

Copernicus wrote a preface to his book in the form of a moving letter in which he, a Canon, speaks freely to the reigning Pope, "The Most Holy Lord Pope Paul III," Alexander Farnese, one of the greatest men of learning in the history of the Papacy. In this beautiful dedicatory preface, his philosophical and moral credo, Copernicus expressed the hope that science "will inspire to virtue and will fill humanity with still greater admiration for the Creator of the Perfect Order of the Universe."

In 1541 Rheticus left Frombork, taking a copy of the priceless manuscript with him. He made arrangements for its publication with the Nuremberg printer Johannes Petreius, while the supervision and edition of the work was entrusted to Andreas Osiander, the Lutheran theologian and mathematician. Taking advantage of Copernicus' illness, Osiander arbitrarily substituted an anonymous preface of his own, which belittled the importance of the theory stating that the heliocentric system was merely a mathematical hypothesis and aid to calculation of planetary positions. By doing this he probably wished to protect the treatise against attacks and to assure its publication. Wittingly or unwittingly, Osiander rendered a much greater service than he realized for the preservation of the great work. Four hundred years ago his words supplied a camouflage for the explosive substance that the book contained, but it is certain that Copernicus would never have agreed to such a misrepresentation of his theory. He firmly believed he had found the truth — the greatest fulfillment of any mortal.

De revolutionibus orbium coelestium appeared in print in March 1543 when Copernicus, nearing seventy years of age, lay partially paralyzed, stricken with his terminal illness. The publisher, a shrewd businessman, sold the book at the very high price of 26 gold ducats (Italian coins), but did not hasten to send it to the author. A copy of the book arrived in Frombork only in May, just before Copernicus' death. The legend has it that when the book, which was to immortalize his name, was placed in his hands, Copernicus looked at it with clear eyes and a smile of contentment crossed his face. A few hours later Copernicus was dead.

He was buried in Frombork cathedral near the main altar and over his grave an unadorned stone was placed bearing the modest inscription:

NICOLAUS COPERNICUS OBIIT MDXLIII

The exact place of his tomb is not certain, because later the commemorative plaque was removed to make room for a "more important" person—the bishop, and another epitaph was placed for Copernicus on the opposite wall.

Nature conceals God—but not from everyone

Goethe

The Copernican cult did not begin till long after his death. Progress only comes after a hard struggle.

Copernicus' astronomical work shows two well integrated aspects: the empirical exploration of facts and the theoretical, based on speculative reasoning. Added to this should be the intangible—his exceptionally intense intuition, which some prefer to call genius.

It was in this transitional era that the Copernican system of cosmology originated and finally replaced the Ptolemaic. It started a chain reaction. Copernicus' successor, Galileo Galilei (1564-1642), the great Italian astronomer, carried on where Copernicus left off and put his theory on a firm footing. Other scientists such as Kepler (1571-1630), developed further and modified the heliocentric theory, and Newton (1642-1727) formulated the physical laws on which it is based. To Copernicus, however, must go the everlasting credit of this tremendous breakthrough on which the entire structure of modern astronomy is based. His conception dealt with more than the planets and celestial mechanics. By implication it touched on everything, on freedom of thought, on liberation of minds from century-long bondages. It fertilized the minds not only of astronomers and physicists but also of philosophers and humanists, marking the birth of modern science.

It is characteristic that the initial reaction of the Catholic Church, influenced by wisdom or perhaps by the progressive spirit of the Renaissance, or simply from oversight, was not unfavorable to Copernicus' work, and two more editions appeared during the following half century.

But the storm was gathering from the opposite side. The new Copernican vision of the world was violently attacked by the old conservative science and particularly by Protestant theologians, since it was not in line with medieval beliefs and with the interpretation of some passages of Scripture. His adversaries tried to cast ridicule on him and his incredible new theory. Phillip Melanchthon (1497-1560), the German humanist and Reformation leader, wrote: "Our eyes speak against the conception of that Sarmatian (Slavic) astronomer, the Bible speaks against it, therefore it is absurd *(rem tam absurdam)*." Martin Luther (1483-1546) considered Copernicus a madman and referred to him as "the new astrologer, the fool who wishes to reverse the whole art of astronomy!"[13] Also opposing Copernicus later was the Danish

[13] Martin Luther, *Tischreden,* vol. IV, p. 575.

astronomer Tycho de Brahe (1546-1601), an acknowledged authority on astronomy. He firmly believed the earth was at rest yet, he must have been stirred by the new conception since he sent his envoy to Frombork to investigate.

Copernicus' assertion that the earth, as one of the planets, is subject to the same laws as those governing the movements of all other planets is perhaps his most significant single contribution to astronomy. It was an act of great civil courage to put forth such an opinion in a century still believing in the privileged position of Earth and Man.

Through his calculations of the dimensions of the planetary path and the relative distances of the planets, Copernicus was the first to touch, as it were, on the inifinity of the universe.

Copernicus conceived his theory in an epoch which was intellectually not yet ready to accept it, nor was science yet ripe for it. However, in his own Alma Mater in Cracow, his book won numerous supporters and, in 1578 became a subject of instruction. Another university which introduced an optional course on the Copernican theory as early as 1568 was Salamanca in Spain. England, too, reacted with interest to the new Copernican theory.[14] The mathematician, Thomas Smith (1513-77), possessed a copy of *De revolutionibus* in his library, when books were rarities, and his pupil Robert Recorde was one of the first protagonists of Copernican ideas. His works, as well as those of John Dee relating to Copernicus, appeared in 1556. The great philosopher Thomas Hobbes (1588-1679), acknowledged that all enlightened men of his time shared the views of Copernicus on the world structure and maintained that Copernicus achieved much more than he himself thought. The rationalistic and non-conformist climate of English science, as well as a much more liberal reformation movement, in contrast to that of Germany, were probably responsible for this acceptance.

