

## HAKEMLİ YAZILAR/Refereed Articles

# A Chronological Overview of Science and Philosophy of Byzantium Between 1300 and 1453

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### Abstract

*The Palaeologi Age (1261-1453) of Byzantine Empire was one of the significant periods in the Medieval Ages because of its creative cultural activities. Byzantine scholars contributed to the rise of interest in antique Greek literature and philosophy in Latin World, by teaching Greek in Italy and translating some important books from Greek into Latin. Moreover, this period witnessed both the establishment of the Ottoman State and the falling down of Byzantine Empire. This article provides the reader with a chronological overview of the late Byzantine science and philosophy, and opens a new base for the possible interactions between Byzantine and Ottoman scholars.*

**Keywords:** The Palaeologi Age, Byzantine Empire, Byzantine science and philosophy.

### *Bizans Bilim ve Felsefesine Kronolojik Bir Bakış (1300-1453 Yılları Arasında)*

### Özet

*Bizans İmparatorluğu'nun Palaeologi Çağı (1261- 1453) yaratıcı kültürel faaliyetlerden dolayı Orta Çağın dönüm noktalarından biridir. Bizanslı bilginler İtalya'da Yunanca öğreterek ve bazı önemli kitapları Yunancadan Latinceye çevirerek Latin Dünyasında Antik Yunan edebiyatı ve felsefesine karşı ilginin artmasına katkıda bulunmuşlardır. Ayrıca, bu dönem hem Osmanlı Devleti'nin kuruluşuna hem de Bizans İmparatorluğu'nun çöküşüne tanıklık etmiştir. Bu makale okuyucuya son dönem Bizans bilim ve felsefesine ilişkin kronolojik bir bakış sunmaktadır ve Osmanlı bilgileri ile Bizanslı bilginlerin arasındaki muhtemel etkileşimlere yeni bir dayanak sunmaktadır.*

**Anahtar Kelimeler:** Palaeologi Çağı, Bizans İmparatorluğu, Bizans bilim ve felsefesi

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## Introduction

The Palaeologi Age (1261-1453), which spanned the last two centuries of the Byzantine Empire and followed the recapture of Constantinople from Latins in 1261, corresponds to a period which witnessed both the establishment of the Ottoman State and the downfall of the Byzantine Empire, and contains of six Byzantine emperors except the founder of the dynasty, VIII. Michael Palaelogos (1258-1282) who supported the revival of old customs after the recapture of Constantinople. The city had been conquered by the Latin Fourth Crusade in 1203-1204 and Michael Palaelogos was able to recapture it in 1261.

In this period, which is called the restored empire of the Palaeologi, Byzantium much of what had been destroyed had to be restored having serious economical and social problems and surviving from the invasion by Latins in Constantinople. By the mid of the fifteenth century the Byzantine State had long ceased to be an empire and it was little more than a large city-state besieged from all sides. The economical structure was mainly dependent on agriculture, and the trade was in hands of the Venetians and Genoese.

On the other hand, this period, critical as it was from political, social and economical perspectives, was one of the brightest points of Byzantine civilization. It was a period of intense creative activity. This restoration included education, and the imperial higher school and the patriarchal school were reopened. It had been appeared a remarkable renew science and philosophy in the same period, and the spirit of the Renaissance and Humanism of Western Europe spread over Byzantium although being not the strong as much as did in Latin World, and even after the capture of Istanbul, this spirit affected the Ottoman intellectuals, in particular Mehmed the Conqueror of Constantinople. And in the Ottomans, important contributions to mathematics and astronomy were made by depending also on Arabic and Persian scientific works.

A lot of notable scholarly developments occurred in the reign of Andronicos II who recognized the need for a reorganization of the University of Constantinople and put it under the administration of Grand Logothete. In that period, under the influence of the Persian and Arabic sciences, the Academy at Trebizond, at the east coast of Black Sea, became a renowned center for the study of astronomy and other mathematical sciences. Besides, medicine also attracted the interest of almost all Byzantine scholars.

Our purpose by this article is to provide the reader with a chronological view of late Byzantine science and philosophy, and to open new historical perspectives on the possible interactions between Byzantine and Ottoman scholars.<sup>1</sup>

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1 This preliminary chronological survey is of course far from to be complete. It needs to further study on the subject to evaluate the mutual cultural influences between Byzantine and Ottoman scholars.

