

Mathematical thought before the fall of an empire: the Cardinal Bessarion's *vita sum numa et arte plato*

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Abstract

An empire is just about to collapse for ever bringing about an intellectual sort of death that is detrimental not only to the nation that suffers the loss of his heart, the Greeks, but also the whole western civilization. In these last tragical moments where survival monopolizes the human existence as a form of self-preservation, mathematical thinking prevails on the mind of a clergy personality. It is the cardinal Bessarion, whose manuscripts scattered in the aristocratic-sometime ago full of Greeks -suburbs of Bosphorus reveal parallel to his love for such a well-structured science another application of mathematics rarely conceived by today educators: oratory and its undoubted power.

Keywords: Byzantine mathematicians, Ancient probability, Cardinal Bessarion.

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1 Introduction

In this paper we are trying sort of turn down the established conviction that Mathematics in the Byzantine Empire has been underrepresented. It is not arguable that in a religion centered state natural sciences were given a second place, mostly out of fear that physical laws, which formed the main object of study, could cause doubt against the fundamental issue of God's existence and omnipotence. Notwithstanding the at times presented severe reaction towards science by the Church, it is also this environment at least in the Eastern Orthodox Church that nourished personalities with a profound zeal for mathematics. What really attracted our attention it is the way that Mathematics was employed in an inextricable way with ecclesiastical oratory and international politics. This wonderful combination took place in the worst time of the empire, when decline was to a certain level inevitable and the whole state was waiting for the adequate tinderbox to collapse. This last culmination of a Byzantine mathematical spirit is attributed to Cardinal Bessarion, to whose well-structured mathematical thinking and zeal we dedicate our work here. A church personality not tacitly admired by his even worst opponents such as Georgios Scholarios, who later became Ecumenical Patriarch and admitted for Bessarion that

Εἶπερ τις τῶν ἄλλων καὶ τὴν πόλιν τὴν ἡμετέραν καὶ τὸ γένος ἅπαν ὠφελεῖν καὶ
κοσμεῖν ἐμελλεν καὶ δικάζων καὶ συμβουλευὼν καὶ διδάσκων καὶ συγγραφόμενος

More than anybody else he is a person whose personality benefits and embellishes our city and our whole nation by judging, advising, teaching and writing.

2 A brief curriculum of Bessarion

A lot of biographies have appeared concerning that great scientific mind that has received such denigration and undermining on the Greek side (Proodos, 1876, Alithia, 1907, Kandelos A. 1864) on account of his personal stance toward the union of the two principal churches, the Roman Catholic and the Eastern Orthodox.

Basilios Bessarion was born in 1403 in the capital of Black Sea Trapezunta today Trabzon in the Turkish language. Coming from a poor family he had limited possibility to pursue further study unless he could ensure the support of the Church, which did happen. Bishop Dositheos acknowledging his talent and according to Ierotheu Jaho (Jaho, I 1909, Glavinas A. 1984) having been impressed by his numerical skills sent young Bessarion to the empire's capital, Constantinople. Although Byzantium had chosen the road of decay without return its center still flourished intellectually and could still nourish talents like Bessarion by instilling into them some portion of its remaining prestige. Finishing his middle studies there he decided to visit Mistra (Paleologos, S. 1926) near Sparta to attend the famous philosophical school established there by Georgios Gemistos Plithon, a Plato advocate but more metaphysically oriented.

When he returned to Constantinople he had earned so far the intellectual prestige necessary to be elected as a Bishop, which was his lifetime aspiration since early childhood. According to Ierotheu he had as a model the great Fotios who had ascended all grades of hierarchy within a week and that was a motivation for the Albanian archbishop to emphasize on Bessarion's life. In the turbulent political scenery of his time he seemed to be a pro-union person believing gradually but adamantly that it was to the benefit of the Byzantine Empire to acquiesce in a union with the Roman Catholics. A stance that left an indelible mark on his name to such an extent that generations to follow either bestowed glory and admiration upon him (Rochol, R. 1904, Hofmann G. 1949) or rejected him and even tried to conceal his writings and, to the superlative form of fanaticism, his existence itself.

Following his beliefs that would never betray whatsoever he supported the union of churches during the Florence-Ferrara Council writing some of the best moments of ecclesiastical oratory. This caused his rejection by the society in Constantinople. After the conquest of this city by the Ottomans, he had to live in Rome where, because of his great accomplishments he enjoyed a life full of honors, appreciation and high social esteem. All this away of his own homeland just to make true once more the biblical adage, according to which no prophet is accepted in his own country. The Roman church embraced him that much that

he was even nominated twice for Pope in 1455 and 1471 (Papyrus Larus, 1964) and he was about to be elected unless a certain plot against him was organized. One year later in 1472 he died leaving his great intellectual heritage to form the nucleus of the famous Biblioteca Marciana in Venice and with sort of tacit desire to see his name vindicated some day in his own country, Greece. We do aim to contribute to his last wish even in a broad mathematical sense.

