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THE ORIGINS OF GREEK ALCHEMY.

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Definition of Alchemy.

ALCHEMY is not easily defined. Some would narrow its meaning to 'the Transmutation of Metals'; others would include within its range all that pertains to the notions of exaltation and regeneration, whether of metals or of the human mind. Alchemy is identical neither with mysticism nor with metallurgy. One of the earliest alchemical texts, the *Φυσικά καὶ Μυστικά* of Demokritos (c. A.D. 100), succinctly expresses by its title the nature of the Art it describes—which may be defined as:—*An art, purporting to relate to the transmutation of metals, and described in a terminology at once Physical and Mystical.*

An inquiry into the origins of Alchemy may proceed by two methods. The safer and more certain is to seek in the earliest texts for evidence, direct or indirect, of their sources: the more ambitious is to extract from these texts—no easy task—their essential ideas, as of transmutation, regeneration, symbolic representation; and to seek to trace these ideas in the philosophies and cults contemporary with or preceding the earliest of alchemical texts. The former and lighter task is here essayed.

Sources of the Earliest Alchemical Texts.

Alchemical texts have been written in every century from the second century B.C. to the nineteenth century A.D.; they hail from every country in Europe and the Near East, from Persia, India, China, and Tibet. But when we seek the origin of the alchemical tradition, we can find direct evidence of the existence of Alchemy before, say, A.D. 300 only in two cultural centres—China and Hellenistic Egypt. Of the early Chinese texts but little is at present known: the texts hailing from Hellenistic Egypt¹ are both voluminous and of great interest. It is with these texts that this article will be chiefly concerned.

Possible Assyrian Source of Alchemy.

In 1925 Robert Eisler drew attention to a remarkable passage contained in an Assyrian clay tablet of the eighth century B.C. The text in question is concerned with the manufacture of glazes, enamels, and precious stones, and

¹ Prof. T. L. Davis advances the view (*Scientific Monthly*, 1936, xliii, 551–558) that the texts are not strictly alchemical, in that the operations they describe are directed to a staining or colouring of metal, not to a supposed transmutation. With this view I disagree, and hope to express my views in a subsequent number of *Ambix*.

appears to allude to the silvering of bronze vessels; its content therefore is distantly related to the subject of Alchemy. The hall-mark of Alchemy is the combination of a spiritual and practical aspect in the making of precious materials; it was therefore of great interest to find that in Assyria magical practices were associated with the setting up of a furnace for such purposes. Here is a translation² of the text :—

'When thou settest out the (ground) plan of a furnace for "minerals", thou shalt seek out a favourable day in a fortunate month and thou shalt set out the (ground) plan of the furnace: While they are making the furnace, thou shalt watch (them) and shalt work thyself (?) (in the house of the furnace): thou shalt bring in embryos³ (born before their time) another (?), a stranger shall not enter, nor shall one that is unclean tread before them: thou shalt offer the due libations before them: the day when thou puttest down the "mineral" into the furnace thou shalt make a sacrifice before the embryos: thou shalt set a censer of pure incense, shalt pour *kurunnu*-beer before them.

'Thou shalt kindle a fire underneath the furnace and shalt put down the "mineral" into the furnace. The men whom thou shalt bring to be over the furnace shall cleanse themselves and (then) *thou shalt set them to be over the furnace or "crude minerals"*.

'The wood which thou shalt burn under the furnace shall be styrax, thick decorticated billets which have not lain exposed in bundles, (but) have been kept in leather coverings, cut in the month of Ab. This wood shall go underneath thy furnace.'

This text antedates Western Alchemy by some eight centuries, and there seems to be a consensus of opinion against regarding it as connected with true Alchemy, on the ground that the association of religious or magical rites with the initiation of a new enterprise, in this case the building of a furnace, is in no way exceptional or necessarily dependent on the purpose to which the furnace was to be put.

Early Chinese Alchemy.

The Chinese alchemical texts which have been translated amount only to a few dozen pages: it is difficult therefore for one who is not a sinologue to give any adequate account of them.

The central purpose, at least of practical Chinese Alchemy, seems to have been the prolongation of life by artificially prepared gold—believed to be of greater efficacy than common gold. Chinese Alchemy is connected with Tao-ism, the philosophy of Lao-tzu, who lived some four centuries before the earliest mention of Alchemy. Essential to his doctrine is the idea of the whole universe being informed by Tao, which may be thought of as analogous to the influence of destiny, the *εἰμαρμένη* of the Greeks. The doctrine of Tao led to a mystical system whereby the individual could merge himself in Tao and so

² Campbell Thompson, *Chemistry of the Ancient Assyrians*, Luzac, 1925.

