

## **Natural philosophy and alchemy in the Byzantine period: a controversial relationship<sup>1</sup>**

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### **Introduction**

This presentation is a part of a research project in progress about natural philosophy, sciences and alchemy in the Byzantine era. The paper addresses a significant void in the current historiography of science by surveying and mapping a previously unexplored area: the relationship between alchemy and natural philosophy in the Byzantine era. Our study is based on the examination of the life and works of the scholars who presented works on both natural philosophy and alchemy.

There are a lot of difficulties in the study of the relation of byzantine natural philosophy and science. Firstly, the sources are very few and fragmentary. Secondly, philosophy, the arts, and technology were not separated by clear boundaries, as the surviving sources reveal. So, a clear definition, although is necessary, is very problematic. In addition, the more one takes into account the differences among texts, contexts, and even social roles of the Byzantine thinkers, the more one realizes how multiform this tradition is.<sup>2</sup>

Anyway, in this paper the texts under the term “natural philosophy” are the ones having as a main subject the study of nature and the physical universe. Byzantines usually used the terms *physica*, or *physiki akroasis*, according to Aristotle, or natural science<sup>3</sup>, or *physikos logos* (discourse about nature) according to the definition by the *Suida Lexicon*, from 10<sup>th</sup> century, where we are reading: “discourse about nature by philosophers, i.e.

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<sup>2</sup> Trizio Michele, “Byzantine Philosophy as a Contemporary Historiographical Project”, *Recherches de Théologie et Philosophie Médiévales*, vol. 74, 2007, p. 247-294

<sup>3</sup> As Michael Psellos wrote: “[Aristotle] was the first which intentified the natural science” («[Ὁ Ἀριστοτέλης] τὴν φυσικὴν πρῶτον ἐπιστήμην ἀκρίβωσαι»), Boissonade J.Fr. (ed.), *Michael Psellus, De Operatione Daemonum*, Norimbergae 1838, p. 163.

about bodies, principles, elements, about universe and space and vacuum” etc.<sup>4</sup> On the other hand, for the alchemy in Byzantine texts the term in use was “chymeia” (χυμεία or χημεία) and its definition, again by the Suida Lexicon, was the following: “the making of silver and gold, which the relative books burned by Diocletian” (here the Lexicon referred to Greco-Egyptian alchemical texts).<sup>5</sup>

### **Alchemy in Byzantine era**

Greco-Egyptian alchemical tradition, according to different types of sources, was familiar to the Byzantine scholars from the early period. There are references to alchemy in theological, historical or scientific texts, etc. For example, Aeneas of Gaza, a Neoplatonist philosopher who became a Christian, and lived in the 5<sup>th</sup>-6<sup>th</sup> centuries, in his dialogue entitled *Theophrastus* about immortality of the soul and the resurrection of the body, accepts the principle that the change of matter is possible and uses as an example the making of gold from cheaper metals, such as silver and tin. Aeneas says that in the same way the bodies are joined with the souls.<sup>6</sup> According to Aeneas, the alchemical process changes the *eidōs* (form) of matter.

Six centuries later, in the late eleventh century, in a poem entitled *Dioptra*, which is in the form of a dialogue between body and soul, the monk Philip Monotropos uses the alchemical process too: just as an alchemist changes lead into gold, so Christ will change human nature.<sup>7</sup>

<sup>4</sup> «Φυσικὸς λόγος παρὰ φιλοσόφοις. Μετὰ τὸν ἠθικὸν διεξέρχονται περὶ τοῦ φυσικοῦ τουτέστι, περὶ σωμάτων, περὶ ἀρχῶν, καὶ στοιχείων, καὶ περὶ τοῦ κόσμου, καὶ τόπου, καὶ κενοῦ [...]»: Suidae Lexicon, ed. Thomas Gaisford, vol. II, Oxonii (Oxford) 1834, c. 3862.

