

## Alexandre Joseph Hidulphe Vincent on George Gemistos Plethon

### Abstract



George Gemistos Plethon's work in all its dimensions has attracted many scholars across the ages. One of those scholars was Alexandre Joseph Hidulphe Vincent, a French mathematician and erudite, who in the first and the only critical edition of Plethon's *Book of Laws* by C. Alexandre in the nineteenth century, added three notes on his calendar, metrics and music, as he could reconstruct them from the ancient text. Vincent's calculations were dictated by the main scientific thought of his time, which was Positivism, and through this he thus contributed to the elucidation of some practical aspects of Plethon's metaphysics. The results of meticulous calculations of the Plethonian calendar,

metrics and musical modes show that the scientific spirit, which started appearing in the last days of Byzantium and during the Renaissance, was not only a revival of Antiquity, but an innovative attempt at explaining and being in accordance with the social demands and the physical reality of the time, both being understood as an extension of the metaphysical order. Vincent's positivistic approach allows considering the impact of Plethon's system in a postmodern perspective.

**Keywords:** Metaphysics, Mathematics, Positivism, Calendar, Metric, Music, Byzantium

**Photo:** Alexandre Joseph Hidulphe Vincent

### Contemporary rediscovery of A. J. H. Vincent

While the work of Alexandre Joseph Hidulphe Vincent remained in obscurity for a century and a half, there has been, in the past few decades, a renewed interest in the special contribution made by him to mathematics, which helped modern scientists to find an efficient solution to an old mathematical problem. Especially, his study "Sur la resolution des equations numeriques" in the *Journal de Mathematiques Pures et Appliquees* in 1836 was used again in 1976, when the "continued fractions real root isolation algorithm" was introduced, for a new solution to the polynomial equation (Akritas, 1976-2010, Vigklas, 2006-2010). The use of Vincent's solution to this algorithm brings the old French mathematician and polymath into the spotlight again.

But who was Alexandre Joseph Hidulphe Vincent? He was born in Hesdin (Pas – de – Calais) in France on 20 November 1797, and studied in the college of Donai and Amien. He passed the examinations for the Ecole Normale in 1816, from which he graduated in 1824, with the title of *agrégé*. Then he taught physics, chemistry and natural history in the Royal College of Reims. His first publication was in 1824 in the journal *Annales de mathematiques*, a remarkable study under the title: “Considerations nouvelles sur la nature des courbes exponentielles et logarithmiques”. His book, *Cours de géometrie élémentaires*, was famous and was approved by the University, and went on to produce five further editions. In 1825 he published the *Dialogue sur la loterie*, which was honored by the Société des Morale Chrétienne. Soon he was called to Paris to teach in different colleges, in Rollin in 1826, Bourbon in 1830, and Saint-Luis in 1831 (in the latter he was named as a professor in special mathematics). In general, he published more than ninety studies on Geometry, Mathematics, Physics, Music, Archeology, Philology, Prosody, History, Geography, Philosophy, Criticism of Literature, and other scientific areas. He became a member of the Legion d’ Honneur, of the Académie des Inscriptions de Belles Lettres in 1850, and of many other orders, societies, and many academies of foreign countries, before he died, on 26 November 1868 (Vapereau, 1858, 1737-1738, Resbecq, 1869).

Though the main subjects of his investigations were included in the field of the history of science, he elucidated many aspects of the Ancient, Neoplatonic and Byzantine philosophy, as he studied the works of Heron the Alexandrian, Pappus the Alexandrian, Neron the Alexandrian, Bacchius, Proclus, George Pachymeres, Michel Psellos, Aristide Quintalianus, Plato, Augustine, Pythagoras, Boethius, Julius the Africanus, Eratosthenes, Euclides etc. In what follows, Vincent’s mathematical calculations of the Byzantine scholar’s calendar, metrics and music, as are included in the above book, are outlined, in order to show their historical significance for Byzantine thought and the history of science.