## **Chronology**

Andronicos II (1282-1328)

1280- Nicholas Myrepsos wrote his book on pharmaceuticals entitled *Materia Medica* which contains 2656 recipes of which about 150 were derived from Nicholas of Salerno and the remaining were most probably seemed from East.

1297-1330- Under the rule of Alexios II, an academy was constituted in Trebizond to investigate scientific literature in Persia where some intelligentsia were sent, they returned to Trebizond with a load of Persian and Arabic books, some of which were translated into Greek. Thus, Trebizond was a center of a Persian-Arabic renaissance at that time.

~1300- The physician Gregorios Choniades traveled to Persia where he studied Persian and Arabic astronomy and mathematics which he introduced into Byzantium upon his return.

1305- Maximos Planudes (b.1255) died. He was a theologian, mathematician, and man of letters and sent to Venetia as an ambassador where he learned Latin very well and translated many theological and classical works into Greek, including *De Trinitate* (On the Trinity) (410-416) by St. Augustine, logical and theological papers by Boethius, and poems by Ovid. In the point of the history of science, his most important work is *Psephokoria kat Indous* (Calculation According to the Indians, 1300) in which he introduced Arabic numerals and the operations with them. At the end of his treatise, he presented his own method of deriving the square root, which permits a more accurate approximation. Hence, it can be concluded that he accelerated the developing of arithmetic and generally of mathematical sciences in Byzantium. Moreover, he wrote a commentary on the first two books of Diophantos' *Arithmetica* and used the zero as a first time in Byzantine mathematics.

1310- Georgios Pachymeres who was both a Platonic and an Aristotelian scholar, died. He learned Arabic numerals and used them in his *Syntagma ton tessarou mathematon* (The Summary of Four Mathematics) which was on quadrivium consists of arithmetic, geometry, astronomy and music. This work doesn't contain original mathematics, however, it shows the high level of mathematics at the early Palaeologoi period. His most important work is *Hromaike historia* (Roman History) which consists of 13 volumes and follows the chronicle of Georgios Acropolites.

1310- John Pediasimos taught philosophy in the University of Hagia Sofia which was newly opened. He interested in Neopythagorean numerology. He asked why those infants were born at the seventh or ninth month of pregnancy survive, while those born during the eighth month did not. He looked for the answer by the virtue of the odd numbers seven and nine, and the imperfection of the number

eight. He wrote a treatise on geometry and surveying which was closely dependent on Heron of Alexandria and another on music.

1316- Pietro d'Abano who was originally from Italy, died. He translated some works from Greek into Latin and French.

1323- An Arabic astronomical book written by Shams al-Buhari was translated at the Academy of Trebizond.

1323- Astronomer Nicephoros Gregoras (1295-1360) wrote on theology, philosophy, astronomy, history, rhetoric, and grammar. In the combat between Platonism and Aristotelians, he took the side of Plato. He studied solar and lunar eclipses and wrote a treatise on the reform of the calendar, which was an anticipation of the Gregorian calendar introduced by Pope Gregory XIII in 1582. He wrote a commentary on *Almagest* and two treatises on the astrolabe which were widely read and used to recalculate the dates for Easter. Moreover, he composed a very elaborate chronicle from 1204 (Latin invasion) to 1354, which was called *Romaike Historia* consisting of 37 volumes and being a main source for this period of the history.

1327- Aristotelian philosopher Nikeforos Chumnos(b. ~1250) died. His *Concerning Matter* and *Concerning the Vegetative and Sensitive Soul* are published.

1328 - Manuel Moschopulos died. As far as known he was the first to write on magic squares in the West, which was studied and on which many books written by Islamic mathematicians. He was also an outstanding philologist of his time, and his grammatical catechism entitled *Erometa grammatika* in Greek was published in Milan in 1493 and praised by the humanists.

1328 - Barlaam (Bernardo de Seminara) (1290-1348), who was a Calabrian monk, Italian humanist, logician, and mathematician, arrived in Constantinople to study Aristotle in the original. Here, by supporting the rationality, he fought against the Hesychasts (meaning, the quietists) which was a mystical movement in the Orthodox Church thinking by definition, needing no rational justification. It was interesting that the practices of Hesychasts were similar to dhikr of Muslims. He composed his *Logistica* which consists of six books on computations with integers, ordinary fractions, and sexagesimal fractions. Moreover, he commented upon book II of Euclid. He was the first to write an objective treatise on Stoic ethics and among the first to spread to Italy the knowledge of Greek, since he knew both Greek and Latin languages.