<sup>5</sup> «χημεία: Ἡ τοῦ ἀργύρου καὶ χρυσοῦ κατασκευή, ἧς τὰ βιβλία διερευνησάμενος ὁ Διοκλητιανὸς, ἔκαυσε. Ὅτι διὰ τὰ νεωτερισθέντα Αἰγυπτίους Διοκλητιανῶ τούτοις ἀνημέρωσ καὶ φονικῶς ἐχρήσατο. Ὅτε δὴ καὶ τὰ περὶ χημείας χρυσοῦ καὶ ἀργύρου τοῖς παλαιοῖς αὐτῶν γεγραμμένα βιβλία διερευνησάμενος, ἔκαυσε, πρὸς το μηκέτι πλοῦτον Αἰγυπτίους ἐκ τοῖς τοιαύτης προσγίνεσθαι τέχνης, μηδὲ χρημάτων αὐτοῦς θαρροῦντας περιουσία, τοῦ λοιποῦ Ῥωμαίοις ἀνταίρειν»: Suidae Lexicon, op.cit., c. 3899.

<sup>6</sup> «οὕτω δὴ τῶν ἀνθρώπων τὰ σώματα τῆ τῆς ψυχῆς ἀθανασία συμμίζαντα», «Καὶ οὐκ ἀπίθανος ἡ πρὸς τὸ κρεῖττον μεταβολὴ τῆς ὕλης. Ἐπεὶ καὶ παρ’ ἡμῖν οἱ περὶ τὴν ὕλην σοφοὶ, ἄργυρον καὶ κασσίτερον παραλαβόντες, καὶ τὸ εἶδος ἀφανίσαντες, ἐπὶ τὸ σεμνότερον μεταβαλόντες τὴν ὕλην, χρυσὸν κάλλιστον ἐποίησαν», “Aeneae Gazaei Philosophi Christiani, Theophrastus”, in J.P. Migne (ed.), *Patrologia Graeca*, vol. 85, 1864, c. 992A, 989C.

<sup>7</sup> «τὸ γὰρ συνάψε τῶν βροτῶν τὴν φθαρεῖσαν οὐσίαν / (260) τὴν γεηράν τε καὶ ῥευστὴν καὶ κάτω πατουμένην·/μετὰ τῆς ἄνω ὑψηλῆς καὶ θείας τῶν ἀγγέλων, /τοῦτο ἐστὶν ὁ εἶρηκα μειζόνως δοξασθῆναι·/ὥσπερ μολύβδου καὶ χρυσοῦ πόρρω ἀφροστικῶτων/ἀποκισμένον ἐξ ἀμφοῖν ἀπεσχισμένον λίαν·/(265) εἶτα σοφός τις τεχνουργὸς δεῖξαι θελήσας τούτου/τὴν τέχνην, τὴν ἐνέργειαν καὶ ἐπιστήμην ὄντως/αὐτὸν λαβὼν τὸν μολύβδον καὶ χωνεύσας τοῦτόν γε·/καὶ ἀναπλάσας τὸν αὐτὸν χρυσὸν εὐρίζον

In our opinion, these two texts are important because they saw that the principles of alchemy, as Suidas defined it, have a continuous existence in Byzantine thought in a theoretical, not only practical, level.

In addition, there are reports in historical sources for the interest about alchemical practice. For example, the report of ‘Umāra ibn-Ḥamza (d. 814/815), the ambassador of caliph al-Manṣūr (754-775) to the Byzantine court, evokes the alchemical interests of emperor Constantine V Kopronymos (741-775). The report describes that two experiments in the ambassador’s presence transmuted lead into silver and copper into gold.<sup>8</sup>

### **Texts about the making of gold, natural philosophy and their writers**

Returning to the main question of this presentation, the relation between alchemy and natural philosophy, it’s important to examine two interesting cases of Byzantine scholars and their work, Michael Psellos and Nikephoros Blemmydes. Both of them were monks, writers and teachers, and wrote about natural philosophy, medicine and gold making.

