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Kirik the Novgorodian – a mathematician of the Early Renaissance

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Abstract. The contribution of Kirik the Novgorodian (XII century) to the development of mathematical chronology is considered.

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1. Main section

The French scientist Jean Delumeau recently wrote that the Early Renaissance was due to the emergence of powerful creative energy among the Italians at the turn of the 10th and 11th centuries, with its subsequent spread throughout Europe. He singled out as a feature of the Renaissance that "mathematics creates the fabric of the universe" [1], that is, it acts as a kind of organizing-constructive basis. As a result of the beneficial influence of the Renaissance, an educational system was developed with two levels – the initial trivium and the final quadrivium. Trivium contained three educational subjects of a humanitarian nature: grammar, rhetoric and dialectics. Quadrivium had subjects of mathematical content: arithmetic, geometry and astronomy (or astrology). The fourth subject was music, which was understood not only as an art object, but also mathematics - in accordance with ancient ideas: "Democritus, watching the playing of musical instruments, found that the pitch of the sounding string varies depending on its length. Based on this, he determined that the intervals of the musical scale can be expressed by the ratios of the simplest integers" [2]. Hence, a person who received higher education in the Renaissance had to know mathematics at the level of his time.

Modern university training divides specialists into two parts - the humanities, who practically remain outside the higher mathematical knowledge, and "technicians", whose preparation is to some extent based on mathematics. On the need to return to the mathematization of secondary and higher education, modern administrative structures can be treated, at best, as an inappropriate joke. Meanwhile, it can happen. Recently there has been activity of scholars in the humanities in the study of the calendar-mathematical knowledge of Rus, especially the work of Kirik the Novgorodian (1110 - after 1156/1158), the monk of the Novgorod Antoniev monastery [3]. It shows that the educational system and science in Rus was developing in the way of mathematization. This activity of scholars of the humanities is consistent with the astrological forecast that by 2020 the world expects "triumph of intellect" [4], and, hence, the growing role of mathematics in teaching and science.

Ancient Russian scientist and religious figure Kirik the Novgorodian in 2010 was 900 years old. Apparently, there is not a single medieval scientist, who can be considered with great justification the forerunner of the scientific approach to chronology. Absolutely undeservedly his name is almost unknown to the general public. In the treatise "Uchenie im zhe vedati cheloveku chisla vsekh let" (1136), Kirik mathematically studied the cyclicity of time [5]. Originally, historians could not only fairly assess, but mathematically express and correctly interpret Kirik's calculations [5] et al. In the mid of the 19th century the correct estimation of Kirik's creative works was given by a prominent mathematician and academician V.Ya. Bunyakovsky. He noted uniqueness and accuracy of calculations by Kirik [6]. However, historians of science have not yet found an adequate evaluation of the mathematical component of Kirik's creative work, which was transferred to the state of Old Russian mathematics as a whole, as insufficiently developed [6] et al. The situation changed when the sufficient accuracy of the numerical calculations of Kirik was again established - after the prototypical publication of the "Teaching" by Kirik in the Pogodinsky list of the 16th century [7] et al.

For the correct understanding of the role of Kirik in the scientific knowledge of the nature of time, the value of the research context, this characterizes him as an outstanding mathematician [9]. In this connection, the special role is played by the fact that Kirik applied his outstanding mathematical abilities and knowledge in the "Teaching" to the complex task of scientific generalization of data on time as a phenomenon of chronology. (Kirik also belongs to the theological "Questioning" (mid-12th century), more widely known in historiography, which is not considered in this article).

The content of Kirik's "Teaching", which is associated with the terms of the Christian Julian calendar. In the first five paragraphs of it tells about the unit of account time – year, month, week, day, and hour. They interpreted the settlement and chronologically: computational and didactic display of how to know their number "since then (i.e. since the Creation of the Universe, by Kirik "since Adam" – the author's note) to date 6644 of the year", which corresponds to 1136 BC. The concept odds with modern, equal to 60 minutes. In the "Teaching" Kirik uses a variable hour is equal to 1/12 of daylight (day) and a separate 1/12 night of the same day.

The following 15 sections of the "Teaching" deal with the calendar concepts: the indicator (the 15-year cycle), the solar circle (the 28-year cycle), the lunar circle (the 19-year cycle), the "centuries of the world" (millennial cycle) (80-year cycle), the "renewal of the earth" (40-year cycle), the "renewal of the sea" (60-year cycle), "the renewal of the waters" (70-year cycle), leap years, "about the great circle" (a cycle of 532 years), a year consisting of 12 "calendar" months (i.e., a solar year), and a year that counts 12 "celestial lunar months" and 11 days (i.e., a year of lunisolar calendar).