### **Vincent’s three notes on the Plethonian calendar, metric and music**

In the important critical edition of Plethon’s *Book of Laws* by Charles Alexandre, published in 1858, Vincent contributed with three notes on Plethon’s calendar, rhythmic and metrics, and musical modes (Alexandre – Pelissier, 1858, 444-470, Woodhouse, 1986, 316-379). Also, he cited a small annotated and translated text of Plethon, regarding the metrics (*kefalaia atta logōn mousikōn*), which he had discovered in the Bibliothèque Impériale of France (Vincent, 1849, 234-241, Hunger, 1994, 428, Benakis, 2002, 179-186). Vincent’s analysis does not remain within the metaphysical elements of Plethon’s *Book of Laws*, but describes the positivistic structure of time, metric and music, inherent in his metaphysics. This structure is not useless or secondary, but constitutes the practical foundation for metaphysics’ application to everyday life. Without the calendar, the rules of metrics, and the harmony of music for the recitation of hymns, the Plethonian liturgy could not function properly, and the beneficial communication with the divine would fail. Those practical rules for the calculation of time and liturgy were as vital links in the hierarchy of the genera of beings, as they connected the sensible with the intelligible. Without this practical structure, Plethon’s metaphysics would be incomplete, and the salvation of his country could not be accomplished according to his final inapplicable plans.

In the first note, Vincent presented the Plethonian calendar (Anastos, 1948, 183-205, Kandz, 1950), 199-210), which he supposed was based on the Athenian calendar, except that in the former, the solstice starts in the winter. The years have twelve months, but under the condition that one thirteenth month is inserted seven times every nineteenth year (the metonic cycle). He examines in detail the innovations of this calendar, which is solar-lunar, the days, the weeks, the months and the years. The weeks of Plethon start constantly every month, with the addition of one or two complementary days after four weeks have elapsed, to reach the beginning of the following month, and related in that manner approximately to the phases of the moon. The first day of the month, begins at midnight after the new moon, and for that it is named the noumeny (the new moon), which was hieromeny (a holiday) – with six days 2, 3, 4, 5, 6, 7 which are followed by a second hieromeny, starting by the eighth day of the month, and after the first week, which was called the “beginning week”. From the second hieromeny the second week started, called the “average week”, of which every day could be counted by downgrading from the eighth day, and numbering 7, 6, 5, 4, 3, 2 and 1. The dichomeny or the middle moon includes the second and the third week, which is called the “waning week”, before the month ends with the last week. That month is a hollow month, of twenty nine days, and the last day was called ἔνη καὶ νέα, that is moon both “old and new”. If there was a full moon of thirty days, that is the new moon after the twenty nine days, that name is transported to the thirty-day name.

As for the calculation of months, it always starts from the midnight of the sun-moon conjunction. For the succession of the months, if each lunation was exactly 29 days and a half, the months would be perpetually of 30 and 29 days alternately. But the lunation average is in reality of 29 days 12 h 44' 2", 9, or in round numbers, 29 days 12 h 45', giving three quarters of an hour longer, but one small error of 57", 1, less than a minute, which if it was considered in isolation should be repeated 1,500 times to make an entire day, and consequently could produce one day's error on the calendar at the end of 1,500 lunar months or after about 120 years. If the lunation is supposed to be *three-quarters* of an hour longer than 29 days and a half, the full months will be more frequent than the hollow months. In fact *three quarters* of an hour, form exactly the thirty-second part of a day, so, it follows that 32 lunar months have an exact number of days, namely 945, which are decomposed into 17 times 30 plus 15 times 29.

As a complement to this, Vincent produced a table with twenty months, to which he added these calculations, pushing them for up to 20 months. He defined the first two consecutive months of 30 days, because he assumed that the first new moon, from which the origin must be dated, falls at midnight, which always happens for the rest of the new moon in a certain place on the Earth or rather for a certain determined meridian. After these first two months of thirty days, the others are alternately full and hollow up to the sixteenth and seventeenth months (that is to say to the 30 and the 40 of the second year), which are also both full, and from those two later, the regular alternation would continue until the thirty-second month (or the 70 of the third year), which is a hollow month, and at the end of which the new moon occurs at midnight, as at the beginning of the first month. The thirty-third month begins as in a series as in the first and so on indefinitely or for 120 years at least, without alteration or error other than the determination of the initial point.