Only after the passionate preachings of the monk Giordano Bruno (1548-1600) and the work of Galileo Galilei, a fervent follower of Copernicus and founder of telescopic astronomy, did the Catholic Church realize the danger and the heretical implications of the new astronomy and decreed to put Copernicus' work in the *Index librorum prohibitorum,* where it remained until ca 1822-1828.

Newly found sources reveal that the reception of Copernican ideas aroused vivid interest in the seventeenth and eighteenth centuries in Poland, especially among scholars and educators. His works were widely distributed, read and interpreted, evoking sharp polemics in Catholic and Protestant, secular and clerical circles.

Yet, it took one hundred and fifty years for *De revolutionibus* to be fully adopted by mathematicians and scholars in Europe and an-

[14] H. Zins, *The Theory of Copernicus in the Epoch of Shakespeare,* Warsaw, 1971.

other few decades before the Copernican solar system was openly taught at Oxford, Sorbonne and Yale.

The book *On the Revolutions of the Heavenly Spheres* had seven printings (not including parts) and has been translated into several languages. It abounds in reflective thoughts, poetic details of beauty and world-historic importance. Goethe called Copernicus "the greatest man of the era." But it has hardly been accessible since a few scattered copies are buried in libraries. As an anniversary project a new edition of the *Complete Works* of Copernicus is being prepared in Poland by the Polish Academy of Sciences, in Latin, English and Polish.

The first volume of the "Jubilee" edition has recently appeared in Warsaw. It contains a color reproduction of the Copernican manuscript of *De revolutionibus* on which he worked for twenty years. The bibliological introduction appears in Latin, English and Polish. It is Copernicus' authentic manuscript, his final working copy containing many corrections, changes, additions and deletions. It shows the author's creative effort and a tremendous amount of his work. There are no printer's marks on the manuscript and it is generally assumed that a special copy was made for Rheticus to hand over to the publisher in Nuremberg. This has not survived to our time. Copernicus, evidently, did not part with his own manuscript.

The story of this manuscript is highly dramatic. We do not even know what title Copernicus gave his work, since the title page is missing. Scholars have long been trying to establish the authentic version of the title. A large group, among them Aleksander Birkenmajer, believe that Copernicus used only the words: *De revolutionibus.* Ryszard Gansiniec stated, on the basis of the evidence left by Rheticus and contemporary scientists, that the original title was: *Revolutionum libri.* Thus, the Polish publishers of the jubilee edition have decided to give a compromise title, which does not change the author's intention: *De revolutionibus.* After his death the manuscript was passed over to Rheticus who, after a brief professorship in Leipzig, lived for many years in Cracow. After the death of Rheticus, the manuscript came into the possession of his pupil W. Otho. In 1603 it became the property of Jacob Christman, professor in Heidelberg and it is he who must have had it bound (J. Zathey). The next holder was the great Bohemian scholar, Jan Amos Komensky (1592-1670), who bought it from Christman's widow. Then, for a certain time it seemed to have vanished, but finally turned up in the private library of Count Nostic in Prague where it lay, almost unnoticed, for 150 years. In 1788 there was a reference to the original manuscript, but only in 1844 was it described in detail, and Jan Baranowski was the first man to go back to the original manuscript in preparing the Polish edition of 1873.

After World War II, Count Nostic's library was nationalized, the manuscript became the property of the State and in 1956, after lengthy negotiations, the Czechoslovak Government handed the manuscript over to Poland. It is at present in the safekeeping of "Rare and precious books" in the Jagellonian Library in Cracow. The recent, exquisite edition of 1971, looks like a manuscript.

No contemporary biography of Copernicus has survived to our time. As to the first biography written by Copernicus' devoted disciple Rheticus, only references in letters exist. In Italy, Bernardino Baldi (1533-1617) in his *Cronica de' Mathematici* (written 1581?) gave a short biography of Copernicus based on personal narratives of Copernicus' contemporaries, but these pages are missing in the only existing copy in the Copernican Museum in Rome. The chapter on Copernicus is only mentioned in the table of contents of the book. Jan Broscius (1585-1652), a professor at Cracow University, was the first serious biographer of Copernicus after Rheticus, in Poland. To collect biographical data, he travelled, tracing Copernicus' steps, and assembled much source material, such as records, writings, portraits and about twenty letters as well as ten books that had belonged to Copernicus with the astronomer's own original notes. He prepared a biography which was, however, never published, and unfortunately all his documentary findings were lost during the Swedish invasion of Poland in 1626. Some of them were rediscovered at the turn of the century by the greatest Polish biographer of Copernicus, Ludwik A. Birkenmajer, in Stockholm and Uppsala. An exhibition of these precious documents will probably be organized by the Swedish museums during the Copernican year.

The greatest legacy that Copernicus left to humanity was his world-shaking book and his achievement in science. But to the people of Poland he means much more. They have the feeling of common heritage and spiritual unity with him.

Copernicus himself is believed to have said, according to Jan Broscius (1618), "Me genuit Thorunia, Cracovia me arte polivit" — "I was born in Toruń, Cracow shaped my mind." His old Alma Mater and Cracow are justly proud that the great scholar of the Renaissance, the great astronomer, received his instruction and first inspiration in the ancient Jagellonian University and that the cultural and intellectual milieu of Cracow not only moulded his mind but also inspired his revolutionary thought. Great thoughts are a derivative of the environment and the heritage of the past. They are a reflection of the epoch in which they arise.