Before closing this section we should briefly mention that the collection Great Mathematical Redaction of Ptolemaeus (sort of an astronomy gospel that enlightened a lot of people involved in the field) was transferred to Europe at the expense of his own money and efforts. And, last but not least, we should mention his extraordinary endeavour to rebuild from its ashes the famous University of Bologna (Mohler, L. 1949) in Italy, insisting on the necessity of its renowned sciences department and the development of a mathematical language, a pioneering step in the so fashioned nowadays didactics of math. Maybe it is the spirit of Bessarion still present if we judge this school's performance today with Bruno D'Amore (D'Amore, B. 2009) leading its math education curriculum.

3 Highlights of Bessarion's mathematical thought

We were pleasantly surprised when visiting Constantinople (Istanbul today) for a short vacation we bumped into some never published manuscripts attributed to Bessarion and maintained by families in the suburbs of Bosphorus. Bessarion had always a certain predilection for St Panteleimon (Mohler, L. 1942, Migne), a saint recognized as healer by both churches and honored equally prestigiously and to whom Bessarion had dedicated a liturgical hymn. This saint is honored every summer on the 27th of July in a feast that attracts not only Christians of all denominations but also Moslems and Jews of Istanbul (Konstantinidis, I 1992). In the suburb of Kuzguncuk (Bektas, C. 2003) we did feel the pleasure of encountering a Bessarion's hand-written letter that reveals us his profound love for Mathematics.

During the long council hours in Ferrara a diplomatic war unveiled itself by putting down all the pros and cons of the proposed union of churches. Bessarion was the most vocal and forceful proponent of the process. At times much disappointed by the attitude of his adversaries he had to give vent to his frustration by writing down on paper his deliberation over the ongoing talks. In these difficult moments he resorted to that sort of thinking that offered him rationalism and at the same time mental peace, mathematical imagining. He writes

We seem to find ourselves as two lines with no intersection point, not even parallel ones. If we were parallel, it would at least have provided I with the satisfaction that love for homeland surpassed personal aspirations and targets. This is surely not the case.

The Euclidean image is enough to persuade us how he thought mathematically

and induces us to sort of interpret what he meant by that. Of course his views were totally different from those of his opponents, on a line not intersecting his own line. But the image of parallel lines and even failure to follow this graph demonstrates his bitterness for the lack of communication between the two opposing sides. No matter how much they diverged from the proposed policy, they could have been parallel meaning that they could serve the same purpose, to save the empire from the Ottoman danger, following totally different routes. For some reason he fails to mention the term asymptotical, which is not considered as sign of mathematical deficiency but makes us wonder how come he did not mention it. Later on he seems to reveal grounds of advanced geometrical thinking, centuries before geometry schools made their appearance.

Euclid insisted that through a point not on a line only one parallel line can be drawn. If only this could work in human relations. I can see many more lines being drawn that cause me an insuperable confusion. It is really important to be able to institutionalize axioms like the ones employed in Mathematics in our everyday lives, they could undoubtedly simplify situations.

This comment really stroked us and made us go one step further. At this point Bessarion seems preoccupied about the existence of multiple counterarguments, views contradicting his, that seem to be depicted as a set of parallel lines. So there were still moments that the parallel model could function but even then beliefs and approaches were different to such an extent that made him miss the simplicity in the classical Euclidean axiom.

Following as faithfully as possible the trail of his thought we can surely sense a disappointment, which can be ascribed to his conviction that his much desired union of the churches is about to collapse at any time, the way it did occur. Mathematical thinking came into his thoughts in these hard moments of disillusion and had to be employed in his oratory techniques as it is generally stated by his biographers (Jaho, 1909). To us who have served reliability theory one of his comments prepares for the definition of the fundamentals of reliability, the series and parallel systems (Barlow, R and Proschan, F 1981). Bessarion, watching at times how difficult it was to achieve an agreement among the opposing Greek bishops and how detrimental to the survival of our nation that disagreement could be, writes

We need the collaboration and warm heart of everybody present to make our cause succeed. On the other hand one misconception, just one vestige of selfishness can bring about its collapse. How true it really is that this nature followed model seems to be innate to human character.