The calculation by Vincent of the Plethonian year is made in comparison to the Julian year. The Plethonian cycle of the nineteenth years starts from the year which would start the day after the solstice, and the leap years are the 4, 8, 12, 16, 20 etc. The first year starts at midnight, some moments after the solstice, and the twelve next lunations form an ensemble of 354 days and 9 hours; the twelfth conjunction falls eleven days before the solstice of the next year, and it cannot consequently start in a new year. The thirteen year consists of a) the eleven days that remain between the end of the twelfth month and the solstice, and b) the days that remain after the solstice in order to reach the new month or the first month of the next year, which may not begin until January 10, the day after the new moon on the thirteenth and twentieth day after the solstice. These, later, are the intercalary days. But off course, as Vincent observes, the movement of the moon is far from having reached the regularity that the writer describes in his tables, especially due to the variation of the distance of the Earth from the Sun. Thus, the Plethonian lunar-solar calendar is established on the value of the lunar month average, as the most suitable method. So, according to the metonic circle, since there is a thirteen month, among the nineteenth years of the circle, seven embolismic years should be added, and the new moon which defines the end of the nineteenth year falls 20h and  $\frac{1}{4}$  in the same day that begins the New Year. The Plethonian calendar was never practiced in reality, thus the calculations concerning it are characterized by a degree of approximation.

As one can see, Vincent accepted Plethon's intercalation of the metonic circle of the *enneakaidekateris*, which was introduced by the Athenian astronomer Meton, in 432/2 B. - C., and which required the intercalation of a thirteen month for seven years in every nineteen. At this point Milton Anastos raised an objection, saying that Plethon is not implausible as he would have rejected the inaccurate *octaeteris*, of the 8-year circle, the Callippean 76-year circle, or the Christian form of *enneakaidekateris* (the 532-year circle = 19 x 28). But if he had studied Ptolemy's *Mathematike Syntaxis*, it is difficult to see why he would have repudiated the Hipparchan 304-year cycle, with its extraordinarily accurate computations for the length of the solar year and of the lunar month (Anastos, 1948, 202). The lost sections of Plethon's chapter on the calendar would undoubtedly have been explicit on this specific problem. As it is, however, since the intercalation of a thirteenth month approximately every three years would have been required whether Plethon had depended upon his own astronomical observations or upon any one of the principal lunar-solar cycles, he cannot be sure which of these two expedients he preferred. Consequently, Anastos reaches the conclusion that Plethon's New Year date, based upon observation, would not differ appreciably in any one or two *enneakaidekaterides* which Vincent calculated (Anastos, 1948, 204).

Regarding the metrics and rhythmic, Vincent remarked on the acceptance that the long syllable can have more than two musical times, in accordance with the doctrines of antiquity. In the heroic verse the foot starts with the *thesis* (foot down), and finishes with the *arsis* (foot up), in contrast to Aristoxenus, Diomedes, Sergius etc. for whom the opposite was more reasonable. Vincent approaches the doctrines of Plethon through the theory of Saint Augustine, who added at the end of the hexameter verse a *silence* of two times, equal in duration with a long syllable, and which reunifies this silence with the last syllable of the verse in order to compose one rhythmic spondee; then, it forms one anapest with two short syllables of the last

dactyl, and the first long not of the last spondee, continuing in the same way, and following a retrograde course. Vincent, in order to answer the question as to whether the *arsis* corresponds to the fort sound, and the *thesis* to the light sound, or vice versa, goes back to Marius Victorinus, who says to the contrary that *arsis* is soundless, and that *thesis* is full of sound. The same correspondence was applied to Virgil, and the poets of the School of Alexandria.