For Poland Copernicus is a symbol of her participation in, and contribution to, the development of world culture, providing the Polish people with a deep feeling of national pride.

Appendix

COPERNICAN "JUBILEE" YEAR 1973
PUBLICATIONS IN POLAND FOR THE QUINGENTENARY

It is expected that scholars of many countries will contribute to and participate in the celebration of the quingentenary of the birth of Nicolaus Copernicus. A special committee of the International Union of the History and Philosophy of Science* has already been set up to initiate and coordinate many of the special events (congresses, symposia, lectures, publications, films etc.) which will take place in Poland and throughout the world. Certain studies are also being undertaken under the aegis of UNESCO.

One of Poland's major contributions to this celebration will be the publication of several series of books, including the *Opera Omnia* or "Complete Works of Nicolaus Copernicus," the *Studia Copernicana* and the *Small Copernican Library.*

The *Opera Omnia* will be the first complete critical edition of the collected works of Copernicus. It is being prepared by the Polish Academy of Sciences and will appear in three volumes, in three language editions: Latin, English and Polish. Volume I, "The Manuscript of Nicolaus Copernicus on the Revolutions," will include a color facsimile of the entire original manuscript, which is now in the Jagellonian Library in Cracow. Volume II, "De Revolutionibus," will include a translation of the text, with critical material and extensive commentaries by Aleksander Birkenmajer and Jerzy Dobrzycki. Volume III, "Scripta Minora", will contain all the remaining authentic works of Copernicus, including such treatises on astronomy as the "Commentariolus" and the "Uppsala Agenda," his writings on economics, more than twenty letters of his correspondents and his Latin translation of the "Letters of Theophilactus Simocatta."

The "Studia Copernicana" is a series of monographic studies, dealing with various aspects of the astronomer's life and work from both the historical and scientific points of view. At least ten volumes are planned in this series, of which Volume I, "Etude d'histoire des sciences et de la philosophie du Moyen Age" by Aleksander Birkenmajer, and Volume

* Comité Nicolas Copernic de l'Union Internationale d'Histoire et de Philosophie des Sciences, 72 Nowy Świat Street, Warsaw, Poland.

II, "Buridanism in Poland in the Pre-Copernican Era" by Mieczysław Markowski as well as "Copernicus and the Heliocentric Theory" by B. Bienkowska have already been published.

The "Small Copernican Library" is a series of popular books, of which six volumes have already appeared. It is being issued under the auspices of the Toruń Scientific Society.

In addition, a series of books dealing with astronomy before and after Copernicus is being prepared by the State Scientific Publishers (PWN), including works by such authors as J. Dobrzycki, W. Iwanowska, A. Stawikowski and others.

Because the Copernican heritage and tradition lives on, Poland has always actively participated in international astronomical studies. The Astronomical Observatory and the University of Toruń which bears the name of Nicolaus Copernicus, carry out extensive research work.

As soon as the war was over in August 1945, the University of Toruń and its professors, transplanted from the sixteenth century University of Wilno in north-east Poland, incorporated in the USSR as the result of World War II, established an Astronomical Observatory and a special study of astronomy using one single telescope, graciously loaned by Professor H. Shapley of Harvard Observatory in the United States.

Today, Toruń has a number of its own telescopes. The astronomers working there concentrate chiefly on problems of spectroscopy relating to stellar spectra.*

The Astronomical Observatory in Toruń devotes its attention mainly to the "exotic stars", such as neutron stars (there are ordinary stars, among which is our Sun, as well as "strange" ones, and the neutron stars recently discovered), investigating their chemical composition and motion by studying their spectra.

Radio-astronomy was introduced at the Observatory in 1957. This new branch of astronomy, developed in the years of the last war, is devoted to the study of radio waves emitted by celestial bodies. The radio astronomers working in Toruń concentrate on the investigation of solar electromagnetic radiation. Their work will be presented to the international Congress which will be held during the Copernican Year in Toruń. It is expected that nearly one thousand astronomers from all over the world will attend.

There is wide co-operation in astronomy involving all countries and continents. Human passion for learning and discovery is the powerful bond.

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* Wilhelmina Iwanowska, Head of the Astronomical Observatory, *The Copernican Tradition,* Toruń, 1969.

While the principal celebrations will be held in Poland, many other centers of learning have indicated that they will participate in commemorating the anniversary of Nicolaus Copernicus.

Strong ties of friendship unite the University of Toruń with the illustrious Italian universities where Copernicus studied. The University of Ferrara and Toruń are bound by ties of the so-called "twin universities" *(gemellaggio).* The Rector of the University of Ferrara has written that his university is "proud of the fact that Nicolaus Copernicus studied there. The significance of Copernicus' ideas and thoughts on our Galileo's work in the evolution of modern knowledge is worthy of immortal glory".

Copernicus' Alma Mater of Bologna cultivates the memory of its great pupil whose name will be linked for all times with one of the most important of intellectual revolutions. A marble sculpture of Copernicus stands next to Dante Alighieri at the entrance of the Great Hall of the University of Bologna. The two statues standing side by side, constitute a deep and most sincere homage to the great son of Poland.