#### *Michael Psellos*

Michael Psellos was one of the scholars who attached particular importance to the study of the natural world, also as a subject for teaching. He was a scholar in the imperial court, monk for a while, head of the Imperial School of Philosophy under Constantine IX Monomachos (1042-1055) with the rank of the consul of the philosophers (*hypatos*), and was called “polyhistor” on the grounds of his multiplicity of interests. He lived in the 11<sup>th</sup> c., when the interest in the natural world essentially made its appearance<sup>9</sup> and **probably** was associated with a more general secularization of Byzantine thought. Psellos’ contemporary historiographers, like Zonaras or Skylitzes’ Continuatus, criticize his work

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δείξει./τοῦτο ἐστὶ τὸ θαυμαστὸν καὶ ξένον ὑπερλίαν·/(270) ὅτι χρυσὸς οὐκ ἦν τὸ πρὶν καὶ γέγονεν ἀρτίως·/ὁ μὲν χρυσὸς, καὶ ἦν χρυσὸς καὶ πάλιν χρυσὸς πέλει/ὁ δὲ, οὐκ ἦν καὶ γέγονεν, ὅπερ οὐκ ἦν τὸ πρῶτον»:  
Mag. Jürgen Fuchsbauer, *Die Übertragung der Dioptra ins Slavische Ein Beispiel mittelkirchenslavischer Übersetzungstechnik Dargestellt anhand des vierten Buches des Werkes*, PHD dissertation, University of Vienna, Vienna 2010, p. 46-48.

<sup>8</sup> Maria Papatthanassiou, “Stephanos of Alexandria: A famous Byzantine Scholar, Alchemist and Astrologer”, in P. Magdalino, M. Mavroudi, *The Occult Sciences in Byzantium*, La Pomme d’ Or, Geneva 2006, p. 169.

<sup>9</sup> Kazhdan A.P., Wharton Epstein Ann, *Change in the Byzantine Culture in the Eleventh and Twelfth centuries*, University of California Press, Berkeley-Los Angeles-London 1985

from a traditional Christian perspective.<sup>10</sup> It should be noted that, that earlier in the end of the 10th century or in the beginning of the 11<sup>th</sup>, the Byzantine scholars collected the surviving alchemical texts and compiled a coherent corpus.<sup>11</sup>

Michael Psellos, as mentioned above, wrote a lot of works, some of them important for the study of natural philosophy in Byzantium. Among others, we should mention the *Omnifaria Doctrina* (*Διδασκαλία Παντοδαπή*),<sup>12</sup> *Theologica*,<sup>13</sup> *De Operatione daemonum*<sup>14</sup> etc. but there are a lot of interesting quotes in other of his works. The text *Περί χρυσοποιίας* (*On gold making*)<sup>15</sup> is a letter by Psellos to the Patriarch Michael Kerullarios or to John Xiphilinos, in which the writer, still relatively young, discusses the production of gold, outlining a number of possible methods.

An important point in *Διδασκαλία παντοδαπή* from an alchemical view is, according to Psellos, the relation between making and understanding. Psellos, talking about divine and human mind, writes that the making is located in understanding in the same way the understanding is located in making.<sup>16</sup> This principle in the epistemic level is very serious for the scientific discussion in Byzantium as well as in the whole of Middle Ages, when the scientific observation of nature, precise description of what is observed and, the most important, experiment in accordance with a strict methodology, were unknown. As we can see, the making, the basis of alchemical process, is legitimized by Psellos in a philosophical context.

The first sentence of *Χρυσοποιία* is exactly about the relationship between philosophers and the practical art of alchemy (εμπύριος και βάνανσος).<sup>17</sup> Psellos claims that alchemy, which is accused as manual and crude according to the ancient Greek tradition of demarcation of sciences and arts, must become a philosophical discipline. His proposal is that the philosopher has to study the alchemical practices and techniques, which are valuable for scientific knowledge. So, according to Psellos, the alchemical practices and

<sup>10</sup> Ljubarskij J.N. *Η προσωπικότητα και το έργο του Μιχαήλ Ψελλού*, Kanakis editions, Athens 2004.