Andronicos III (1328-1341)

1330- Joseph the philosopher died. He composed an *Encyclopedia* which includes the trivium and quadrivium.

1332 - Theodoros Metochites (b. 1270) died. His most famous literary work which was a kind of encyclopedia, is *Hypomnematismoi kai semeioseis gnomikai* (Commentaries and Moral Judgments) consisting of quotations from some seventy Greek authors most of whom wrote on history, literature, and philosophy. However, many chapters of it are devoted to mathematics and physical sciences. With this book he was the first to support for practical mechanics in Byzantium. Besides, he made commentaries on the works of Plato, Aristotle, Euclid, Apollonios the Pergian, Ptolemy, and Nicomachos. While he was interested in astronomy, he rejected astrology which was so popular at his time. He also composed an introductory astronomical treatise in *Almagest*.

John V (1341-1391)

1345 - Manuel Philes died. He wrote a poem which was a description of the elephant, and another poem on the qualities of animals dealing with natural history which describes many kinds of birds, fishes, quadrupeds, and also fantastic ones.

1346- Georgios Khrysokokkes who was studying Persian mathematics at the Academy of Trebizond, and using the translation made by Choniades, wrote a treatise called *An Astronomical System of the Persians* depending on the books brought from Iran. This shows the effects of Muslim scholars on the late Byzantine science.

1351- Nicolaos Rhabdas was born. He wrote two arithmetical letters in 1381 which were quite original Byzantine studies and in one of them it was given quotations from *Arithmetica* of Diophantos. Moreover, he prepared a new edition of the arithmetic after the Hindu method of Maximos Planudes.

1354- Demetrios Cydones (c.1315/20-1400), who was a student of famous philosopher Neilos Cabasilas, and supported the unity of Orthodox and Catholic Churches, went to Italy where he studied the treatises of great Catholic theologians, and translated *Summa theological* (1265-1273) of St. Thomas and some other treatises into Greek. He became a Catholic in 1365 and opened a school in Venice where he taught Greek language and thought to the students from Florence and Venice. He discussed the issue of mortality in his *De contemnenda morte* (The Disdain for Death).

1359 - Gregorios Palamas (b.1296) who was the main leader of the Hesychasts against Barlaam, died. He explained Hesychastic mysticism which was a movement of mystical love toward God and of ultimate union with him, in his *Hagismos Tomos* (Book of Divinity).

1361- Theodoros Meliteniotes wrote a comprehensive astronomical treatise entitled *Tribiblos*, the third book of which was concerned with Persian astronomy, by depending on translations from Persian works, Ptolemy, Pappos, and Theon of Alexandria.

1371 - Neilos Cabasilas died. He wrote mystical interpretations of Christian life and of the liturgy.

1371 - Isaac Argyros who was a disciple of Nicephoros Gregoras, died. He wrote commentaries on the first six books of Euclid and on *Almagest*, a geodesy derived from Heron of Alexandria, a treatise on the astrolabe, and another on the extraction of square roots. His writings also reflect Persian spirit.

1380 - Nicolaos Cabasilas died. He reconstructed the commentary on book III of the *Almagest*, which deals with the length of the year and the average solar motion, by Theon of Alexandria.

1388 - Theodoros Meliteniotes died.

Manuel II (1391-1425)

1396 - Joseph Bryennios (d. 1405) who was a teacher in the patriarchal school, described the moral and intellectual decadence in Byzantium. He complained that medicine was abandoned to Jewish physicians and his own countrymen were dominated by all kinds of superstitions, and continued to teach quadrivium.

1397/98 - Demetrios Cydones died. He was one of the first translators from Latin into Greek and wrote a commentary on *Elements* by Euclid.

1397/1400 - Manuel Chrysoloras indicated the beginning of Greek humanism in Latin World by his lectures on Greek language and literature in Italy.