³ Or crude minerals.

be freed from the bonds of space and time. This doctrine, like that of every philosophy or religion, was modified by smaller minds to suit their beliefs and desires, chief among which, as always, was the desire for long life. Many were unwilling to undergo the mental and physical discipline of the mystic's life in order to free themselves from the bondage of destiny: these preferred to believe that a medicine could confer the principle of longevity. It was a doctrine associated with Taoism that all things were composed of two principles—*Yin*, the negative principle of femaleness, cold, darkness, death, and matter, and *Yang*, the positive principle of maleness, heat, light, life, and soul. Certain substances, vermilion (cinnabar), gold, silver, and jade, were believed to be particularly rich in *Yang*. Gold, it was believed, could be alchemically prepared from vermilion, and such gold was naturally supposed to have a peculiar power of prolonging life.

This is the central notion of Chinese practical Alchemy, but is totally absent from the Western Alchemy of the first millennium A.D.

The earliest ⁴ notice of Alchemy in Chinese Literature is contained in the *History of Ssuma Ch'ien*, which appears to be a later addition to the *Treatise on the Sacrifices of Feng and Shan*. The following passage from the *Han Shu XXV* has been translated by Waley, and in the opinion of the latter dates from the first century A.D.:—

'(The wizard Li) Shao-chun said to the Emperor (Wu Ti of Han): "Sacrifice to the stove (tsao) and you will be able to summon "things" (*i. e.* spirits). Summon spirits and you will be able to change cinnabar powder into yellow gold. With this yellow gold you make vessels to eat and to drink out of. You will then increase your span of life "'

As the Emperor Wu Ti lived from 140–86 B.C. and it is unlikely that the incident related was the beginning of Chinese Alchemy, we must suppose that the latter was in existence at least as early as 200 B.C., and may therefore antedate our earliest Greek alchemical writings by some two centuries.

A considerable work on Alchemy, the *Ts'ang T'ung Ch'i*—attributed to Wei Po-yang, perhaps pseudonymously—belongs to the second century. Many later works exist. The tendencies of later Chinese Alchemy are hardly relevant to our study of origins. Suffice it to say that, as in the West, it divided into a practical gold-making craft and a mystical religion in which mental transmutations were operated upon the souls of metals which were mystically equated to various organs of the body.

There seems little reason to believe that the Alchemy of Hellenistic Egypt had any contact with that of China. There is some slight likeness of materials: but to the early Alchemy of the West are unknown the two central notions of

⁴ Prof. William H. Barnes has drawn attention to a doubtful earlier reference in the writings of Chuang Tzu (fourth to third century B.C.) ('Possible references to Chinese Alchemy in the fourth and third century B.C.', W. H. Barnes, *China Journal*, xxiii, 2, p. 75).

Chinese Alchemy, namely, the prolongation of life and the Philosopher's Stone, a minute portion of which would transmute a large quantity of base metal. Both these notions appear in the West for the first time in the alchemical texts of the Arabs.

The Greek Alchemical Texts.

The authors of the Greek alchemical texts attribute the source of their art to Ancient Egypt. The force of this evidence is much weakened by the tendency of the classical world to attribute all wisdom to the priests of Egypt. The alchemist, moreover, who could believe that the prophet Moses was the author of a very practical set of alchemical recipes does not command our confidence when he speaks of the origin of his art. There is, however, no small amount of internal evidence for an Egyptian source. No direct written evidence of the existence of the Alchemy as defined at the beginning of this article is to be found in the records of ancient Egypt, of ancient Persia, of the Hittites, or of classical Greece and Rome, nor do the records of Babylon and Assyria reveal anything concerning Alchemy except the doubtfully alchemical text which has already been discussed.

The quest of the making of gold appears full-fledged in Egypt at a date which cannot be far from A.D. 100. Our sources of knowledge concerning it are derived from papyri and manuscripts. The earliest alchemical document is a fragment of papyrus so far mutilated that we can only tell that it is concerned with the making of silver: its date is about A.D. 70. Of far more interest are two papyri, written at a date not far from A.D. 300 and now in the libraries of Leyden and Stockholm. Whether these papyri are truly alchemical will be a matter for discussion. Suffice it to say that they deal with recipes for artificially preparing gold, silver, aemos (a white silver-like metal), precious stones, and purple; and that, although they contain nothing that is mystical, they make allusion to the alchemist Demokritos, an allusion which indicates that their authors were acquainted with true Alchemy.