The musical modes of the Plethonic liturgical system, according to Vincent, are phrygian, dorian, hypophrygian and hypodorian, which correspond respectively to the octave of re, mi, sol and la. The French mathematician tried to find the real correspondences of Plethon's musical modes to the ancient music, but also to the ecclesiastical music, which was known in his era. Thus, according to him, the real ancient notes that Plethon used, and which are not in correspondence with the preceding four modes, are the note re for the hypodorian, the note mi for the ancient mixolydian (which Vincent identifies with the dorian of Plethon, irrelevantly if there are now two notes under the same name), the note sol for the Phrygian, and finally, the note la for the dorian. The four modes have a special function, since they are attributed to different levels of being: 1) the hypodorian is attributed to Zeus, which is our minor mode; 2) the hypophrygian is attributed to the Olympian gods, and is equivalent to the major mode without a sensible note; 3) the Phrygian is attributed to the inferior gods, and the minor mode with a major sixth; 4) the dorian, which coincides with the ancient mixodylian, refers to the mystic mode as it is known in the Latin Church. According to Vincent, Plethon rejected the chromatic and enharmonic genera of the Ancient Greeks, as the nuances of the diatonic genus, which are different to the diatonicity, the only one admitted to by Plato. The general historical conclusion is that Plethon's system was composed by the noblest modes of Ancient music.

Anastos, ninety years after Vincent's notes were formalized, parallelized Pletho's hymns included in the *Book of Laws*, with the pedantic hymns of Proclus, pseudo Orpheus, and Julian. He agreed that each of the hymns was to have been accompanied by music, the range of which was limited to four modes, bearing the ancient names in adverbial form (ὑποφρυγιστί, φρυγιστί, ὑποδωριστί, δωριστί). Anastos repeated Vincent observations that the nomenclature of Plethon's music was derived from his studies of Aristoxenus and Aristides Quintilianus, and had some affinity with the section of the *Republic* (3, 398E – 399C) of Plato. But he concluded that Plethon imitated the Greek rites, as was the Byzantine liturgical practice, of the eight sounds of the Christian liturgy, which Manuel Bryennius and John Cucuzeles in the fourteen century had already equated with the eight modes of their pagan forbears (Anastos, 1948, 267-8 and note 428).

The aspects of the Plethonean work elucidated by Vincent were necessary for the function of the pagan liturgy which Plethon had imagined and composed via the use of many Greek sources. This is also proved from the fragment of the *Book of Laws* containing the calendar which occurs in the chapter entitled περὶ θεῶν θεραπειᾶς. This fact in itself shows that Plethon regarded, as did the ancient Greeks, the calendar as intimately bound up with the cycle of religious festivals (Anastos, 1948, 192). The defining of five daily prayers and twenty-eight hymns, guided by the example of pagan literature, in which prayers and hymns abound, were composed for the use of the subjects of the ideal state. These propositions were never applied, as it

is well known, on a general level, because of the dangerous and fluid social and political situation of the last years of Byzantium. However, it is testified by historical sources, that a secret society (θίασος) (Wilson, 1994, 106-108) had probably been established, a characteristic member of which was Iouvenalios, whose life had a tragic end, and who can be considered as a martyr of the movement (Constatelos, 1999). Thus, this reformation of the calendar, metrics and music in the last years of Byzantium could have been applied on a small scale inside this secret society of the philosopher's followers.

### **An interpretive perspective on Vincent's notes**

Vincent's notes, observations and calculations aimed at clarifying the above fields of knowledge, as were developed by the philosopher of Mystra. His scope was of course scientific, and this is why he meticulously examined Plethon's systems of the calendar, metrics and music. Being a mathematician and a scholar at the same time, Vincent's interest falls on the aspects of Plethon's work which were close to the scientific and positivistic spirit, as spread widely during his century. The way in which he analyses the structures of Plethon's efforts to constitute a corpus of knowledge is very important, as he tries not only to imitate the erudition of the ancient philosophers, but to revive them in his time. It is well known from Plethon's biography of the tireless and repeated efforts he made to find a solution to the problems the Byzantine State had to deal with. It was from those exact efforts that his scientific vision was encapsulated, that brought about the real enlightenment of the Byzantines, and the path out of their historical, social and economic crisis was through their baptism in the reviving waters of this ancient wisdom.