1405 - Gennadios Scholarios who was the first patriarch under the Ottoman rule, was born. From his youth he tried to establish Aristotle as the standard philosophical authority of the Orthodox Church, and Aristotle became an authority for the Orthodox Church under the Ottoman rule. As an Aristotelian philosopher, he gave courses on Aristotelianism and Neoplatonism, and sought to reconcile Aristotelianism and Christianity. In addition, he wrote résumés of Aquinas's *Summa Theologicae* and *Summa Contra Gentiles*. Moreover, he compiled a book on the faith of Orthodox which was translated into Turkish later by the request of Sultan Mehmed the Conqueror.

John VIII (1425-1448)

1436 - Rabbi Eli Mizrahi who was a Jewish author on scientific and theological matters, was born in Istanbul. He wrote his *Melehet haMispar* (Science of Numbers) on arithmetic and geometry which was later translated into Latin with the title of *Safar haMispar* (Book of Numbers). Moreover, he wrote an astronomical book entitled *Tsurat haArates* (The Shape of the World) in which the shapes of the world and stars were studied.

### Constantine XI (1449-1453)

1450/52 - Gemistos Pletho, who was a great Byzantine philosopher, died. He pronounced the philosophic and religious differences between Plato and Aristotle, and strongly criticized Aristotle's philosophy as being much inferior to that of Plato in his *Peri on Aristoteles pros Platonian drapheretai* (On the Difference between Plato and Aristotle). He had established schools of philosophy in Italy and Greece. As we know, great Islamic philosopher Al-Farabi was also focused on the same matter in the previous ages. Pletho presented a report about social problems to Manuel II, and advised to restore the institutions in Byzantium.<sup>2</sup> When he signed the paper of the unity of Catholic and Orthodox Churches, Byzantine theologians included Georgios Scholarios, who later became the patriarch of Constantinople, and people reacted to him.

He suggested to Cosimo de Medici establishing Academia Platonica in Florence. According to Franz Taescher, German Orientalist, Pletho was not unfamiliar to Ottoman thought and was acquainted with Sufism.

1465 - Sultan Mehmed the Conqueror examined the Greek manuscripts of *Geography* of Ptolemy, and entrusted Amiroutzes with an edition of the treatise for which Amiroutzes's son supplied the names of countries, places, and cities in Arabic.<sup>3</sup> The Sultan who had greatly enjoyed the edition, did not only rewarded Amiroutzes and his son highly, but at the same time promised a further recompense if they would bring out all the books in Arabic. Amiroutzes (d.1475), who was originally from Trebizond, was a palace officer for Emperor David Komneno until the capture of Trebizond by Turks in 1461. He attended to the religious meeting for the unity of Latin and Orthodox Churches in 1452. He had written a paper on spherical triangles by his geometrical and mathematical competence.

1471 - Famous historian Kritovoulos composed an eulogistic history of Mehmed the Conqueror's conquests from the year 1451 to 1467 entitled *Tarih-i Sultan Mehmed Han-i Sani* (History of Sultan Mehmed II the Conqueror) in which the Sultan was praised as a friend for Greek culture, and presented it to the Sultan.

1487 - John Argyropulos died. He spent his life between Italy and Byzantium. After 1453, he taught Greek in Rome and translated some works of Aristotle into Latin.

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2 We would like to mark to the Ottoman socio-political critical literature which started to appear in the second half of the sixteenth century.

3 The first printed *Geography* was appeared in Bologna in 1477 which includes the engraved maps probably by Taddeo Crivelli. The other similar collections were printed in 1478 in Rome by Arnold Buckink, in 1482 in Florence by Francesco Berlinghieri, and in 1482 in Ulm by Lienhart Holle in sequence. However, these prints and the maps inside them lost their currency as geographical explorations have been commenced.

## Conclusion

From this chronological overview we arrived at the following conclusions:

(1) Theological discussions, led by the efforts of the Palaeologues to unify the churches, gave birth to two groups of scholars, one favoring and the other opposing unification. Under the influence of these discussions, the works of St. Augustine and St. Thomas Aquinas were translated from Latin into Greek, and studied in details.

(2) A religious mystical doctrine called “Hesychia” (Stillness) which integrated Neoplatonism into Orthodoxy had been appeared, and gave the dedicated mystic a greater awareness of the divine light.

(3) Some schools, where Greek language and thought were taught, were opened in various Italian cities among which Venice and Florence were the main ones, and thus the Byzantine Greeks helped revive an interest in classical learning in Europe and contributed to the Renaissance.

