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JOSEPH BOSCOVICH IN ROMANIA

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There is really very little evidence of our country's interests in the field of astronomy that has survived to this day. And it is for this reason that certain events, such as the discovery of the calendar-sanctuary (one of the oldest in the world) at Grădiştea Muncelului in the heart of the country, or the famous book "Liber de Paschal" by Dionysius Exiguus (Dionysius the Little or Dionysius the Scythian, a native of Dobruja) dating back to 528 A.D. assume great importance in the history of astronomy in Romania.

In the period from the beginning of the 16th to the end of the 17th century, the political and geographic situation of the Transylvania region (well protected by the Carpathian Mountains) allowed the carrying on of some of the first truly astronomical activities in this part of the world. At this point we must mention the building of Romania's first astronomical observatory in the period between 1445 and 1465 at Oradea by Bishop Ioan Vitez, even before that of Tycho Brahe's observatory. Special mention must also be made of the famous volume "Rudimenta Cosmographica", published in Brasov by Johannes Grass (Honterus) a century later, in 1548, to be exact. The twenty-six editions of this work were widely diffused, above all in Germany, and led to the development of this science in Romania as well. The first notions of rockets and space flight were recorded in a document published in Sibiu by Conrad Haas (1509-1579). The following centuries saw the publication of many scientific works, most of which of great importance.

Starting from the first half of the 18th century, research in the

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field of astronomy began to develop on the other side of the Carpathians as well. It was thus in that period that the first rays of the light of science began to illuminate Eastern Romania. The special merit of having kept alive the flame of knowledge must go to the Walachian Prince Constantin Brâncoveanu who succeeded in sending some young Romanians abroad to study in the finest European universities. It suffices to mention Hrisant Notary (Chrisantie or Chrisandos Notaras) who became the disciple of Giovanni Domenico Cassini, the first director of the Paris Observatory. Before returning home, Notaras visited Padua, Constantinopolis and Moscow. The future patriarch of Jerusalem was also the author of an important "Trattato di astronomia" ("Treatise on Astronomy") where for the first time appear the coordinates of two Romanian cities, Bucharest and Tîrgoviṣte. It also appears that in his catalogue another 236 localities are mentioned. Keeping in mind the instruments and methods in use at the time, it is quite likely that he found this information in "Connaissance des Temps" (which, starting from 1679, has been published every year). However, the discovery of who determined the coordinates of these Romanian localities remains a mystery.

Only forty-six years after the appearance of Chrisantie Notaras' volume, one of the most important astronomers of the time, the Jesuit Joseph Boscovich, arrived in our country through Moldavia and Dobruja. Information on his travels in Romania is to be found in the "Diary of a Journey from Constantinopolis to Poland (entitled in German "Reise von Constantinopoli durch Rumänien, Bulgarien und die Moldau nach Lemberg in Pohlen"). The book, containing 323 pages, was printed in Lausanne some ten years later (in 1772) and contains a detailed description of the journey, which lasted from 24th May 1762 to 15th July of the same year.

The English ambassador Porter was leaving Constantinopolis after

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a sojourn there of well over 14 years. Among the many people accompanying him, we also find the illustrious Jesuit Joseph Boscovich: scientist, mathematician, physicist and astronomer.

On 23rd June the travellers arrived at Galati in Moldavia after passing through Bulgaria and the Dobruja region. Because of the torrential rains that regularly flood vast areas in that month, the level of the Danube was particularly high and the banks were completely under water. The ambassador and his entourage were welcomed by a special commissar of the Prince of Moldavia and lodged at the monastery of Saint Mary which, "per quanto fosse piccola, rispetto alle nostre case dell'Italia, essa ci apparve magnifica, a confronto delle case, più precisamente dei tuguri, dove abbiamo abitato in Bulgaria. Il monastero aveva parecchie camere dalle finestre piccole, alcune delle quali erano fornite di vetri e altre di cuoi sottili o di membrane fatte di vescica o di membrana intestinale, per sostituire il vetro delle finestre."(1)

The unending rain forced the travellers to spend a few days in Galati. Boscovich the astronomer took advantage of this to make some astronomical measurements of great importance to the Romanians, since they were the first determinations whose author, as well as the method and instruments by which they were made, are known with certainty. Here is what Boscovich himself had to say: "Nel corso del nostro soggiorno a Galati, ho provato di determinare la latitudine e la longitudine di questo porto, che è una delle principali città commerciali del paese. Non avevo che un quarto di cerchio con riflessione di un piede e mezzo con il quale si può facilmente determinare l'altezza del sole sul mare dove l'orizzonte è ben determinato, ma che non può essere utile nei posti dove le irregolarità del terreno impediscono la determinazione dell'orizzonte, a meno che non si ricorra alla riflessione nell'acqua, riunendo le due immagini del sole nell'acqua e nello spec-