Vincent does certainly remain holding this plausible conclusion. He agreed that Plethon aimed at the revival of ancient Greek culture, and he examined Plethon's work from the inside, working as much as a historian of science, following the scientific ideals of his time, and showing in part the differences and the similarities with Plethon's predecessors – as Milton Anastos would do later. Vincent's special interest was in the way Plethon solved the abstract and mathematical relations between the elements of reality, for the creation of a sustainable calendar, a new metric for the expression of poetic meaning, and more successful musical modes. Though the Neoplatonic philosopher used the ancient terms and ideas for the reform he tried to bring into his society, he applied to them the new content dictated by the conditions of his era. In this sense, the work of Plethon was an attempt to give an answer to the real social and spiritual problems of the Byzantines, who were confronted with a serious and catastrophic crisis after one thousand years of their Empire's history. Auguste Comte, who was a positivist philosopher in the nineteenth century, influenced Vincent's thought, and as Plethon, intended to bring a social reform, based on scientific criteria. Also, Comte had a project for the *Religion of Humanity*, a Positive Church that would provide the scientific-humanist equivalent to what systematic theology had been in the high Middle Ages (Wernick, 2003, 2); Plethon analogously planned to implement a "religion of ratio" through the "common notions" (Bargeliotis, 1980, 43). Vincent's positivist approach may reinforce the view that Plethon's goal was not just antiquarian, but practical as well. That Plethon aimed at finding a correspondence of the Neo-platonic hierarchies with the sensible realities, via the forming of new scientific tools, cannot be ignored; he gave a boost not only in the way of perceiving the real, but also of handling it. This connection is useful for

establishing a pragmatist perspective (Kolakowski, 1976, 174) on the way Plethon's work should be interpreted.

Vincent in his calculations, even if he focused on the relations and analogies in Plethon's structures, succeeded in illuminating some aspects of the history of ideas and science, which refer to the changes that Plethon intended to apply to the society of Byzantium. Plethon tried to combine the Neo-platonic pagan beliefs and knowledge with the scientific spirit and method. Consequently, Plethon's plans for reform were not consisted only of idealistic constructions. Plethon's intellectual changes implicate a dramatic historical situation, when everyone and everything changed quickly. If the Byzantine people had returned to the pagan past of Ecumeny, they would have found a path out from their problems, only by reinterpreting the ancient knowledge through a new perspective. The Plethonian work lacks intellectual vacuum and emptiness, it is not even a romantic and regressive ideology, filled with nostalgia of a mythical pagan era. Vincent's analysis shows a scientific innovative spirit which is in dialogue with reality, and for which the return to the past is the only solution, but only under certain presuppositions; according to Plethon, the real solution for the Byzantines was to confront their difficult problems, having coolness of mind, without emotional entanglements in the doctrine, especially if these were coming from the Christian Church (Dedes, 1975-76, 424-441).

The Plethonian combination of intellectualism and pragmatism was an intense and superhuman effort to awake the Byzantines, to surpass the religious defeatist fatalism, according to which the end of the Byzantines was coming due to the sins before God. Plethon avoided being trapped in the belief of an inescapable fate since human being is in the "methorion", in the border between the sensible and the intelligible realm, maintaining the hope to ascend in the ontological and axiological scale. In the end of the Middle Ages, the ideal of anagoge (ἀναγωγή) of the whole sensible world to the intelligible, did not remain tied to the religious other-worldliness. It changed towards an art of life, when most of the metaphysical and scientific theories dealt with the cultivation and the development of the individual (Burckhardt, 1961 (1860), Part II). If for the Byzantine thought the distance between the two levels, the sensible and the intelligible, grew larger, for the Westerns diminished. The effort for the unification of these two levels is evident in Plethon's work, if inside his normative and educational program the reformation of the calendar, music and rhythm is included. Thus, our point of view is that Plethon aimed at reviving the ancient Greek doctrines and the ancient way of life, but not as they were exactly, and in distinction to Christianity, in connection with a scientific, educational and normative transformation of life. Consequently, utopianism, as an indispensable element of his thought, is not so much enlarged as it has been written, and it has meaning only in a pragmatist framework. As the Plethonian thought was on the boundary of transition from the closed worldview of Antiquity and the Middle Ages to the open universe of Modern Times (Koyre, 1957, ch. V), primarily referred to a metaphysical ontology. But Plethon's platonic Realism was not a groundless metaphysics; it could be tested in relation to the sensible reality, in the interpretation and change of which it intended.