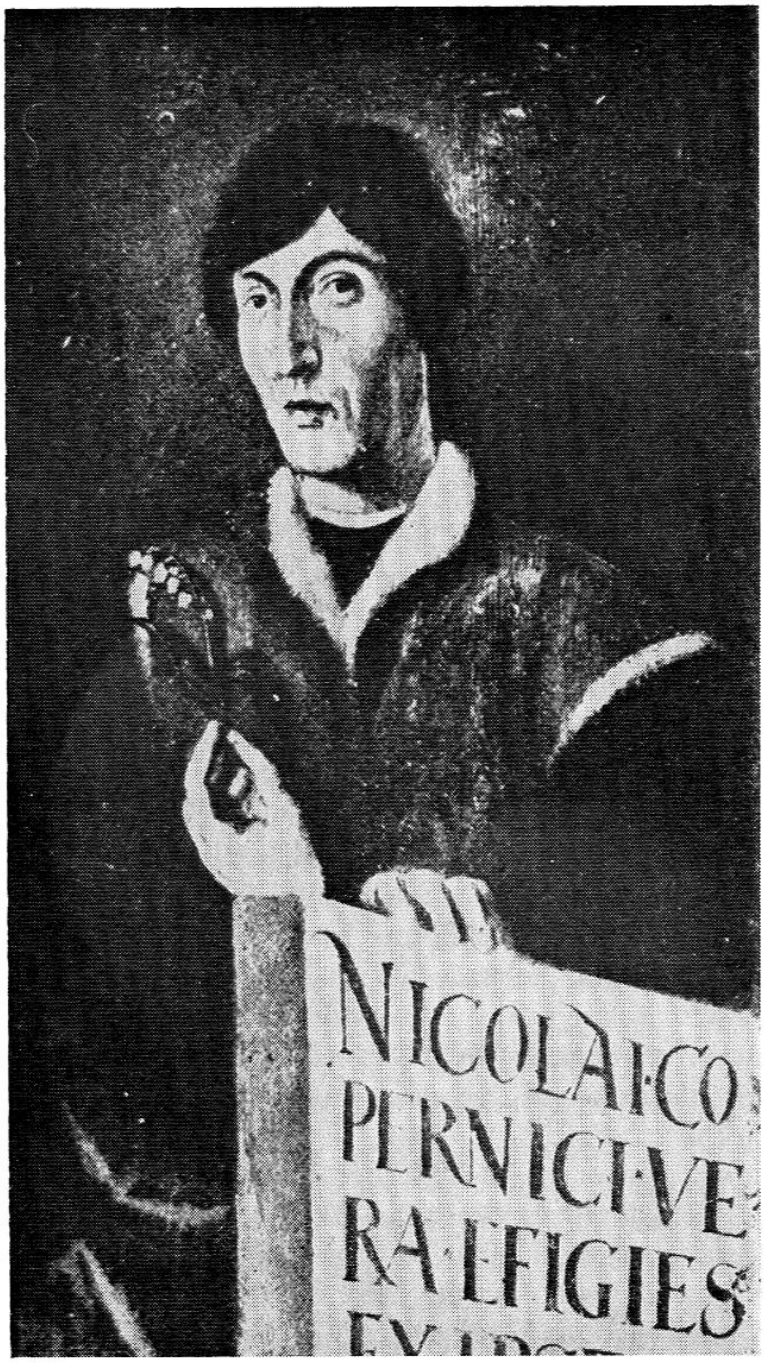
In Rome, Il Museo Copernicano di Monte Mario, the ancient La Sapienza, is preparing for the Jubilee Year under the direction of Professor Massimo Cimino, head of the Astronomical Observatory and Director of the Copernican Museum.

Plans have been completed for statues or memorial plaques, dedicated to Copernicus, to be erected or set in the walls of Italian universities where he studied or lectured.

In the United States and in Canada committees for the Copernican celebrations were formed and study projects are in progress in scientific centers as well as in the Polish community.

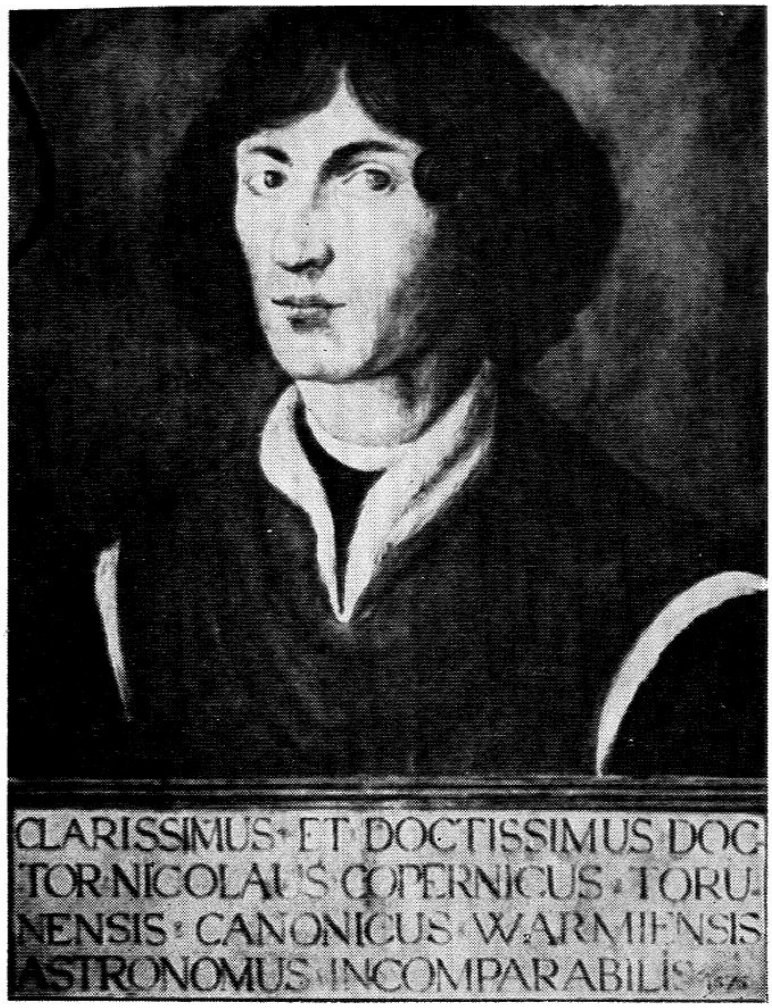
South American countries, Argentina, Chile, Venezuela and Mexico have announced their participation and are preparing translations of Copernicus' work into Spanish.

