

THE STUDIES OF EXACT AND NATURAL SCIENCES IN THE HISTORY OF THE DUBROVNIK DOMINICANS

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ABSTRACT: As their order was modeled after universities, the Dominicans originally pursued classical studies, philosophy, theology, and both exact and natural sciences, offering »solid foundation in the quest for greater wisdom«. Valuable codices, incunabula and rare editions preserved in the Dominican Library serve as evidence of their educational and scholarly work in the city-republic of St Blaise.

Immense interest for books and sciences in Europe was caused by the opening of universities in the 13th century. Social, economical and political affairs were tending to gain an intellectual dimension. Undoubtedly, there were two main reasons for this - economic progress followed by demographic growth as well as the opening of the Christian West to the Arabic world (at the time considered more developed) which succeeded to merge its Moslem civilization with scientific achievements of the ancient Greeks and some advanced eastern cultures.

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By the end of the 13th century European trade and craftsmanship developed from family enterprises into powerful corporations of associated citizens. The novelty in the social and political sense were the city communes governed by collegial authorities. The citizen is a new type of man, a person of marked individuality and a very free-spirited person, open to new ideas which were to bring him social affirmation and economic progress.¹

The only guarantee of such success, providing that the schooling system was well organized, was the development of science. And this is why the art of translation grew importantly, particularly in the Mediterranean, where the interaction of European and Arabic cultures was the strongest. Among the highly educated westerners who laid the ground stones of the European science in the 12th and 13th centuries was Herman Dalmatin, a native Croatian who came, as he himself stated, from Central Istria. Under the guidance of Thierry from Chartres, the master of »artium« Herman finished the high studies of »free arts« in Chartres and Paris after which, together with his English schoolmate Robert from Ketton he traveled from France, Italy and the Croatian coast to Greece and Asia Minor up to the river of Euphrates led by the desire to learn Arabic and to learn about oriental cultures. In the year 1138 the two friends, by crossing the North Mediterranean Sea went to Spain, where 4 years later Peter Venarabilis, a friar from Cluny, found them studying astronomy in the most diligent way.²

Herman's translations of Euclid, Ptolomy and Abu Ma'shar, together with those of Avicenna, Aristotle, Isydor of Sevilla and other scientists of the Ancient World and the Middle Ages, are now precious holdings of the oldest library of the Dubrovnik Dominicans.

It is namely known that the Black Friars' Order (which is the official name of the Dominicans) had been established according to the medieval university institutions' standards and that its founder Domingo de Guzman from Castilla

¹ Concerning new civilization relations in Europe of the 13th century see: Jacques le Goff, *Srednjovjekovna civilizacija Zapadne Europe*, Beograd: 1974; Jacques le Goff, *Intelektualci u Srednjem vijeku*, Zagreb: GZH, 1982; Georges Duby, *L'Europe au Moyen age*, Paris: Flammarion, 1984; Jacques Paul, *L'Eglise et la culture en Occident*, vol. II, Paris: PUF, 1986; Franjo Šanjek, *Crkva i kršćanstvo u Hrvata. 1. Srednji vijek*, Zagreb: 1988.

² Franjo Šanjek, »Doprinos Hermana Dalmatinca zblizavanju arapske i europske znanosti u 12. stoljeću.« *Zbornik radova Četvrtog simpozija iz povijesti znanosti*, Zagreb 1982, pp. 69-83; Franjo Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 151-161; Franjo Šanjek, »Na izvorima europske i hrvatske znanosti u Srednjem vijeku: Herman Dalmatinac (o. 1113/15 -1154)«, *Pandžićev zbornik*, Bamberg 1988, pp. 251-270.

had opted for intellectual work and permanent study, because he was well aware of the fact that his Order's mission, i.e. the dialogue and conflicts with fringing Christianity religious encounters with Islam, primarily depended on lasting in doctrinated specialization and study.³

It is very significant that the Dominicans never depend on local authorities or circumstances. Their houses and monasteries stretch to the very boundaries of the Christian ecumene, so that their experiences and intellectual horizons have quite an influence on the universality of various universities. The St. Dominic Order appreciates extremely the study of languages and literature as well as the study of exact and natural sciences, which all together represent »a reliable indication of how to reach superior wisdom«,⁴ i.e. one's orientation towards theological studies. The only exception is alchemy which, described as a pseudo-science and useless pass-time, was forbidden by the Black Friars' Order.⁵

Always in motion, moving from one place to another (this is how they arrived in Dubrovnik in 1225/26),⁶ the Dominicans brought new ideas and promoted the new way of thinking which made them become a synonym of progress and a sign of new modern times coming.