The works of the Greek alchemists proper are to be found in very numerous manuscripts, distributed through the libraries of Europe. If we exclude the works written after A.D. 1000, which generally appear in manuscripts separate from those containing the works of the more ancient authors, it may be said that all these manuscripts derive from two originals:—

1. The manuscript Marcianus 299 of Venice, copied in the tenth or eleventh century.
2. The manuscripts Parisinus Græcus 2325 of the thirteenth century and 2327 of the fifteenth century, which latter seems to be a more complete copy of the original from which the former, Parisinus Græcus 2325, was taken.

It would appear that a collection of alchemical manuscripts was made in Byzantium in the seventh or eighth century which, after some losses and mutilations, appears as Marcianus 299 and the numerous manuscripts copied therefrom. The original seventh century collection was probably copied before all of these mutilations had occurred, and numerous later texts were added to the copy: the result was the manuscripts Parisinus Græcus 2325 and 2327 and their numerous copies. The filiation of these manuscripts has been a matter of controversy, but the above summary is not far from the truth.

Most of the Greek alchemical writings are edited and translated in Berthelot's invaluable *Collection des Alchimistes Grecs* (Paris, 1888), which, however, omits the work of Stephanus, which is found in Ideler's *Physici et Medici Græci Minores* (Berlin, 1841). Berthelot also omits the alchemical poems: these are to be found in Fabricius, *Bibliotheca Græca VIII* (1802) and in Goldschmidt's *Heliodori Carmina Quattuor (Religionsgeschichtliche Versuche und Vorarbeiten XIX, 2, Giessen 1923)*.

The chemical Papyri have been published by O. Lagercrantz, *Papyrus Græcus Holmiensis* (Upsala, 1913) and by Berthelot (*Archéologie et Histoire des Sciences, Paris, 1906*).

An examination of the miscellaneous collection of Greek alchemical texts enables us to classify their authors with fair certainty into (1) those who wrote before Zosimos of Panopolis (c. A.D. 300) formed his great collection of alchemical material, and (2) the authors later than Zosimos; these latter produced little else but commentary. Zosimos himself occupies an intermediate position, being at once an original author and a commentator on earlier works.

These early writings are of exceedingly diverse character. Some are very practical laboratory treatises: others are almost wholly mystical. It is not possible, as might have been hoped, to trace mystical and practical Alchemy to a single source. Rather, as we approach the earliest texts, we find a more definite division between these aspects of the Art.

The Chemical Papyri.

Almost wholly practical are the papyri of Leyden and Stockholm. The authors of these are unknown, but the format and calligraphy indicate that they were written towards the end of the third century A.D. They contain some hundreds of recipes for the preparation (or falsification) of gold, silver, aemos, precious stones, and dyestuffs. It is interesting that these should be lumped together in a single treatise, and it is clear that the colouring of a metal so as to imitate gold or silver was thought of as fully analogous to the dyeing of a piece of cloth⁵.

⁵ For the further development of this notion, see Arthur John Hopkins' 'Earliest Alchemy', *Scientific Monthly*, vi, 1918, 530-7; 'Bronzing Methods in the Alchemistic Leyden Papyri', *Chemical News*, lxxxv, 49; *Alchemy, Child of Greek Philosophy*, Columbia University Press, 1934.

How did the authors of these papyri try to make gold and silver? Here is a recipe :—

'Asemos ⁶ one *stater* or copper of Cyprus 3 *staters* ; 4 *staters* of gold ; melt them together.'

In other words, turn 24-carat gold into 19-carat or 10-carat gold. This type of recipe is common enough. It seems that it was thought of not as a mere mixing, say, of gold and copper, but as an increase of the quantity of gold at the expense of its quality. Here is a less crude recipe :—

'To increase the weight of gold, melt it with a fourth part of *cadmia*. It will become heavier and harder.'

Cadmia was an impure mixture of oxides of such metals as copper, arsenic, etc., obtained from copper smelter's flues. The effect of the process would be to smelt this to base metal, which would mix with, debase, and augment the gold.

These papyri contain a great variety of other recipes for gold-making. 'Gold' is made not only by debasing genuine gold as described above, but also by surface treatments. Thus base gold objects were heated to redness with iron sulphate, alum, and salt. These evolved sulphuric and hydrochloric acids which removed the base metals from the surface of the gold, leaving a thin layer of pure gold which, after polishing, made the whole object look like pure gold. Other recipes describe gilding.