A celebration will be held under the auspices of UNESCO which will proclaim the year 1973 as the Copernicus Year. Poland has presented the Secretary General of the United Nations with a sculpture of the head of Copernicus cut in granite by the artist Alfons Karny, to stand in the Hall of the United Nations Headquarters. In his thanks, the Secretary General said that "all members of the United Nations family draw their inspiration from the works and discoveries of Copernicus. Thus, one sees in him the co-creator of present-day achievements in outer space."

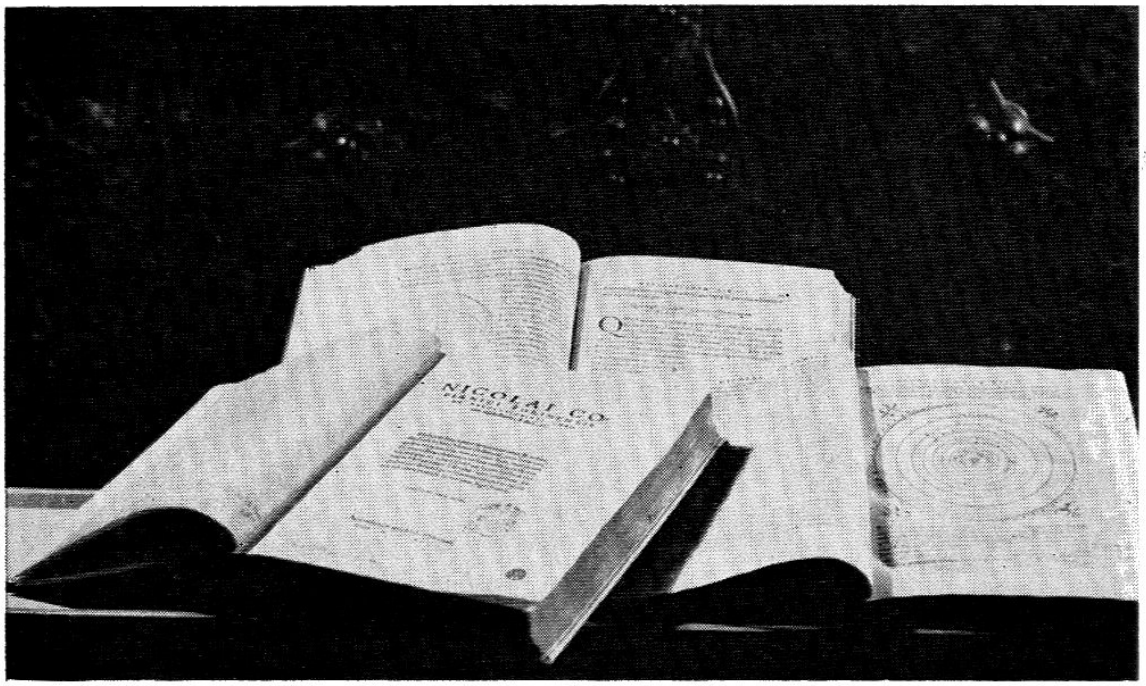


15. Self-portrait of Copernicus, holding a flower, the emblem of the medical profession. It was reproduced on the clock tower of the cathedral in Strassburg in Alsace. This is the only existing copy as the original has been lost.

16. Stamp issued in Poland for the Copernican Jubilee, his portrait and the Gothic house where he was born.



17. Portrait of Nicolaus Copernicus, 1675, from the Collection of the Museum of the Jagellonian University in Cracow.



18. The oldest editions of Copernicus' De Revolutionibus *(Nuremberg, 1543; Basle, 1566; and Amsterdam, 1617). Municipal Library, Torun.*

19. Epitaph of Nicolaus Copernicus at the church of St. John in Torun where Copernicus studied in the Cathedral School—the oldest evidence of recognition erected in 1580 by the burghers of Torun.

20. The statue of Nicolaus Copernicus by the great nineteenth century Danish sculptor, Bertel Thorwaldsen, stands in Warsaw. A similar copy was erected in Montreal for Expo 1967, by the Polish community of Canada and another one is being raised in Chicago in time for the five-hundredth anniversary of Copernicus' birth in 1973.

SELECTED BIBLIOGRAPHY

I. TEXTS

The original manuscript of Copernicus' *De revolutionibus* is in the Jagellonian Library in Cracow

Nicolai Copernici Torinensis *De revolutionibus orbium coelestium,* Libri VI, Norimbergae, apud Joh. Petreium, 1543 (1st edition),
Basle, 1566.
Amsterdam, 1617.
Warsaw, 1854 (containing a Polish translation by Jan Baranowski). These editions were superseded by M. Curtze, Leipzig, 1878, (Collection)
Toruń, 1873 (based on Baranowski's critical study of the original manuscript), 1944 facsimile, Karol Zeller, Osnabrück.
Warsaw, 1953, Book I, (critical edition by R. Gansiniec [Ganszyniec], translated into Polish by M. Brożek, comment by Aleksander Birkenmajer).
Warsaw, 1971, the first volume of the jubilee edition of the complete works in Latin, English and Polish languages. It contains a color reproduction of the authentic Copernican manuscript and a bibliological introduction and commentary by J. Zathey.