Therefore it is no wonder that a universal study of free arts, the so-called »artes liberales« was the first one to be organized in the newly founded Dominican monastery in Dubrovnik. This schooling system, which had already been famous in ancient times, was divided into »trivium« or the literature study which consisted of grammar (language), rhetoric and dialectics (logic), and into »quadrivium«, or the scientific study which consisted of arithmetics, geometry, music, astronomy and technical sciences.⁷

³ Comp. Franjo Šanjek and Ivica Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj.« *Croatica christiana periodica* 10/17 (1986), pp. 48-49.

⁴ Comp. *Libellus de instructione noviciorum*; Celestin Douais, *Essai sur l'organisation des études dans l'Ordre des Frères Prêcheurs au 13e et au 14e siècle*, Paris-Toulouse: 1884, p. 22; F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, p. 51.

⁵ C. Douais, *Essai*, p. 5; F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, p. 50.

⁶ Antonin Zaninović, *Pogled na apostolsko-znanstveni rad dominikanaca u hrvatskim zemljama*, Zagreb 1917, p. 6; Franjo Šanjek, »Dominikanci u našim krajevima.« *Bogoslovska smotra* 36/3-4 (1966), p. 715; Stjepan Krasić, *Congregatio Ragusina Ordinis Praedicatorum (1487-1550)*, Rome: 1972, pp. 38-39.

⁷ Of the study system of »free skills« in the Middle Ages comp. F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 148-149.

The scientific medieval method, better known as a scholastic one, was primarily founded on reading and explaining chosen texts written by famous authors. The term »lectio« (reading) has two meanings, i.e. it is a comment on the text and an independent lecture at the same time. »Legere« (to read) means to teach, to lecture, to explain, etc. According to this a lecture consists of reading (the texts were mostly taken from the Holy Scriptures, the so-called »auctoritates«, but also some other significant authors were read), followed by a grammatical analysis and a dialectical »pondering« of various words and terms in order to find their definite sense (»sensus«), after which a debate (»discussio«) is developed. The scope of this debate was to reach the scientific truth (»sententia«) by confronting single personal opinions and comments.⁸

About the way of lecturing and subjects which were taught in the Dubrovnik Dominican school least is known from the relatively scanty archives and monastery book-keeping and something more from the biographies of the eminent monks who lived in the town beneath Srđ and who left a prominent scientific opus behind or had a reputation as a university professor. Finally, the source from which we can learn most is the inventory of handwritten codices and first-printed originals (incunabula).

Up to the end of the Middle Ages the Dubrovnik library became the most eminent one for the whole Croatian nation and not only by the number of codices and printed publications - more than 1.000 volumes placed on twenty-two wooden shelves made by artists - but also by the selectivity of its holdings. Most of the codices were written in Italy and only a smaller number came from local scriptoriums, while the printed works originated from Italy (Venice, Padua, Bologna, Milan, Pavia, Rome, Naples), France (Paris, Lyons, Strasbourg) and from the most eminent Flemish and German printing shops (Anvers, Amsterdam, Leiden, Augsburg, Nurnberg, Vienna, etc.).⁹

We should point out one rather peculiar but very true fact: the above - mentioned library holdings of about one thousand volumes was equally di-

⁸ Franjo Šanjek, »Pariško sveučilište u 13. stoljeću.«, *Bogoslovna smotra*, 45/1 (1975), pp. 4-11; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 146-148.

⁹ Regarding the holdings of the Dubrovnik Dominicans and the provenance of its book totals, see: Thomas Kaeppli and Hugues Vincent Shooner, *Les manuscrits mJdiJvaux de Saint Dominique de Dubrovnik*, Rome: 1965; Franjo Šanjek, »Knjiga u Hrvata u vrijeme otkrića tiska.« *Croatica christiana periodica* 8/14 (1984), pp. 214-218; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 405-511; Šime Jurić and Franjo Šanjek, »Zbirka inkunabila dominikanskih knjižica u Hrvatskoj.« *Croatica christiana periodica* 9/15 (1985) 15, pp. 123-199, especially pp. 131-183.

vided into three scientific fields of general interest for the Dominican students. These three fields are:

1. The most ample study of language and literature;
2. Researching of natural philosophy and other exact and natural sciences (when talking about technical science, books on agriculture should be mentioned);
3. The study of theology.