Plethon's philosophical goal is the Platonic Good as the true knowledge, but without neglecting the change of the totality of the way of living. The concept of infinity which had no position in the Platonic world of ideas, more intensely and

openly in the work of Plethon, found its culmination, not only in the Neo-platonic One or in the Christian God, but in the possibility of attainment of truth and perfection. The possibility of practical implementation can be regarded as an expression of the will for power in the sense of the transfiguration of human existence. Vincent's interpretation revealed not only the way Plethon conceived the world, but also his planning for the organization and normalization of life. Behind his hierarchical paganism there is an ontological level that generates and forms the sensible world, which is destined to return through the climax of Being into the place of truth. But in order this truth not to be conceived as a private reverie, has to find its immediate correspondence and similarity in the world of action. The world of spirit in order to be materialized should include every aspect of human life, to spiritualize it, conquering the reality. The perishable human nature cannot stay as it is; it has no right to be perished. The big challenge is to become a collective consciousness, finding a similarity with the metaphysical and astral order. Every aspect of this world should reflect the supersensible world, neither as a substitute, nor as duplication, but through an ontological verification: its value is dependent on the way it imitates the ideal state of being. Nothing can exist for itself, the human actions have to be rational, and this is the only way to sociability. The scientific goal of Plethon is the transformation of life according to the eternal ideas, but the homogeneity of action is not an end in itself, it always has to refer to the infinity of possibilities opened to the world of senses.

Man is included in this organization of the way of life in order his consciousness to be controlled. The process of individualization passes through the complexity of the Plethonian structural hierarchy, and the action is its necessary outcome, as it is the formation of interiority. Through his positivism and erudition, assisted by his mathematical methodology, Vincent interested in the empirical realities of Plethon's work and perhaps unintentionally unfolded the ideal development of the subject in the pagan intellectualism of the latter. The human existence was determined externally in order to be determined internally. It is not just essentialism, definition of the general types in the most perfect degree (ἐπόμενοι θεῶν κατὰ τὸ δυνατόν ἄνθρωποι) (Plethon and Tambrun-Krasker, 1987, 1); the aim is the elimination of the differentiation. Although as regards the human subject is given the promise of openness to the diversity and multiplicity that implies the world of matter, at the same time in absentia of the subject its objectives is established.

The mathematization of the Plethonian work could so easily lead to mechanization, as happened at the time of Vincent. Thus, the individuals, although they are ensouled entities, are confused with the objects, and they can see themselves mediated by the world of a hierarchy and a logical structure. The natural and social beings in their becoming are deprived of their autonomy, obtain meaning as othernesses. The ultimate otherness for Plethon is God or Zeus, which allows the soul to move within an organized framework, and gives the *raison d'être*, the cause and the purpose, without which the world would be meaningless. The genesis and the end of the world are opened to eternity. The infinity is the horizon of sensible beings, and at the same time it is beyond the intelligible reality. Now, as regards the axis of Vincent's methodology were the classification and an endless chain of calculations, not the contemplation and the reflection on the metaphysics and the ultimate. He was not interested in connecting the results of his detailed calculations with a meaning of existence (Kolakowski, 1976, 11-19). Only the human beings can give meaning to the results of positivistic research, and to the events of the historical becoming. Although

according to Positivism any positive existence is always in reference to something else, this should be also positive, empirically checked. In this respect, the Positivism of Vincent meets the postmodern project of a “history of problematization” (Foucault, 1984). The classification and the organization of forms are *sine qua nons* in his epistemology. He is not interested in an ontology, but in a morphology. The existence of beings does not emanate from the Forms or Ideas, platonically understood, but it is considered as a system of relationships between factors, numbers, distances, modes, natural realities, phenomena.

Consequently, the difference between the subject and the object has no meaning. If the real Being in Plethon’s work is the intelligible world, in Vincent’s work it is the world of numbers. For Plethon the truth of individual consciousness is related to the pantheon of paganism, which is viewed as an objective order of meaningful types, in the extension of, and inside the sensible world; for Vincent, the reality is truthful, if it is reduced to its abstract components. The point of their convergence is not only the historical, the scientific, the human affairs, and the metaphysics; it is the effort to define a symbolic and timeless order, where there is no difference between the way of thinking and the way of life, in a utopia where there is no difference between the thinking subject and the object of thought.