<sup>11</sup> Codex Marcianus Graecus 299 (= M), surviving in the San Marco Library in Venice.

<sup>12</sup> Westerink L.G. (ed.), *Michael Psellus, De Omnifaria Doctrina*, J.L. Beijers N.V., Utrecht 1948.

<sup>13</sup> Gautier P. (ed.), *Michaelis Pselli Theologica*, vol. I, Teubner, Leipzig 1989.

<sup>14</sup> Boissonade J.Fr. (ed.), *Michael Psellus, De Operatione Daemonum*, Norimbergae 1838,

<sup>15</sup> Bidez J., «Michel Psellus, L'Épître sur la Chrysopée», *Catalogue des Manuscrits Alchimiques Grecs*, vol. VI, Bruxelles 1928.

<sup>16</sup> Και η ποίησις εν τῷ νοεῖν και η νόησις εν τῷ ποιεῖν, 28.10-11

<sup>17</sup> 1.4-10

techniques become scientific activity, not occult or magic. A similar sentence exists in another text, a letter by Psellos, where he refers to cheese production and he stresses the importance of working manually.<sup>18</sup>

Here, a corresponding principle by Stephanos of Alexandria should be noted. Stephanos, in the 7<sup>th</sup> century, wrote that a born of God (*θεογενής*) and godly-minded (*θεόφρων*) man have to learn by doing, and by theologies and mystical orations.<sup>19</sup>

The second serious point in *Omnifaria Doctrina* is Psellos' perception of Creation and functioning of the natural world. As he writes, God is the creator and the first cause, but after him in the natural world we could find a lot of causes, which explain the creation and function of bodies.<sup>20</sup> In addition, in another text, echoing mainly the Stoics,<sup>21</sup> he writes that things are in sympathy with each other, so they act in togetherness (in *sympnoia* – σύμπνοια) and all are under the first Cause.<sup>22</sup> So, this dogmatic principle allows the changes of natural bodies, by human action and intervention. The scholar, supporting the relative autonomy of the laws of nature, legitimates the human effort to change the natural bodies on the basis of natural laws. As he writes in a letter, the providence of nature is wise.<sup>23</sup>

On the same grounds, in *Χρυσοποιία*, Psellos on the basis of the principle that the cause of transformations in things must be sought in nature, he goes on to present and analyze the methods for producing gold. At no point in the text, there are to be found references to the divine will. Presentation and interpretation of the issues is transparently secular. The basic interpretative tool, i.e. the relationship between cause and effect, claims universal validity insofar as hermeneutic approaches to the natural world are concerned. Another point, which relates Psellos' philosophy with alchemy, is his ideas about matter and things. In *Omnifaria Doctrina*, on Earth, all material things are under continuous

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<sup>18</sup> Letter 206, in Kurtz E. (ed.), *Michaellis Pselli Scripta Minora*, vol. II, Societa Editrice-Vita E Pensiero, Milano 1941, p. 237.30-238.1.

<sup>19</sup> «ἵνα ὁ θεόφρων καὶ θεογενὴς ἄνθρωπος διὰ τῆς εὐθείας ἐργασίας καὶ θεολογιῶν καὶ μυστικῶν λόγων μάθῃ», Ideler I.L. (ed.), «Τοῦ αὐτοῦ Στεφάνου σὺν θεῷ Πράξι δευτέρα», in *Physici et Medici Graeci Minores*, vol. II, G. Reimer, Berlin 1842, p. 208, 31-34.

<sup>20</sup> Ἀρχὴ τῶν ὄντων πρώτη μὲν καὶ υπερᾶρχιος ὁ Θεός, μετὰ δὲ θεὸν πολλαὶ ἀρχαὶ τῶν φυσικῶν πραγμάτων εἰσὶ, §83.2-3.