Ways of Learning

All the aspects of the Dubrovnik Dominicans' scientific efforts in the period of pre-humanistic Europe could be described best through the life and times of Ivan Stojković (born in Dubrovnik between 1390 and 1395 - died in Lusanne in 1443).¹⁰

Known in literature as Ioannes Stoycus de Ragusio, this eminent Dubrovnik citizen belonged to the circle of very prominent cultural personalities acting on the political and religious European stage in the first half of the 15th century. As a professor at Paris University and its ambassador both at emperor Sigismund's court and to Pope Martin V, and acting as an organizer of the Basel Council and representative at the successful Constantinople negotiations, thanks to his immense love and interest of knowledge and books Stojković was one of the pioneers of the humanistic revival in the West. This is why many of the most important European personalities, Erasmus of Rotterdam being one of them, considered Stojković one of the leaders of Humanism.¹¹

He was born in the town beneath Srđ around the years 1390/95, most probably it was in the year 1392, because in 1414 as a young priest he entered

¹⁰ Regarding Stojković's place in cultural, political and religious history of Europe in the 15th century see review of works »Misao i djelo Ivana Stojkovića.«, published by Kršćanska sadašnjost (Zagreb), *Analecta croatica christiana* 20 (1986). Comp. also F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 181-185, 294-296 and 379-383.

¹¹ Stojković comes from a poor family from Dubrovnik of father Miho and mother Stoja, whom he especially pointed out during his promotion to the doctor's degree at Paris University, describing them as parents of ideal honesty and as »modest and hard-working people, who sacrificed themselves and educated him honestly and in accordance with Christian ideals« (Alois Krchnak, *De vita et operibus Ioannis de Ragusio*, Rome: 1960, pp. 4-5; Iohannis de Ragusio, *Tractatus de Ecclesia*, Zagreb 1983, p. VI; Stipe Krasić, *Congregatio Ragusina Ordinis Praedicatorum (1487-1550)*, p. 154).

Padua University, which means that at that time he could have been at least twenty-two. And since he could not have become a priest before he was fifteen, it is believed with certainty that he joined the Dubrovnik Dominicans in the year 1407 and spent seven more years studying in the parent monastery in which he first had been registered. During this period of time he received general education, which was taught in a »seven arts« programme. In addition, he learned a lot about elementary theology, knowledge which in that scholastic period was based on reading and explaining the Holy Scriptures, chosen paternalistic texts and systematic theological anthologies (the so-called »Summa«) written by medieval theological authors. The ambitious and extremely talented Stojković graduated from the aforementioned university after seven, instead of the usually needed nine years of studying and then, in the end of the summer of 1414, with sufficient scholarship money which was given to him by his native town and the St. Blaise Republic, he entered Padua University where he studied at the faculty of »artium« and became highly respected by his professors and fellow students. He could also count on the support of Leonardo Dati of Florence, the top superior of the Dominicans who, after Stojković, had graduated from the Padua »free arts« faculty (in 1417), and arranged to send him to Paris to continue his studies. With a master's degree which was an equivalent to the doctor of »artium« at Padua University in 1422, Stojković succeeded in obtaining the title of universal doctor of science, after which he entered the College of Professors of Paris University, which was doubtless the most famous in the Christian West in the Middle Ages.¹²

The Organization of Studies in Dubrovnik Monastery

Another Dominican system of study similar to the already existing one in the Dubrovnik monastery could be found in the cathedral school in Zagreb,

¹² By the letter dated 13 May 1422, the Chancellor of Paris University congratulates the citizens of Dubrovnik, because after »a very hard scientific work their fellow citizen Ivan Stojković, M.S., a member of the Black Friars Order, not full of ephemeral wealth but full of knowledge, wreathed with his doctor's degree is coming back to Dubrovnik...Citizens of Dubrovnik, morality and honesty of this great man surpasses many of his contemporaries«. (Bonaventura Duda, *Joannis Stojković de Ragusio*, Rome: 1958, p.14; »Misao i djelo Ivana Stojkovića«, p.380; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, p.182).

which was reorganized at the beginning of the 14th century by bishop Augustin Kažotić (1303-1322) who followed the model of the Dominican schooling system »studia liberalia«. A Dominican, master in »artium« and theology, a scientist who acquired the reputation of an expert in natural sciences at Paris University in the late nineties of the 13th century - in 1317 Arnold of Bamberg dedicated to him his Treatise on health care (*Tractatus de regimine sanitatis*) - he fully used his knowledge gained in Paris to improve the overall hygienic and medical conditions of the population living in his large (Zagreb) parish. Among the things he did for his fellow citizens we should mention the reception centre which he built for the sick and poor (in Zagreb), the new wells for clear drinking water (Zagreb, Cernik), and the plantation of trees with medicinal fruits (Cernik and Lupoglav near Zagreb), etc.¹³

One of the most important of Kažotić's works without any doubt was the reorganization of the cathedral school in the cultural, political and religion centre of Northern Croatia. The erudite bishop carried it out according to the model of Dominican monastery schools (*studia liberalia*) similar to the one near his native town Trogir.