An interesting and primitive recipe runs :—

'To give objects of copper the appearance of gold so that neither the feel nor rubbing on the touchstone ⁷ will discover it ; particularly useful for making a fine-looking ring. This is the method. Grind gold and lead to a dust fine as flour ; 2 parts of lead for one of gold, then mix them and incorporate them with gum, coat the ring with this mixture and heat. This is repeated several times until the object has taken the colour. It is difficult to discover because the rubbing gives the mark of an object of gold and the heat consumes the lead ⁸ and not the gold.'

Gilding with an amalgam of mercury and gold in the modern style is also described. A number of recipes describe gums or varnishes or dye-liquors to tint metal superficially in the style of a lacquer, and numerous methods of making gold-coloured paints or inks with various yellow lacquers and pigments are described.

⁶ This word in modern Greek simply means 'silver' ; in the works of the alchemists it seems to mean a 'white silver-like metal'.

⁷ A hard black stone on which the gold was rubbed, leaving a bright metallic streak. The colour and extent of the streak enables an expert to judge the purity of the gold.

⁸ *i. e.*, oxidizes it to litharge, which melts and runs off,

Much attention is also given to the making of silver and 'asemos', a white alloy resembling silver. Here is a recipe for making silver⁹ :—

'Take copper which has been prepared for use and dip it in dyer's vinegar and alum and leave it to soak for three days. Then melt one *mina*¹⁰ of the copper, some Chian Earth and Cappadocian salt and flaky Alum up to six drachmæ. Smelt it carefully and it will be excellent. Add not more than 20 drachmæ of good and tested silver, which will make the whole mixture imperishable (untarnishing).'

The process is, first, a superficial cleaning of copper (the mixture of alum and vinegar is very effective). Next the copper is melted with a kind of fuller's earth and with salt and with 'flaky alum' which in the works of the alchemists is used, in some places, for a composition containing arsenic. A *careful* fusion (in order not to drive off all the arsenic) gives a white or whitish-yellow copper-arsenic alloy. By fusing this with silver a brilliant white alloy of, perhaps, 77 per cent. copper, 19 per cent. silver, and 3 per cent. arsenic would be obtained.

We find in these papyri very clear evidence that attempts to make gold and silver, sometimes genuine and sometimes fraudulent, were being carried out in Egypt before A.D. 300. We should say that these papyri were the work of alchemists were it not that their gold-making is treated as an entirely matter-of-fact and practical process. There are no hints of revelations from gods or of traditions from ancient philosophers. There is no concealing of methods under symbols and no rhapsodies about the divine character of their art. None the less these papyri are the earliest *documents* which reveal the idea of making precious metals; the methods they use, moreover, are very like those of one of the groups of early alchemists. We cannot regard these papyri as the source from which true Alchemy developed, for one of them mentions the alchemist 'Demokritos'; but they give us the valuable information that practical goldsmiths were trying to make gold and silver in Egypt not long after the time when the first alchemists were writing.

These papyri are not in the direct tradition of Alchemy. They are nowhere quoted or alluded to by an alchemical author, and they lack the spiritual aspect always present in Alchemy.

The Earliest Greek Alchemical Authors.

The truly alchemical texts of the Græco-Egyptian period include much that is earlier than A.D. 300. These early texts are attributed for the most part to lofty sources. Demokritos, Isis, Iamblichos, Moses, Ostanes, Eugenios, Maria, Kleopatra, Agathodaimon, Komarios, Hermes, Pammenes, Chymes, Pibechios, Petasios are the names we find attached to early alchemical texts. The character of these texts precludes any possibility of the attributions to the historical Demokritos, Iamblichos, Moses or Kleopatra being correct: the

⁹ *Papyrus Holmiensis* (1st recipe).

¹⁰ 1 mina = about 1 lb. = 100 drachmæ.

attributions to supernatural personages need not be discussed: the other authors—Eugenios, Komarios, Pammenes, Chymes, Petasios—cannot be identified with any known personage. Many of the early texts are anonymous. It seems likely that the sources of all these texts are concealed by pseudonyms: this is only to be expected in view of the secret character of early Alchemy, and also of the respect which antiquity conferred upon alchemical writers.

The School of Demokritos.