<sup>21</sup> Sofroniou S.A., «Michael Psellos' theory of science», *Athena*, vol. 69, Athens 1967, p. 78-90.

<sup>22</sup> «διὰ τὴν ἐν τῷ παντὶ συμπάθειαν», Letter 188, in Sathas K. (ed.), *Bibliotheca Graeca Medii Aevi*, vol. V, Phoinix, Venice 1876, p. 477.

<sup>23</sup> «σοφὸν δὲ ἄρα ἢ τῆς φύσεως πρόνοια», Letter 206, in Kurtz E. (ed.), *Michaellis Pselli Scripta Minora*, op.cit. p. 236.30

change, as he writes in various paragraphs.<sup>24</sup> Material bodies can change quantitatively and qualitatively.<sup>25</sup> On the other hand, matter is the basis of the four elements (earth, water, fire, air), **which we can keep in mind if we remove from them the qualitative characteristics**. Nevertheless, this pure form of matter doesn't exist in the natural world.

On the above basis of the principle that the cause of transformations in things must be sought in nature, as well as that bodies could be changed quantitatively and qualitatively, Psellos in *Χρυσοποιία* goes on to present and analyze the methods for producing gold, emphasizing that for himself the question of transmutation of stones is of equal interest. As he writes, the alchemical art processes matter.<sup>26</sup> However, he limits the discussion on the one hand to methods for production of gold, on the other to directions for doubling of its existing quantity, improvement of its quality, and heightening of its lustre.

The last crucial point in *Omnifaria Doctrina* is the issue about mixing and constitution of bodies.<sup>27</sup> The argument for this process is related with alchemical process, so we can find here another relationship between the philosophical view of matter and alchemy. In *Χρυσοποιία*, we can find a lot of examples for the aforementioned mixing. But these recipes seem to be only academic, so it's more possible that Psellos did not enter into alchemy.<sup>28</sup> Nevertheless, this fact doesn't change the significance of his philosophical principles.

#### *Nikephoros Blemmydes*

Nikephoros Blemmydes was a monk and teacher of Theodore II Laskaris, emperor of Nicaea. He wrote an extensive textbook under the title *Περὶ φυσικῆς ἀκροάσεως* (*Epitome physica*), for the students in his school in his monastery in Emathia, near Ephesus. The *Epitome* survived in numerous manuscripts up to the 19<sup>th</sup> century, an indication of the popularity it enjoyed at schools thereafter. On the other hand, unfortunately we have only the problematic edition in *Patrologia Graeca* but not a scholarly standard edition yet.

<sup>24</sup> Πράγματα αλλοίωτα και μεταβλητά, 17.4.

<sup>25</sup> See §86

<sup>26</sup> Τας ύλας μετακινεῖν και τας φύσεις μεταποιεῖν, 1.6-7.

<sup>27</sup> Περὶ μίξεως και κράσεως, § 90.

<sup>28</sup> Mertens M., "Graeco-Egyptian Alchemy in Byzantium", in P. Magdalino, M. Mavroudi, *The Occult Sciences in Byzantium, The Occult Sciences in Byzantium*, La Pomme d' Or, Geneva 2006, p. 225.

Blemmydes wrote a work on alchemy too, where he mentions a recipe for gold making from eggs.<sup>29</sup>

Nikephoros Vlemmydes, in the 32 chapters of *Epitome physica* presented in detail the main subjects of natural philosophy. He uses the Aristotelian works, mainly the *Φυσική Ἀκρόασις* and *Μετεωρολογικά*, as well as the commentaries by Alexander from Afrodisias, John Philoponus, Simplicius and others.

The first chapter is about natural principles and causes, and Vlemmydes writes here that the first efficient cause is God and the first final cause is divine kindness.<sup>30</sup> In other words, God created the world and so someone could know God by knowing nature. Then, Vlemmydes presents the main principles of Aristotelian physics, adding Christian cosmological principles (God is the first cause Creation,<sup>31</sup> God is the architect who created the world<sup>32</sup>).