Finally, we would like to present his pro-probability stance, quite ahead of his time. According to Jaho's writings the notion of fraction and percentage was

quite popular to him when sending letters to the European leaders to organize a new crusade for the liberation of Constantinople. When the concept of the fraction comes to describe what was going on during the pope's election, we do sense a premature concept of probability. Laplace surely did not know Bessarion's probabilistic notion but the French mathematical school under the influence of Jesuit fathers should have known something as it was revealed in a footnote in the *Calculus* written by Lacroix. So when Orsini at the 1471 election manipulated the conglomerate of the Cardinals in a dirty and devious political game, which was so often employed at such an election for the highest position of the Roman catholic church, Cardinal Bessarion presents the situation by throwing some seeds of the centuries later formed probability fraction notion

Si ellos aparecen, mi potencia sera la misma, el numero de mis partidarios no cambiara por el mismo denominador. En el caso de que no aparezcan aparecer mas fuerte y la fraccion sera mas en favor de mi.

It is interesting that this manuscript attributed to Bessarion and preserved in a Turkish city is written in Spanish. It seems that Bessarion enjoyed high esteem on the Spanish side and part of his correspondence was kept in this country as an intellectual treasure. Bessarion should have been fluent in German and Italian, that is why the Pope sent him quite often to deescalate hostility caused by conflicts in the German kingdoms. He seems to have mastered the Spanish language after his failure in being elected Pope in 1455, when the Aragonese Alfonso de Borja was chosen to the throne as Callixtus III. Time elapsed and these valuable manuscripts came to the possession of prominent Jewish families whose tendency to education was renowned. When Jews fled out of the Iberian Peninsula they were munificently provided with privileges to establish themselves in the Ottoman Empire. One of their new locations was the wonderful Asian side of Bosphorus and their concentration point became the suburb of Kuzguncuk. There all ethnic groups maintained such a level of cooperation among themselves that three different religions and cultures coexisted and formed a wonderful community amalgamate that thrived not only socioeconomically but also spiritually till nowadays.

The landlady that provided us with the manuscript is Jewish with a certain love for Greek culture as this suburb has experienced in the past a heavy Greek orthodox presence that would terminate so abruptly. By translating into English we have

In case they appear, my potential will remain the same, the same number of advocates over the same denominator. If they do not I will be more powerful, the fraction will be more for me.

4 Epilogue

Trying to track down what was left from Bessarion's correspondence among prominent Byzantine families and kept with a religious respect by descendants in private collections we came up with a surprising conclusion. Passion for Mathematics was necessary and sufficient to unite four different ethnic groups and three different religions. Turks, Greeks, Jewish and Albanians collaborated under their connecting love toward science and especially mathematics. Moslems, Christians and Jewish followers seemed to cooperate for shaping the mathematical ingenuity of a person that had served the international Christianity of his time on such an advanced level, a step before he could become a Pope. It is really worth to present herewith the characterization in the Albanian language

Nje prifti te madhe= a great priest

that the nowadays descendants of Ierotehu Jaho used while being interviewed at the magnificent village of the Albanian south, Carshove (the Cherry Tree Village) (Haxhi, K. 2003). Ierotehu was a bishop of the Ecumenical Patriarchate, active in the World War I and as soon it was over he was sent by the patriarch as an unofficial Archbishop of a church to be born, the Autocephalous Orthodox Church. In spite of his pioneering job there, his much beyond his time open-mindedness and his unquestionable leadership talent, he finally withdrew to the Holly Mountain of Athos, irrecoverably embittered by the stances of the Greek and Albanian governments. His rich archive was handed partly to a nephew of his living in Greece (Glavinas, 1984) and a certain portion that could not be transferred remained in his own native village of Carshove. Another nephew of his, Starro Jaho, a graduate of the Italian Military Academy and probably one of Hoxha's great obstacles for demanding the state's presidency, had inherited the bishop's intellectuality and love for mathematics. This person did maintain what Ierotehu left behind and especially his mathematical moments that included his work on Bessario's spiritual achievements.

The Albanian state was taken over by a regime hostile to the scientific spirit. It cultivated fear and treason to such an extent that even manuscripts were considered as proof of unaccepted disobedience and had to be kept, or better buried, in inaccessible places. A parallel situation seemed to occur in Istanbul, where the persecuted Greeks had to find as soon as possible a new land to survive and to do so they had to get rid of anything that could incriminate them, including vestiges of their cultural heritage.

Thus Bessarion's remaining correspondence was scattered and what we manage to uncover was dugged out through innumerable interviews with living history, persons who have lived in very turbulent political times and written history by just being there without knowing it. Thanks God things nowadays have settled down a lot and as we wrote above the insatiable scientific thirst did work its miracle.

We are grateful to these families of the Istanbul suburbs of Cengelkoy, Bebek and Kuzguncuk for spending their valuable time revealing us this the unexplored side of social history and history of mathematics. And we are also grateful to the inhabitants of Carshove who, despite their extreme poverty and lack of freedom, maintained their intellectual wealth and their traditional love for mathematics.

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