Consecutive volumes to appear during 1972-3.

There are eighty-two known copies of the first edition: sixty-five in Europe, sixteen in the United States (one in the New York Public Library) and one in Canada in the Osler Library at McGill University, Montreal.

Translations:

English: 1. Digges, (Thomas). *A Perfit Description of the Caelestiall Orbes according to the most anciente doctrine of the Pythagoreans, latelye reniued by Copernicus etc.* (Based on Book I of Copernicus, *De revolutionibus Orbium Coelestium,* 1576.
There were probably at least seven editions of this work before 1605.

2. Shapley-Howarth, H. *A Source Book in Astronomy,* New York, 1929 (fragments only).

3. Dobson, J. F., assisted by S. Brodetsky: Introduction and Book I in: *Occasional Notes,* Royal Astronomical Society, Vol. 2, no. 10, London, 1947; 2nd ed., London, 1955.

4. Rosen, Edward, *Three Copernican Treatises,* New York 1939, includes the work of: Rheticus, G. Joachimus, *De libris revolutionum narratio prima,* Danzig, 1540; 2nd ed., Dover, 1959.

French: Koyre, A: *Des révolutions des orbes celestes* (12 chapters), Paris, 1934. Facsimile, M.Y. Herman, Paris, 1927.

German: Menzer, C. L.: *Über die Kreisbewegungen der Weltkörper,* Thorn, 1879.

Other works of Copernicus, published in Poland for the jubilee:

1. *Nicolai Copernici, Locationes mansorum desertorum,* edited by Marian Biskup, Olsztyn, 1970. (Copernicus' manuscript, first time published in full).

2. *Copernicus' letter from the Warmian Chapter in Olsztyn to the Polish king Zygmunt I, of November 16, 1520.* Edited by Marian Biskup, Olsztyn, 1970. Translated from the Latin manuscript. Summaries in English, French, German and Russian in both works.

II. BIBLIOGRAPHIES

Baranowski, Henryk, *Bibliografia Kopernikowska 1509-1955.* Warsaw, 1958, 1969. [repr. 1969 — Franklin Burt, New York]

Bibliografia Nauki Polskiej — Odrodzenie. Warsaw, 1954.

Bibliografia Literatury Polskiej — Nowy Korbut. "Piśmiennictwo Staropolskie", V. 2, pp. 384-388, Polish Academy of Sciences, Warsaw, 1964.

Encyclopedia Britannica: "Astronomy (History of Astronomy)" and Index references to Copernicus, Chicago, 1964.

Dobrzycki, J.; Hajdukiewicz, L; "Mikołaj Kopernik" (in) *Polski Słownik Biograficzny,* Vol. XIV, 60, Wrocław, 1968.

III. WORKS IN POLISH

1. Banfi, A., *Kopernik a kultura włoska,* Warsaw, 1953.
2. Barycz, Henryk, "Czy Mikołaj Kopernik był doktorem filozofii Uniwersytetu Padewskiego?" *Przegląd Humanistyczny,* no. 1, 1964.
   Dzieje nauki w Polsce w epoce Odrodzenia, Warsaw, 1957.
   "Mikołaj Kopernik w dziejach narodu i kultury polskiej." *Przegląd Zachodni,* no. 11-12, Poznań, 1953.
   Posłowie do książki Hermann Kesten: *M. Kopernik i jego czasy,* Warsaw, 1961.
   Mikołaj Kopernik, wielki uczony Odrodzenia, Warsaw, 1953.
3. Batowski, Z., *Wizerunki Kopernika,* Toruń, 1933.
4. Bieńkowska, Barbara, *Kopernik i heliocentryzm.* Warsaw, Ossolineum, 1971.
5. Birkenmajer, Ludwik, *Kopernik jako filozof.* Studia i Materiały nauki polskiej, Seria C, Warsaw, 1963.
   Mikolaj Kopernik. Studia nad pracami oraz materiały biograficzne. I, Cracow, 1900.
   Mikołaj Kopernik — uczony, twórca i obywatel. Cracow, P.A.U., 1923.
   Stromata Copernicana. Cracow, 1924.
6. Biskup, Marian, *Działalność publiczna Mikołaja Kopernika,* Toruń, TNT, 1971.
   "Doktora Mikołaja portret prawdziwy", *Przekrój,* no. 1341-43, Cracow, 1970.
   Mikołaja Kopernika lokacje łanów opuszczonych, Olsztyn, 1970.
   List Kapituły Warmińskiej do króla Zygmunta I, napisany własnoręcznie przez Mikołaja Kopernika w Olsztynie, 1520 r. Olsztyn, 1970.
7. Brückner, Aleksander, *Historia kultury polskiej,* 3 ed. (1st ed. 1930) Warsaw, 1958.
8. Cackowski, Stefan, *Mikołaj Kopernik jako ekonomista,* Toruń, TNT, 1970.
9. Cohen, J. B., *Od Kopernika do Newtona. Narodziny nowej fizyki,* Warsaw, 1964.
10. Gansiniec, Ryszard, "Rzymska profesura Kopernika," *Kwartalnik Nauki i Techniki,* Warsaw, 1957.
11. Górski, Karol, *Dom i środowisko rodzinne Mikołaja Kopernika,* Toruń, TNT, 1968.