Thus, Plethon’s Platonic Realism and Vincent’s Positivism converge at another point, in the postmodern era, in the light of the symbolic order (Deleuze, 1972). In the space-time, these three points that are the fifteenth century of Plethon, the nineteenth century of Vincent, and today’s later Postmodernism, can be connected in a form that would resemble a trihedron, each one epoch corresponding to each of its sides. In the symbolic realm, what counts is not only the distinction between the sensible and the intelligible or transcendental, but the structural relations, the typical characteristics, the production of forms; it is a condition under which the essence has no meaning in itself, but only in connection with the form, or the form remains empty.

### Epilogue

Vincent’s work suggests his intense attention to detail and the responsible way in which he interpreted the above-mentioned scientific subjects. Some unknown dimensions of Vincent’s works have only come to the surface today, such as his polynomial real root isolation algorithm along with other information of the distant and near past. Though today there are an incredible number of studies on the disciplines with which Vincent occupied his mind, due to an increasing specialization, he gave to the scientific community the valuable results of his erudition, and he can be considered as a pioneer of the history of science in Byzantium. The French erudite and mathematician undertook the effort to study some scientific aspects of Plethonian work, which were as significant for Plethon as they were for his own era, and they are still significant today. He was a scholar, whose reception of the Plethonian work, was influenced by the historical conditions of his time and his place. Under the influence of the positivistic spirit of the nineteenth century, he brought to light the calendar, the metrics and rhythmic, and the musical modes described by Plethon, in which we can see, except for a revival of the ancient Greek culture, a development of science and of the individual, the outcome of which was the intellectual atmosphere of Modernity, and of the later Postmodernity.

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## BIBLIOGRAPHY

Akritas, 1976, A. Akritas, Polynomial real root isolation using Descartes' rule of signs. *Proceedings of the 1976 ACM*.

Akritas, 1978a, "Vincent's theorem and Akritas' polynomial real root isolation algorithm". *Proceedings of the North Carolina Academy of Sciences*. In: *Journal of the Elisha Mitchell Scientific Society*, Vol. 94, No. 2, 95, 1978.

Akritas, 1978b, A new method for polynomial real root isolation. *Proceedings of the 16-th annual southeast regional ACM conference*, Atlanta, Georgia, 39-43, April 1978.

Akritas, 1978c, "A correction on a theorem by Uspensky". *Bulletin of the Greek Mathematical Society*. Vol. 19, 1978, 278-285.

Akritas, 1978d, On the forgotten theorem of Mr. Vincent. *Historia Mathematica*, Vol. 5, 1978, 427-435.

Akritas, 1978e, A short note on a new method for polynomial real root isolation. *ACM-SIGSAM Bulletin*, Vol. 12, No. 4, 1978, 12-13.

Akritas, 1978f, *Vincent's theorem in algebraic manipulation*. Ph.D. thesis, Operations Research Program, North Carolina State University, Raleigh, N.C., 1978.

Akritas and Vigklas, 2010, A. Akritas – P. S. Vigklas, Counting the Number of Real Roots in an Interval with Vincent's Theorem. *Bulletin Mathematique de la Societe des Sciences Mathematiques de Roumanie*, Vol. 53 (101), No. 3, 2010, 201-211. See: <http://inf-server.inf.uth.gr/~akritas/publications.htm>

Anastos, 1948, Milton Anastos, "Pletho's Calendar and Liturgy", *Dumbarton Oaks Papers*, Vol. 4, (1948), 183-205.

Bargeliotis, 1980, Λ. Κ. Μπαρτζελιώτης, *Η κριτική του Αριστοτέλους παρά Πλήθωνι ως έκφραση του αντιαριστοτελισμού κατά τον ΙΕ' αιώνα*. Ίδρυμα Ερεύνης και Εκδόσεων Νεοελληνικής Φιλοσοφίας, Σειρά «Έρευνα» - Αριθμ. 1. Εκδίδεται υπό την διεύθυνση Ε. Μουτσόπουλου, Αθήναι 1980.