Blemmydes in *Epitome* devotes a large part in the debate on matter and its properties, according to Aristotelian principles, changing only the first cause, which for him is the Christian God. However, some excerpts listed in other sections are very interesting. One of these refers to metals and their natural properties. Here, Blemmydes presents the properties of metals and their different types, such as metals and ores. These different types are made by different natural process. He states, for example, the exhalation and the burning, usual and frequent processes for the alchemists.<sup>33</sup> In other passages, he refers as natural caused processes the condensation and the sublimation.<sup>34</sup>

In the alchemical text which passed down under his name, the *Crysopee*, Blemmydes gives a technical recipe for gold making, using mainly natural materials as eggs, earth, and water. He seems to know well the power of fire and in his text gives precise

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<sup>29</sup> Berthelot M. (ed.), “Nicephore Blemmydes – Chrysopee”, in *Collection des anciens alchimistes grecs*, vol. II, G. Steinheil, Paris 1888, pp. 452-457.

<sup>30</sup> «Ὅθεν ποιητικὸν αἴτιον (καὶ) κυρίως καὶ πρώτως ὁ θεῖος ἐστὶ νοῦς· καὶ τελικὸν ἢ αὐτοῦ ἀγαθότης, δι’ ἣν πᾶσαν κτίσιν ἐδημιούργησεν, ἵνα γνωρίζηται καὶ κηρύττηται», 1025γ.

<sup>31</sup> «γενέσεως ἀρχὴ καὶ αἰτία μόνη ἐστὶν ἡ πανουργὸς σοφία καὶ δύναμις τοῦ Θεοῦ», 1065 στ.

<sup>32</sup> «κατὰ τὴν νεῦσιν τοῦ μόνου σοφοῦ ἀρχιτέκτονος καὶ πανταίου Θεοῦ», 1097δ.

<sup>33</sup> Migne J.P. (ed.), «Νικηφόρου τοῦ Βλεμμίδου Εἰσαγωγικῆς Ἐπιτομῆς Βιβλίον Β. Περὶ φυσικῆς Ἀκροάσεως», *Patrologia Graeca*, vol. 142, 1863, c. 1211 C-D.-1213 A.

<sup>34</sup> As example in c. 1165, op.cit.

instructions for the amount of material and the necessary tools and utensils.<sup>35</sup> It should be noted that these short text doesn't refer to any philosophical or alchemical principles.

### Conclusions

A conclusion from this presentation is that the both scholars were familiar with the subject and shows that they believed in the theoretical possibility of transmutation, as a consequence of the laws governing the four elements. In this context, they considered that the alchemical process is a natural process, based on the properties of matter, and it agrees with the Divine will. Blemmydes, for example, mentions in the first and final lines of his text that his recipe was performed with the synergy of God.<sup>36</sup> So, the maker-craftsman could change nature only with divine synergy and help. The Creator created the world but he gave to humans the freedom for changes. Therefore, alchemy is based on natural and divine principles and doesn't have any relation with occult practices or paganism. This rational schema maybe shows a difference between the origins of alchemy and the Byzantine scholarly tradition.

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<sup>35</sup> «Ἄπερ χρήζει ἡ παρούσα κατασκευή», in Berthelot M. (ed.), *Collection des anciens alchimistes grecs*, vol. II, G. Steinheil, Paris 1888, pp. 458-459.

<sup>36</sup> «τῇ συνεργείᾳ τοῦ πάντα ἐξ οὐκ ὄντων εἰς τὸ εἶναι παραγάγοντος Χριστοῦ τοῦ ἀληθινοῦ θεοῦ ἡμῶν», Berthelot M. (ed.), “Nicephore Blemmydes – Chrysopee”, *op.cit.*, p. 452.