12. Gutt, Romuald, "Medycyna za czasów Kopernika," *Problemy,* wrzesień, 1971.
13. Hahn, Wiktor, "Kopernik w poezji polskiej" w *Księdze zbiorowej Mikołaja Kopernika,* Lwów, 1924.
14. Hurwiec, Józef, *Mikołaj Kopernik, szkice monograficzne,* Warsaw, 1965.
15. Infeld, Leopold, *Od Kopernika do Einsteina,* Warsaw, 1965.
16. Ingarden, Roman, *Mikołaj Kopernik i zagadnienia obiektywności praw naukowych,* Warsaw, 1953.
17. Jarzębowski, L., *Biblioteka Mikołaja Kopernika,* PWN, 1971.
18. Kisielewski, Janusz, "Prawo Kopernika-Greshama w świetle badań numizmatycznych w ostatnim dziesięcioleciu" *Komunikaty Mazursko-Warmińskie,* no. 2, Olsztyn, 1969.
19. Leśnodorski, Bogusław, *Dominium Warmińskie,* Poznań, 1949.
Mikołaj Kopernik — szkice monograficzne, PWN, 1971.
Społeczne i filozoficzne podstawy pracy naukowej M. Kopernika, Warsaw, 1953.
20. Lipiński, Edward, *Poglądy ekonomiczne Mikołaja Kopernika,* Warsaw, 1955.
21. Lipko, S., *Kopernikanizm w szkołach polskich XVIII wieku,* Olsztyn, "Komentarze fromborskie," 1965.
22. Markowski, Mieczysław, *Burydanizm w Polsce w okresie przedkopernikowskim,* Wrocław, 1971.
23. Mosko, E., "O nazwie miejscowej Kopernik i nazwisku Toruńczyka." *Poradnik językowy,* 1962.
24. Nadolski, B., "Walka o myśl Kopernika i jej losy w Polsce," *Wkład Polaków do nauki,* Warsaw, 1967.
25. Nowicki, Andrzej, *Kopernik, człowiek Odrodzenia,* Warsaw, 1953.
26. Obłąk, Jan, Bp., *Historia diecezji Warmińskiej,* Olsztyn, 1959.
27. Pagaczewski, Janusz, "Obserwatorium M. Kopernika w Olsztynie." *Problemy,* no. 2, Warsaw, 1967.
28. Polkowski, Ignacy, *Żywot Mikołaja Kopernika,* Gniezno, 1873. [The first good biography of Kopernik in the Polish language.]
29. Polska Akademia Nauk, *Sesja kopernikowska, 15-16. IX, 1953.* Warsaw, 1955.
30. Przypkowski, Tadeusz, *Dzieje myśli kopernikowskiej,* Warsaw, 1954.
"Z dziejów heliocentryzmu w Polsce," *Myśl filozificzne,* no. 1, 1953.
31. Rospond, Stanisław, *Nazwiska Ślązaków,* Opole, 1960.

32. Rybka, Eugeniusz i Przemysław, *Mikołaj Kopernik i jego nauka,* Warsaw, 1953.
33. Rybka, Eugeniusz, "Studia M. Kopernika w Krakowie." *Problemy,* RSW, Warsaw, 1970.
34. Sikorski, Jerzy, *Mikołaj Kopernik na Warmii. Chronologia życia i działalności,* Olsztyn, 1968.
35. Śniadecki, Jan, *O Koperniku.* (1802) Opracowała M. Chamcowa, Wrocław, Ossolineum, 1955.
36. Tworkowski, Leonard, *Ziemia i niebo,* Olsztyn, 1971.
37. Voisé, W., *Mikołaj Kopernik. Dzieje jednego odkrycia.* Tow. Naukowe, Toruń, 1970.
38. Wasiutyński, Jeremi, *Kopernik twórca nowego nieba,* Warsaw, 1938.
39. *Zbiorowa Księga: Mikołaj Kopernik,* Lwów, 1924. (includes F. Bujak, "Traktat Kopernika o monecie.")
40. Zins, Henryk, "Kapituła fromborska w czasach M. Kopernika," *Komunikaty Mazursko-Warmińskie,* no. 4, 1959.
W kręgu Mikołaja Kopernika, Lublin, 1966.
"Teoria Kopernika w epoce Szekspira," *Problemy,* no. 6, Warsaw, 1971.
41. Zonn, Włodzimierz, *Świat widziany oczyma Kopernika,* Warsaw, Arkady, 1972.
42. *Źródłoznawcze studia, Commentationes,* Vol. XV, PWN, 1971, Warsaw: A. Birkenmajer, "Trygonometria M. Kopernika w autografie głównego jego dzieła. Analiza bibliograficzna traktatu De Revolutionibus. (Rozdział I)" pp. 1-70.

IV. WORKS IN OTHER LANGUAGES

1. "The Unknown Copernicus," *Poland,* pp. 21-25, no. I, 1964. no. I, 1964.
2. Armitage, Angus, *Copernicus the Founder of Modern Astronomy,* London, 1938, New York, 1957.
Sun, stand thou still: Life and Work of Copernicus, New York, 1947.
3. Berlstein, Alfred, "Nicholas Copernicus." *The Polish Review,* vol. X, no. 2, 1965.
4. Birkenmajer, Aleksander, *Etudes d'histoire des sciences et de la philosophie du Moyen-âge,* Cracow, 1970.
5. Boas, M., *The Scientific Renaissance,* New York, Harper Brothers, n.d.