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chio dello strumento. Questo modo di lavorare è molto difficoltoso per la correzione del quarto di cerchio, allorquando l'altezza del sole è superiore ai 45 gradi, proprio come adesso. Ho utilizzato dunque la superficie del Danubio, che non era abbastanza larga in questo posto verso mezzogiorno, per determinare l'orizzonte, benchè mi fossi tanto chinato verso l'acqua, al punto da sfiorarne la superficie con la parte inferiore dello strumento."(2)

Following some calculations, on 27th June 1762, the astronomer found the latitude of 45 degrees and slightly more than 20 minutes. On the following day he found 45 degrees and slightly less than 24 minutes, which allowed him to establish for that locality a latitude of 45 degrees, 23 minutes. For longitude determination, Boscovich measured the various distances between sun and moon after having set a clock that counted the seconds by means of the sun's height determined by means of its reflection in the water. However, he was not able to arrive at the result desired with satisfactory accuracy: first of all he should have had a good determination of the position of the moon on the same day in a town he had a good knowledge of. Boscovich decided it was best not to trust only the theory of the moon which, although it has been greatly improved by modern surveyors and astronomers, at that time still lacked the necessary precision.

Some days later, Ambassador Porter and his entourage left Galati and, by way of Bîrlad and Vaslui, arrived in Iaşi on 3rd July. During the journey they were met by M. De la Roche, secretary to Grigore Calimachi, Prince of Moldavia, who awaited them at Frumoasa, the residence so accurately described by Boscovich. Near the palace "interamente ammobiliato", even though the princes who had built it no longer lived there, was the beautiful lake the astronomer used in determining the coordinates of the place. But the lake was not large enough to give him, by means of its curvature, the surface of the horizon, and

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it was thus necessary to do some calculations: he measured one end of the dam and used the length of the lake as the base. On 6th July he found the latitude of 47 degrees, 9 minutes; at the centre of Iasi it was almost one minute more than the latitude of Frumoasa, that is, 47 degrees, 10 minutes. Two observations of the moon at its passage at the meridian (5th and 6th July) gave him a different result: 47 degrees, 12 minutes, which Boscovich himself considered better, since this time he had observed the moon both directly and by its reflection on the lake.

On the same day that Ambassador Porter was lodged at Frumoasa, the special envoy of the Sultan arrived at Iasi to consecrate Grigore Calimachi. Two days later, Boscovich was received by the prince in a special audience, to which he was taken by carriage. The conversation took place in the presence of M. De la Roche and a Greek boyar he had met the day before. Besides the prince, the prince's brother was also present, and both showed great interest in the instruments the astronomer had brought with him. There was a three-foot telescope recently designed by the famous English optician John Dollond (1706-1760), with a double objective made up of two different kinds of glass, at the extremity of which could be mounted an instrument containing a small, mobile metal mirror, which Boscovich had constructed in London, by means of which the image of the Sun could be projected onto a wall in a camera obscura for the observation of sunspots and eclipses. This was the instrument he had set up in Venice the year before to observe Venus, but with no success because of cloudiness.

The interest and the intelligence the two brothers showed were in part the merit of the lessons they had received in childhood from M. De la Roche, who asked Boscovich to explain the use of the camera obscura the prince had ordered from Italy. During the meeting they spoke at length of the passage of Venus and how best to exploit the

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observations that had been carried out. Many other problems of astronomy, physics and other subjects were discussed. The prince was able to understand Boscovich even without an interpreter, although he posed his questions in Greek. The conversation went on till late at night and, on parting, the prince showed him great kindness, adding that he would be pleased to have him in his capital for five or six months. After thanking him, Boscovich returned to Rome where he again placed himself at the orders of his superiors.

These are some of the notes that the great Italian astronomer made on his visit to our country and the observations he made here.

Translation of passages cited in the original Italian

(1) "although small compared with our dwellings in Italy, it appeared magnificent to us after the houses, or rather hovels, in which we had lived in Bulgaria. The monastery had many rooms with small windows, some with glass, others with thin leather or membranes made from bladders or intestines as a substitute for glass."

(2) "During our sojourn at Galati, I tried to determine the latitude and longitude of this port, which is one of the most important commercial towns of the country. I had but a quarter circle with reflection of a foot and a half, with which the height of the Sun can easily be found over the sea, where the horizon is well determined, but of no use in places where irregularities of the land hinder determination of the horizon, unless one uses reflection in the water, bringing together the two images of the Sun, one in the water and the other in the instrument's mirror. This technique is quite difficult due to the correction of the quarter circle when the height of the Sun is above than 45 degrees, as is now the

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case. I used the surface of the Danube, which was not wide enough here for the determination of the horizon at noon, even though I bent so far over the water as to skim its surface with the lower part of the instrument."

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