Benakis, 2002, Linos Benakis, in *Texts and Studies on Byzantine Philosophy*, Παρουσία, Αθήνα 2002, 179-186.

Burckhardt, 1961 (1860), *The Civilization of the Renaissance in Italy*, S.G.C. Middlemore, New American Library, New York, Part II. The development of the Individual

Constatelos, 1999, D. Constatelos, *Christian Hellenism. Essays and Studies in Continuity and Change* Publishing by Aristide D. Caratzas, New Rochelle, New York & Athens 1999, Chapt.: A Conflict between Ancient Greek Philosophy and Christian Orthodoxy in the Late Greek Middle Ages.

Dedes, 1975-6, Δ. Δέδες, «Θρησκεία και πολιτική κατά τον Γεώργιο Γεμιστό-Πλήθωνα», *ΦΙΛΟΣΟΦΙΑ, Επετηρίς του Κέντρου Ερεύνης της Ελληνικής Φιλοσοφίας* 5-6 (1975-76), 424-441.

Deleuze, 1972, « A quoi reconnait-on la structuralisme? », F. Châtelet (ed.), *Histoire de la Philosophie*, tom. 8: *Le XXe siècle*, Hachette, Paris 1972, 299

Hunger, 1994, H. Hunger, *Βυζαντινή Λογοτεχνία. Η λόγια κοσμική γραμματεία των Βυζαντινών*, τομ. Γ', Μ.Ι.Ε.Τ, Αθήνα 1994.

Foucault, 1997 (1984), M. Foucault, Interview: "Polemics, Politics and Problematizations", in *Essential Works of Foucault, 1954–1984*, Vol. 1, Edited by Paul Rabinow, Transl. Lydia Davis, The New Press, New York 1997

Kandz, 1950, Solomon Kandz, "The Calendar – Reform of Pletho: Its Significance and its place in the History of the Calendar", *Osiris*, vol. 9, (1950), 199-210.

Koyre, 1957, Alexandre Koyre, *From the Closed World to the Infinite Universe*, The John Hopkins Press, Baltimore 1957

Kolakowski, 1976, L. Kolakowski, *La Philosophie Positiviste*. Trand. Claire Brendel, Denoël/Gonthier, Paris 1976

Plethon, 1858, *Pléthon Traité des Lois*, par C. Alexandre et A. Pelissier, Librairie de Firmin Didot Frères, Fils et Cie, Paris 1858, 124. New edition by R. Brague, J. Vrin, Paris 1982.

Plethon and Tambrun-Krasker, 1987, Γεώργιος Γεμιστός Πλήθων, *Περὶ Ἀρετῶν*, Georges Gémiste Pléthon, *Traité de Vertues*, Edition Critique avec Introduction, Traduction et Commentaire par Brigitte Tambrun-Krasker, *Corpus Philosophorum Medii Aevi: Philosophi Byzantini - Βυζαντινοί Φιλόσοφοι* 3, Αθήναι – Ακαδημία Αθηνών, Athens- The Academy of Greece. E.J. Brill, Leiden- New York – København – Köln 1987

Resbecq, 1869, Comte Eugene Hippolyte Marie Theodore Fontaine de Resbecq, *Notice sur la vie et les travaux de feu M. Vincent*, L. Danel, Lille 1869.

Vaperau, 1958, Gustave Vapereau, *Dictionnaire Universel des Contemporains, contenant toutes les personnes notables de la France et des pays étrangers*. Librairie de L. Hachette et Cie, Paris 1858, 1737-1738.

Vincent, 1847, A. J. H. Vincent, *Notice sur divers manuscrits grecs relatifs à la musique, la deuxième partie du tome XVI des Notices et Extraits de Manuscrites de la Bibliothèque du Roi et autres Bibliothèques*, Institut Royal de France, Imprimerie Royale, Paris M DCCC XLVII, 234-241.

Wernick, 2003, Andrew Wernick, *Auguste Comte and the Religion of Humanity. The Post-Theistic program of French Social Theory*. Cambridge University Press, Cambridge 2003