According to Ivan, the archdeacon of Gorica,¹⁴ who was one of the closest associates of bishop Kažotić, the Zagreb Cathedral School is a reflection of Augustin's intellectual openness and his eager concern in solving the social problems of his time.

Although he was of patrician origin, Augustin Kažotić in his actions was always deeply socially oriented and close to the poor and those who felt rejected by the society they lived in. Being the bishop of Zagreb and the reformer of the cathedral school he was always trying to give equal chances in schooling both to students whose parents were poor and those who were well-off. In order to keep in line with the 18th conclusion of the Third Lateran Council (1179),¹⁵ Kažotić ordered that both the dean lector, head of the cathe-

¹³ F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 170-177 and 291-293 (about bishop Kažotić's life and works see his treatise and additional studies in the magazine *Croatica christiana periodica* no. 1/1977, 4/1979 and 5/1980).

¹⁴ Regarding Ivan Gorica's archdeacon and Kažotić's associate, see Nada Klaić, *Povijest Zagreba*, Zagreb: SNL, 1982.

¹⁵ The 1179 Lateran Synode orders that all the cathedral churches should provide benefices for lectors of cathedral and episcopal schools, and Pope Alexander III, requires that for every capable teacher, without any material compensation, a »licentia docendi« should be issued (F. Šanjek, *Crkva i kršćanstvo u Hrvata*, p. 146).

dral school and his first assistant (sublector) should earn for their living only by receiving special church benefices (prebends) so that »they could not charge directly or indirectly for their services the poor students who were begging or would have begged if they had not been helped by someone...«¹⁶

Other orders of Kažotić also accurately illustrate the social complexity of the medieval Croatian north. Besides the free-of-charge study for the poor students he introduced the order that »...Children whose parents have a job but no real estate have to bring to their teacher (master) one cock for Christmas, four round unleavened flat cakes for Easter and a hen in honour of the Day of St. Stephen of Hungary, the protector of the Zagreb diocese.« The sons of merchants, craftsmen and lower aristocrats were due to give 12 denarii, half of which they could pay in goods, while the sons of the rich gentry had to pay 20 denarii in cash for their studying.

The whole programme of teaching, which similarly to the Dominican »studia liberalia« was based on »free arts « as a groundstone for the advanced studies of medicine, law and theology, had its regular day schedule (programme) which went like this: In the morning grammar was taught, a skill which was indispensable for the understanding of scientific texts. Near noon, when the students were already well awake dialectics (logic) was taught. Special attention was paid to the Latin language because of the order which said that »lecturing of grammatical rules is important as this is the way in which students memorize them«. This is why immediately after the evening service, i.e. between three and four o'clock p.m. »the declensions drill began so that the students could get used to this (i.e., Latin) language and thus achieve knowledge necessary for the understanding of Latin texts as well as for conversation.« It can be said by experience, Augustin believed, that when such a level is achieved the students will be able to comprehend the content and the meaning of the texts without any or with little help.¹⁷

Augustin Kažotić, as an excellent pedagogue, demanded that all the students without exception should gain some »basic human knowledge«, neglecting not even one of the sciences except alchemy, which was immediately excluded from the Dominican study programmes as a useless and non-scientific

¹⁶ »Statuta Capituli zagrebiensis« III/2, edition Ivan Krstitelj Tkalčić, *Poviestni spomenici zagrebačke biskupije*, vol. II, Zagreb: 1874, pp. 77-79.