6. Czynski, Jan, *Copernicus Nicolaus. Kopernik et ses travaux,* Paris, 1847.
7. Douglas, A. Vibert, "Copernicus. 1473-1543." *Queen's Quarterly,* vol. I, no. 2, 1943.
8. Heath, Sir T. L., *Aristarchus of Samos, the Ancient Copernicus,* Oxford, 1913.
9. Kesten, Herman, *Copernicus and His World.* New York-London, 1945. [Polish transl., Warsaw, 1961.]
10. Kucharzyk, H., "The First Disciples of Copernicus in England." *Polish Science and Learning,* London, 1945.
11. Knight, David C., *Copernicus; Titan of Modern Astronomy,* New York, 1965.
12. Koyre, Alexandre, *La révolution astronomique: Copernic, Kepler, Borelli,* Paris, 1961.
13. Lipiński, Edward, *De Copernic à Stanisław Leszczyński,* Paris-Warsaw, 1961
14. Mizwa, Stephen, ed., *Great Men and Women of Poland,* New York, 1941, pp. 37-50.
Nicholas Copernicus. A Tribute of Nations, New York, The Kościuszko Foundation, 1945.
The Life Story of Copernicus, New York, The Kościuszko Foundation, 1943.
15. Prowe, Leopold F., *Nicolaus Copernicus,* 2 vol. Berlin, 1883-1884; 2nd ed. Osnabrück, 1967.
Kopernikus als Arzt, Halle, 1881.
16. Ravetz, Jerome R., *Astronomy and Cosmology in the Achievement of Nicholaus Copernicus,* Wrocław, 1965.
17. Rosen, Edward, "Copernicus Was Not a Priest." *Proceedings of the American Philosophical Society,* vol. 104, no. 6, Philadelphia, 1960.
Three Copernican Treatises, New York, 1939.
18. Rybka, Eugene, *Copernican Thought and the Jagellonian University,* Warsaw, 1963.
Four Hundred Years of the Copernican Heritage, Cracow, 1964.
19. Santillana G. de, *The Crime of Galileo,* (2nd ed.), New York, 1962.
20. Schmeidler, Felix, *Nicolaus Kopernikus,* Stuttgart, 1970.
21. Silverberg, Robert, *Four Men Who Changed the Universe,* Putnam, 1968, pp. 64-99.
22. Stimson, D., *The Gradual Acceptance of the Copernican Theory of the Universe,* New York, 1917.

23. Taylor, J., "Copernicus on the Evils of Inflation and the Establishment of a Sound Currency." repr. from *Journal of History of Ideas,* October, 1955.
24. Thomas, Henry, *Copernicus,* New York, 1960.
25. Trattner, Ernest R., *The Story of the World's Great Thinkers,* New York, 1938, pp. 11-45.
26. Wędkiewicz, Stanisław, "Copernic et la Pologne," *Bulletin de l'Academie Polonaise des Sciences et des Lettres.* Etudes Copernicienne, Paris, 1955-57, no. 13-16.
27. Westphal, Johan H., *Nicolaus Copernicus.* Konstanz, 1822.
28. Ziffer, Bernard, "Gresham or Copernicus?", *The Polish Review,* vol. II, no. 2-3, pp. 71-77.
29. Zinner, E., *Entstehung und Ausarbeitung der Copernicanischen Lehre.* Erlangen, 1943.
30. Colloquia Copernicana. Vol. I. Ed. J. Dobrzycki, Wrocław Ossolineum, 1972.
31. Neugebauer O., On the Planetary theory of Copernicus, Vistas in Astronomy, Vol. 10 (1968), Pergamon Press, Great Britain.

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Founded in 1942 and since its inception enjoying the hospitality of McGill University in Montreal, it aims to promote Polish culture, scholarly research and knowledge of Poland in Canada, as well as to increase contacts between Canadian and Polish scholars, writers, and artists. Membership in the Branch in 1972 reached 158. In addition to the headquarters in Montreal Chapters exist in Ottawa and Toronto.

It organizes study groups on current problems, public lectures, conferences, exhibitions, concerts and competitions in the arts and the sciences. It advises the Canadian Polish organizations upon scholarly matters. It is now preparing to organize the third Congress of scholars of Polish origin in North America, the two previous ones having been held at Columbia University, New York City, in 1967 and 1971.

The Polish Library of the Canadian Branch is a specialized research library in the humanities and social sciences of East Central Europe, containing a collection of over 20,000 volumes. A Reading Room is supplied with encyclopedias, bibliographies, and books of basic source material. This Room is likewise a social and educational meeting place which, among others, is visited by many newcomers from Poland. There is also a Periodical Room with several hundred periodicals from Poland and all centers of Polish emigration. The services of a public lending library are maintained for the use by the entire Polish community. The number of borrowers, growing steadily, has now reached 600, and its annual circulation is approximately 15,000 books.

The author of the monograph Wanda M. Stachiewicz is the chief librarian of the Polish Library at McGill University in Montreal which she organized in 1946 and has directed since. She holds degrees and diplomas from Lwów University in Poland and from the University of the Sorbonne in Paris as well as from Library Science at McGill University in Montreal. She has lectured on Polish culture at McGill University and other Canadian Colleges. She is the author of monographs and articles in English on the history of civilization. Residing in Montreal, she is very active in Polish-Canadian cultural affairs, a member of P.I.A.S., C.L.A., Q.L.Ass., etc.

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