Kirik's "Teaching" is a scientific treatise on the mathematical study of the cycles of the Christian Julian calendar, used in the state and church practice of Russia in the 12th century. (The beginning of its use, apparently, dates back to the 10th century, especially after the adoption of Christianity in 988). Kirik's "Teaching" also contains fragmentary information about the cycles of the lunisolar calendar, which can be a reflection of the parallel use of the lunar month and lunar year in Old Russian life, as well as calculations of the natural cycles of "renewal" of heaven, earth, sea and water. The original section is "About fractional divisions of the hour" - about small and the smallest time units, built according to the fivefold division of the hour and successively obtained "particles", up to the seventh fractional "hour" inclusive. (On the last two plots also look further). Repeatedly in the "Teaching" by Kirik there are the motives of komputistiki (pashalistics). Thus, he gives the dates of the Jewish Pesach and the Christian Easter in 1136, pre-specifying the calendar concepts that he used for their calculations.

There is reason to believe that in the mathematical creativity of Kirik the Novgorodian, there was a manifestation of the Renaissance exact science. In this case, for a correct understanding of the role of Kirik in this process, one should rely on the tasks set by the Renaissance mathematician. The main task was the development of komputistiki: "Komputistika, or the art of calculating the table will give Easters for a whole hundred years ahead, is the collective creation of the best mathematical minds of late antiquity. It was, according to the figurative expression of A. Pannekuk, a delicate stream of science that flowed through the night of European civilization - the early middle ages. The theory of the calendar received a new impetus for its development in the 11th-12th centuries, when Europe got acquainted with the achievements of Arab mathematics and astronomy. Almost simultaneously in a number of countries of the Latin West appeared works on komputistika. Kirik's treatise "Uchenie im zhe vedati cheloveku chisla vsekh let", we deem it necessary to be attributed to this ensemble, in spite of the fact that until now it was usually considered either as an isolated phenomenon or as a purely Russian phenomenon, or considered based on the data of Byzantine science" [10].

According to M.F. Murianov, Kirik's "Teaching" is to be considered not only in the narrow context of the regional science of Rus, but also in a broad – pan-European one. Let us dwell on some examples of Western motifs in the Teaching. So, it contains a unique five-fold system of consecutive division of the hour into smaller and smaller "particles". A well-known historian of science V.P. Zubov devoted a special study to this question and came to the conclusion that this account is not found anywhere else. He concluded that «apparently, this is an original Russian "division"» [11]. One of the western predecessors of Kirik in the fivefold division of the hour M.F. Murianov considered the famous Irish komputist Bede the Venerable or his followers [12] (about the Irish origins see [13]). Kirik could take the initial principle of trouble about the division of the hour into five parts, which he probably learned from those monks of the Antoniev monastery

who came from Western Europe [14], and developed it further - on the principle of a consistent fivefold division.

The second example: in the "Teaching" there is a mysterious text about the so-called "renewals": the sky for 80 years, the sea for 60 years and the waters for 70 years. V.P. Zubov argued that "we do not know any analogies to these periods in the ancient and medieval literature". M.F. Murianov did not rule out that Kirik's information went back to the Pythagoreans through the Gnostics. A.A. Simonova suggested that information about the "renewal" could go to Kirik from the Irish monks.

The third example: at the very end of the "Teaching", Kirik indicates his age in all time units used in Russia: years, months, weeks, days and hours [14]. The method used by Kirik to record the age before him was met in Latin epitaphs, which reported that a certain deceased had lived for so many years, months, days, hours and scruples [15].

The most probable path by which the ideas of Western European komputists got into the "Teaching", and, most likely, the idea of writing this treatise on the theory of the calendar Kirik could assimilate in Antoniev monastery, having received the relevant information from his colleagues - monks, natives of the West or from travelers, western pilgrims who temporarily lived in the monastery or visited it. In the year of writing the "Teaching" (1136), Kirik served as domestics (head of the church choir or senior chorister). Consequently, he was a professional musician. Apparently, this is confirmed in his future destiny, connected with the transition to the retinue of the Novgorod Archbishop Nyfont. According to the latest research, Kirik was surrounded by Nyfont because of his professional musical activity [16].

It turns out that Kirik the Novgorodian, being a professional humanist (musician, theologian, religious philosopher), also became known as an outstanding mathematician. Syncretism of humanitarian and exact knowledge is a feature of the Renaissance. (As appropriate typical representatives of the Renaissance period, one can name Leonardo da Vinci and Durer, who, being professional painters knew mathematics and left a mark on its history). Where and how could Kirik learn mathematical knowledge of a high level? The mathematics of Kirik's "Teaching" corresponds to the quadrivium of medieval university studies, and this knowledge he could obtain in the Novgorod Antoniev monastery.

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