¹⁷ »Statuta Capituli zagrebiensis«, ibid. Comp. F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, p. 55; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, p. 293.

subject. He insisted that »the lecturing and teaching of each individual student should be organized in order to match his talents and capabilities, i.e. to have a different approach towards each student just like good physicians who treat different kinds of physical diseases using various medicines to cure them.«

Although Latin was predominant as a language in which most of the original classical scientific and literature documents were written, not to mention the Greek and Latin patristics and the Holy Scriptures on which the medieval profane sciences and theology were based, one could say that the Croatian language was not of less importance.¹⁸ After all, *Red i zachon...suetoga Dominicha* (1345) is considered one of the first Croatian texts written in the Latin script and *Nauk sa piisati dobro latinskiema slovima riesti yesika slovinškoga* (Venice, 1637), written by Rajmund Gjamanjić, a Dubrovnik Dominican, is »a correct writing in Croatian legislature« (Franjo Fancev). In his inspirational speech to his fellow citizens (the citizens of Dubrovnik), in which he urged them to »follow the example of famous university towns in neighbouring Italy by founding a similar school which will become the pride of the town and the Republic and will promote knowledge and the Catholic religion,« Ivan Stojković continued and said that he would be honored and ready to interpret any part of the Holy Scriptures either into the popular (Croatian) or into the standard (Latin) language at a time and place to be decided by his fellow citizens and no matter whether he had to prepare the interpretation or just read it.¹⁹

¹⁸ Every Dominican as a potential preacher should know Latin and the language of the region in which he wants to work. In terms of that, the supreme convention of the Order in Paris in 1236 determines that the one who would not learn the language of the region or the country in which he was going to operate as an enlightener and preacher could not be a member of the clerical order. Comp. MOPH III/9, according to F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, p. 50, note 7.

¹⁹ F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, 57, note 20 (from original text from Basel Universitätsbibliothek, Cod.A VI 35, p.460). In their monasteries in Dubrovnik and on Lopud the Dominicans had schools of open type in which they taught young people grammar, logic and humanistic sciences. At the beginning of the 17th century the Dubrovnik Dominicans opened the first boarding school (grammar school) for teaching the young from Dubrovnik (Stjepan Krasić, »Filozofsko-teološki studij dominikanskog reda u Zadru (1396-1806).« *Zadarska revija* 36/1-2 (1987), p. 14). A similar institution was opened in the Gargani mountains for Croats on the Italian Peninsula (Josip Burić, »Ilirski kolegij na Garganskom gorju u 17. stoljeću.«, u: *Mandićev zbornik*, I-II, Rome 1965, pp. 235-252). A Dominican and a St. Blaise Republic historian Serafin Cerva (Crijević) writes about the boarding school in the Dominican monastery that the young here »were taught good manners and morality as well as literature and other humanistic sciences, without paying for it« (*Monumenta Congregationis S.Dominici de Ragusio*, vol.V, Dubrovnik 1734, pp. 1-2, manuscript).

Stojković made this proposal in public, speaking in a church, in front of a large audience on the first Sunday of October in 1424 and he did it, as he said »not because of my personal intention but because of the honor of Dubrovnik and my professorial career« at Paris and Bologna universities.

Profane Sciences Serving Religious Missions

Serious pre-learning of grammar and dialectics, two literary courses of humanistic studies, was the condition for entering into the profound study of natural philosophy, mathematic sciences and astronomy. A Guidebook for Novices (*Libellus de instructione noviciorum*), which set directions in intellectual and moral education of young priests in Dubrovnik and other Croatian monasteries, insisted on the meaning of studying and the importance of reading books in everyday Dominican life. The author, who remained unknown, points out that »only conceiving of Christ, and no other skill or knowledge, can bring a man to beatitude«, but at the same time he points out that this »other skill« (*aliqua ars alia*) is not only useful, but indispensable, for conceiving God and for a balanced human life.

This »other skill« involves not only grammar, rhetoric, dialectics and poetry, but also the sciences we call exact ones, i.e. arithmetic, geometry, etc. Human knowledge develops and shapes the spirit, dialectics (logic) shows it the way, rhetoric, poetry and music together make a harmonious evidence of beauty, while both astrology and astronomy - the author considers the achievements and discoveries of these two sciences, definite and final - bring man to the foreground of the scene of creation and enables him to discover or at least to get a feeling of God's immensity and almightiness. Humanistic sciences are »sign-posts whose indications help man to keep his pace towards superior wisdom«. ²⁰

This was the context in which one should perceive the interest of the Dubrovnik Dominicans for the exact and natural sciences. Medieval »ratio studiorum« in their Dubrovnik school, the preserved codices and incunabula (firstprints) and the saved archive inventory prove that the study of profane sciences was

²⁰ F. Šanjek and I. Tomljenović, »Dominikanci i razvoj školstva u srednjovjekovnoj Hrvatskoj«, pp. 50-51; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 289-290.