Greek scholars contributed to familiarity both of Byzantine Greeks to Latin culture by the translations from Latin into Greek and of Latins (Catholics) to Orthodox culture by making translations from Greek into Latin. Thus, they became transmitters between Eastern and Western civilizations. The main figures were Planudes and Cydones for Latin-Greek transfer, and Pietro d’Abano, Chrysoloras and Argyropulos for Greek-Latin transfer.

(4) Byzantine scholars tried to follow the scientific literature of Islamic world, and translated some mathematical and astronomical books from Arabic and Persian into Greek. Among these scholars, who were influenced by Islamic science, were Planudes, Pakhymeres, Chrysokokkes, Rhabdas, Meliteniotes, and Argyros. For example, *Psephophoria kat Indous* (Calculation According to the Indians) by Planudes seems to be important, since it has given Arabic numerals and the operations performed with them in a considerably early period for both Christian and Orthodox Worlds.

It seems that some Byzantine scholars contributed to the Ottoman science by making translations from Greek into Arabic; for example, Amiroutzes translated Ptolemy’s *Geography* into Arabic once more and by doing so, he played a role to attract Turkish scholars’ attention to the science of geography.

It also appears that Ottoman and Seljuk Turks and Byzantine scholars had been affected and formed each other mutually. However, it would be appropriate from the standpoint of historical truth to await for the further studies on history of science + history of philosophy + history of literature, to comprehend and enlighten the general structure of scientific and philosophical interactions between Byzantine and Turkish scholars. It is evident that to create something new in the world of thought is extremely difficult, and intellectual interaction between the societies was more intensive than we had expected.



Since we have presented the story which took place only between 1300 and 1453, the consequences also are current for this period. However, there are histories of thought both for the period of before 1300 and after 1453 and it is possible to show that there had been intense interactions between west and east in Byzantium in both of the periods.<sup>4</sup>

### **Acknowledgements**

It is a pleasant duty to express our gratitude to Sally Ragep, Mine and Huseyin Akbulut for reading our text and correcting a number of grammatical errors. The writers are responsible for all inadequacies in the text.

The English version of this text has been written during the study of Melek Dosay Gokdogan at the library of Oklahoma University with a Mellon Fellow Travelship.

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4 The life story of Dimitrie Cantemir (1673-1723), who was the voivode of Moldavia in 1710 and famous with his *History of the Rise and Decline of Ottoman Empire*, indicates the complexity of cultural interactions among the people who were living under the Ottoman rule. Dimitrie Cantemir, was called "Kantemiroğlu" (the son of Kantemir) by the Ottomans since he was son of Constantin Cantemir who was the voivode of Moldavia and from Nogay Tatars, received a perfect education and learned Latin, Greek, and Slavic at his childhood. He received his music courses from Yeremia Kakavellas of Crete who interested in philosophy and sciences, was acquainted with Byzantine music, and familiar to many languages. Dimitrie Cantemir came to Istanbul in 1688 and stayed here until 1691. Meanwhile he had been elected as a voivode, however, his first office of a vaivode lasted only three weeks. After that he returned to Istanbul and lived there until 1710. He tried to learn, on the one hand, ancient Greek, Latin and Byzantine Orthodox cultures by attending to the Academy in Fanar, and on the other hand, Turkish, Arabic and Persian cultures by keeping on the Palace School. Among his teachers were philosopher and geographer, Meletius of Arta, Yakob Manos of Argos, Alexander Mavrocordato, philosopher Antonio Spandoni, Notara, astronomer and linguist of Arabic, Nefyoğlu, mathematician Esad Efendi from Yanya, and musician Kemani Ahmed Efendi. Beside Turkish, he learned Arabic, Persian, French, Italian while he was living in İstanbul, and after 1711 Russian and old Slavic. He was playing the lute very well, and preferring Turkish music to European one. He was familiar to many politicians and friend of famous painter Levni. Moreover, he tried to follow the developments take place in Europe by means of diplomats, merchants and scholars coming from Europe. For example, he became a friend of French ambassadors, Chateauneuf and Feriol, Holland ambassador Collier, and Russian ambassador Peter Andreyevic Tolstoy. Hence, the case of Cantemir clearly indicates that the issues of histories of philosophy and science are more complex than we expected, and urgent generalizations must be avoided by historians. We need to study comparatively the history of thought both of Byzantium and Ottoman, and to discuss the elements which were connecting the people but not cutting off them as generally done.

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