considered in a most serious way. And this is above all true when we talk about natural philosophy. Under the influence of Albert the Great (1206-1280), who was the initiator of the critical approach towards natural sciences at Paris University and in Europe in general together with his disciple Thomas Aquinas (1225-1274), and in accordance with the distinguishing of physics, metaphysics and theology in Aristotelian terms, the Dominicans gave priority to the autonomy of philosophy instead of theology. Thomas's dualism between intellect and faith, (existence and essence), between the causes and nature of things can be found in the everyday moral and political life. For Dominicans, who also accepted the possibility (theory) of the eternal world, Divine Announcement does not exclude the light of reason which, translated to everyday life, means that the establishment of the »State of God« does not contradict the establishment of the mundane human society inspired and led by natural laws. Besides original comments on, for example, Aristotle's work *De caelo et mundo*, written by Albert the Great and some original comments written by Thomas Aquinas in Dubrovnik Dominican Studies one can find some of the fundamental works of Aristotle, Plato, Porphyry, Avicenna *De caelo et de mundo*, *De anima*, *De animalibus*, Abu Ma'shar and other authors.

Plato's perception of the Spirit of the world (*De anima mundi*) together with Avicenna's and Abu Ma'shar's works (translated by the Croat Herman Dalmatin),²¹ was one of major issues of the medieval cosmogony because it was seeking for the explanation of the interaction between the micro- and macrocosmos, reminding of the »legitimum societatis foedus« between heaven and earth.

The presence of Plato's, Aristotle's, Avicenna's and Abu Ma'shar's works in the Dominican library in Dubrovnik indicates that cosmogonical and natural - science discussions were undoubtedly held in their monastery school. Both Albert the Great and Thomas Aquinas (e.g. *Contra gentiles*) debated about the »world's spirit« but so did also Grgur Budisaljčić, a Dominican from Dubrovnik (about 1480/90-1550), summarizing in his treatise *Sylva sive observationes in historiam naturalem at rem pharmaceuticam* (Library of Bologna University, manuscript 236) Albert's natural-science papers about flora, fauna and minerals and how they could be used in medicine and pharmacy. Our author, who calls himself »Master Gregorius Ragusinus«, observes and explains the physi-

²¹ Comp. Franjo Šanjek, »Na izvorima europske i hrvatske znanosti u Srednjem vijeku, p. 264.

cal world and nature as an interaction of powers maintaining the Cosmos and helping man to live his mundane life in the best possible way. Budisaljić's »Sylva naturae« is divided into three books. The first one talks about the characteristics of minerals (various stones, metals and other natural elements), the second one talks about the characteristics of plants and medicinal substances (about trees and medicinal herbs), while the third one reflects about medicines one can get from particular parts of the animal body, describing the look, origin, the geographical spread and the pharmaceutical characteristics of quadrupeds, birds, fish, snakes and worms.

Among Budisaljić's works there are some significant manuscripts we should also mention. These are: *De astrologia*, *De sphaera* (written on the model of Sacrobosco's *De sphaera mundi*), *Adnotationes super medicinam per modum dialogi* and *Commentaria in Physicam et Metaphysicam Aristotelis*.²²

During the 15th century the Dubrovnik monastery school produced many scientists who became famous as expert lecturers at various European universities and, at the same time, contributed to their home monastery and school in Dubrovnik by supplying it with valuable scientific works. One of the most famous scientists was Ivan Stojković, praised by the humanists, but we should remember other well-known professors of »artium« like Blaž Constantini, Donat Đorđić, the Martinušić brothers (Luka and Anđeo), Ambroz Ranjina, Petar Gučetić, father Benjamin and many others.²³

Among the works which enter the field of exact and natural sciences are Codices no.79 and 84 together with works written by Silano de Nigris (*Super nonum librum Almansoris De agritudinibus*) and Julie Firmicus (*Matheseos libri octo*). The first analyzes Avicenna's medicine definition (*Scientia qua humani corporis dispositiones*) and introduces the names of the angel-natured creatures who - according to what the astrologists of that time believed - were governing all the planets, while the second work treats the results of mathematical and astronomical research up to the 4th century A.D., including also

²² Mijo Brlek, »Budisaljić Grgur Bozin OP (oko 1550). Sylva naturae.« *Anali Historijskog instituta JAZU u Dubrovniku* 3 (1954), pp. 144-146; Serafin Maria Cerva, *Bibliotheca regusina*, vol.II, Zagreb: 1977, pp. 119-127.

²³ Comp. A. Zaniņović, *Pogled na apostolsko-znanstveni rad dominikanaca u hrvatskim zemljama*, pp. 17-22; F. Šanjek, »Dominikanci u našim krajevima.«, pp. 723-734; Frano Šanjek, »750. obljetnica dubrovačkih dominikanaca.« *Croatia christiana periodica* 1/1 (1977), pp. 143-148; Stjepan Krsić, *Congregatio Ragusina Ordinis Praedicatorum (1487-1550)*, pp. 153-195.

his personal observations. (He lived in Syracuse, Sicily.)²⁴

At the time when the independent St. Dominic congregation on the St. Blaise Republic territory was founded and St. Dominic's school in Dubrovnik became »studium solemne«, its library became richer every day thanks to Guttenberg's invention of movable type and thanks to the interest of the Dominican returnees who had studied abroad. A few very precious incunabula were produced in that time: Pliny's *Historia naturalis* (three copies one dating from 1472), Gafuri's *Practica musicae utrisque cantus* (1496), Theophrastus's *Historia Plantarum* (1483), Collumela's treatise *De cultu hortorum and De re rustica* (between 1475 and 1480), Zerbuz's *Gerontocomia* (about old people's homes, written in 1489), anonymous *Opusculum repertorii prognosticon i mutationes aeris* (1485) etc.

One of the most interesting scientific fields of that time was astrology. Intellectual circles appreciated it very much. Besides Hippocrate's *Libellus de medicorum astrologia* (1488) and Abu Ma'shar's *Flores astrologiae* (two copies of the 1488 issue) there is also Savonarola's Treatise against astrologists (*Trattato contro gli astrologi*, 1497). Put together, all these works show us that the Dubrovnik Dominicans approached this issue from various starting points. Their library also kept some prohibited documents, which may explain the presence of the Court of Inquisition which held meetings in their monastery. This is how the forbidden documents such as *Heptaplus de septiformi sex dierum Geneseos ennaratione* (1490) and *Apologia conclusionum suorum* (1487), written by Giovanni Picco della Mirandola, one of the leading erudites, were preserved.

A special place not only in the library holdings but also in the intellectual life of the Dubrovnik Dominicans has always been kept for mathematics, geography and astronomy works. Most of these works had been purchased for the needs of local study. Among these works one should point out Hyginus's *Poeticon astronomicum* (1486), *Magistralis compositio astrolabii* (1485) by Adelard de Bath, the translator Euclidus's *Elements*, Abu Ma'shar's *Liber introductorius in astronomiam* (two copies issued in 1489 and translated by Herman Dalmatin) and Johann Müller's *Epitomae in Almagestum Ptolomei* (1496). Müller was better known under his humanistic name of Regiomontanus.

²⁴ Comp. Th. Kaeppli and H.V. Shooner, *Les manuscrits mĀdiĀvaux de Saint Dominique de Dubrovnik*, pp. 86, 94-95 and 99-100.

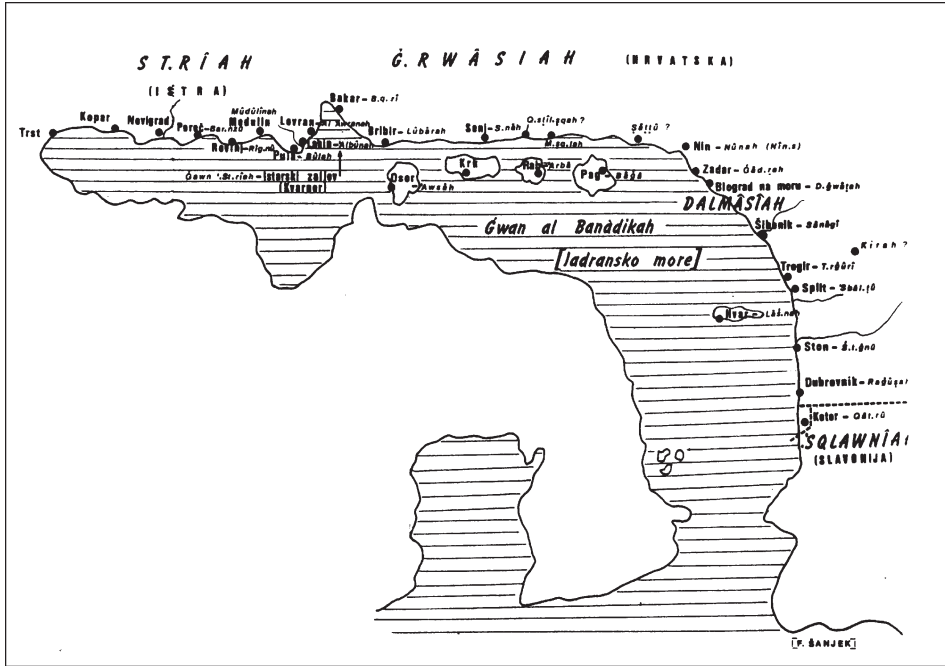
Puerbach's *Theoricae novae planetarum* (three copies, issued in 1483, 1491 and in 1499) and "Of Comets" (*De cometa*, 1472) written by Angelo Cato in Naples, represent another two precious treatises which can be found in the Dominican library in Dubrovnik. A mathematics and astronomy manual for the medieval schools, *De sphaera mundi*, written by the English astronomer John of Halifax of Holywood (1190-1250), better known under his Latin name of Johannes de Sacrobosco, has been saved in three issues (1485, 1491, 1499) with additional notes and comments by monastery lecturers.

A copy of the astronomical tables (*Tabulae astronomicae*, 1483), which belonged to Castilian King Alphonso VI the Brave, among other things, brings a few profound and interesting chapters, important for our country. These, for example, are »Radices ad civitatem Epidaurii, Dalmatie et Ragusii...Radices ad meridianum ragusinum«, etc. Similar notes can be found in Ptolemy's works *Cosmographia* (Vicenza 1475) and *Opus Quadripartitum* (Venice 1484). The turbulent times which were brought to Dubrovnik by Napoleon troops left heavy traces on the Dominican library from which disappeared the most valuable of Ptolemy's work *Mathematike syntaxis* better known as *Almagesti*, i.e. »A long essay«, which was the title of its Arabic translation. This work contains Hipparchus's astronomical research and Ptolemy's observations about the dynamics of the stars and a description of the instruments necessary for a large observatory (such as an astrolabe, diopter, etc.).²⁵

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This short historical review of St. Dominic's Faculty in Dubrovnik and even a shorter one of some of the scientific texts kept in its library give us an introspection into the scientific approach and the variety of their studies. It is obvious that the Dubrovnik Dominicans have not treated the scientific books only as a tool for contemplation or simply as very precious pieces of art, but above all as an efficient means of the human communication and as an exceptional factor in exchanging ideas and scientific experiences and with a view to maintain the personal integrity and cultural progress of the environment from which they had originated and the nation they belonged to.

²⁵ S. Jurić and F. Šanjek, »Zbirka inkunabila dominikanskih knjižica u Hrvatskoj.«, pp. 126-127 and 131-183; F. Šanjek, »Knjiga u Hrvata u vrijeme otkrića tiska.«, pp. 214-218; Frano Šanjek, »La circulation du livre européen en Croatie aux XVe et XVIe siècles.«, *Croatica parisiensia* 1 (1986), Paris, pp. 36-40; F. Šanjek, *Crkva i kršćanstvo u Hrvata*, pp. 405-411.



The Map: Croatian Towns and Villages According to Al-Adrisi’s Map of the Mediterranean (1154) (M. Amari - C. Schiaparelli, L’Italia descritta... da Edrisi, Roma 1985).

Abn’Abd Allah Muhammad al-Edrisi, or shorter al-Idrisi (Ceuta, born in about 1099 - died between 1165 and 1186) gave in his »Geography of the Mediterranean« a very interesting description of our lands along the Adriatic coast, from Istria to Kotor. This Arabian scientist and official geographer of the Sicilian king Ruggero II (1130-1154) had already known that for example Istrian towns from Koper to Lovran belonged to the Aquileian region, i.e. they made up part of the Empire, while the region between Bakar and Dubrovnik (both towns were included in it) was considered as G.rwasiah - Croatia, the land inhabited by the Dalmatians and the Slavs. The inhabitants of the towns situated along the eastern coast of the Venetian Gulf (this is how al-Adrisi called the Adriatic Sea) were very brave, honest and capable seamen. Their pretty towns like Bakar, Zadar, Šibenik, Split and Dubrovnik were important trade centres where the main sea and land trade routes meet. Besides, ship-building was quite developed in these towns, as well. The population dealt

with agriculture, especially with growing of vine. Al-Edrisi accurately noticed a few important details regarding Croatian lands and towns. Senj, for example, had a strong navy, Zadar (against whose city walls big waves splashed) was surrounded by boundless fields and vineyards, Šibenik was a meeting point of continental and Mediterranean trade, some people from Trogir earned their living as pirates, Split was a beautiful town with paved streets and Dubrovnik, Al-Adrisi noticed, was a very important maritime centre and the last Croatian town.