The most important of these early alchemical writers was Demokritos. The style and content of the texts preclude their having been written by Demokritos of Abdera (d. 376 B.C.), but their ascription to him is readily understood, for a considerable pseudonymous literature attaches to his honoured name. The alchemical author who took the title of Demokritos wrote before A.D. 250, as is witnessed by his mention in the Stockholm and Kenyon papyri: Zosimos (third to fourth century) mentions him as an ancient author, so an ascription of his work to the second century A.D. is reasonable. His successors regard him as *The Philosopher*, inferior perhaps to Hermes in prestige, but superior in lucidity and scope. Two works attributed to him survive—the *Physical and Mystical Matters* and the *Book addressed to Leukippos*. He certainly wrote many other books, which are freely quoted by Zosimos.

The *Physical and Mystical Matters* is obviously a composite work. It opens with two very practical recipes for dyeing cloth purple; these closely resemble the recipes contained in the chemical papyri. The style then abruptly changes to one which is best characterized by quotation:—

‘Recollecting these ideas of our ordained master and knowing the diversity of matter we endeavoured to bring the natures into harmony. But as our master died before we were initiated and at a time when we had not attained the complete knowledge of matter, we were told that we must evoke him from Hades. And as I set out to do this, I called upon him directly in these words. “Grant me gifts, in return for that which I have accomplished for you”, and having thus spoken, I kept silence. And as I called upon him many times, asking now how I should harmonise the natures, he told me that it was difficult to speak without the permission of the daemon. And he only said “The books are in the temple”. Returning to the temple I set myself to search if by chance I might gain possession of the books: for when he was alive he had said nothing of them. For he died leaving no testament, having, as some say, taken poison to separate his soul from his body; or better, as his son says, having taken poison in error. Before his death, he had intended to show the books to his son alone when he had passed his first prime. None of us knew anything about these books. As after a search we found nothing, we were most anxious to know how the substances and natures were made one and combined. As we had completed the combination of matter, and it was time for a ceremony in the temple, we made a common feast. Then as we were in the temple one of the columns suddenly opened but we saw nothing within. For neither he nor anyone had said the books

of his father were hidden there. Advancing, he led us to the column : leaning forward we saw with astonishment that nothing had escaped us except the precious formula which we found there :

“ The Nature rejoices in the nature and the nature conquers the nature and the nature masters the nature.”

‘ We were much surprised that he had summed up all his writings in so few words.

‘ I come ¹¹ also bringing into Egypt the treatise on Natural things so that you may raise yourselves above the curiosity of the vulgar and the confusion of matter.’

Thereafter the mystical atmosphere is dispelled and we return to the perfectly practical and sensible recipes—allied to those of the chemical papyri—by which the author proposes to make gold and silver. Similar abrupt transitions are found in many early texts, and it is difficult to resist the conclusion that practical treatises, not much unlike the chemical papyri already described, have been dressed up in these fantastical garments to gain the respect of later mystical alchemists. The rest of the book is divided into two parts, the *Chrysopeia* or book of gold-making and the *Argyropeia* or book of silver-making.

The recipes included in these are not in the least arcane in character, but are essentially practical methods of making gold-like and silver-like alloys. They are obscure, not through any intention of the author, but on account of our difficulty in identifying the materials and elucidating the technical procedure. The mystical commentator breaks in again in a later part of the text, but disappears again equally abruptly. It is very clear that the text of the *Physical and Mystical Matters* is composed of two separate parts, physical and mystical.

A reading of the Greek alchemical texts reveals that there are three others, not attributed to Demokritos, which resemble the *Physica et Mystica*, first in the character of their recipes and secondly in their ready separation into a practical content and a mystical or supernatural ascription. These are the *Work of Isis addressed to Horus*, the *Chemistry of Moses*, and the four small works attributed to Iamblichos. Thus the work attributed to Isis has a long mythological exordium followed by very practical recipes with no trace of Egyptian or other mystical symbology. The work attributed to Moses has a short prelude based on Exodus, xxxi and xxxvi, followed by wholly practical recipes. It is obviously a compilation and contains recipes taken direct from the works of Demokritos. A seventh or eighth century author refers to ‘ our treatise dedicated to Moses ’, thus affording evidence that the ascription to the Hebrew prophet was made at a very late date.

Finally the work attributed to Iamblichos also derives in part from that of Demokritos, and there is no trace of anything save the name Iamblichos which would warrant its attribution to that philosopher.

¹¹ This appears to be the beginning of the original treatise, to which some later author has added the high-flown introduction.

Zosimos (c. A.D. 300) quotes Demokritos freely, but makes no mention of Isis or Iamblichos, and in only one passage, of doubtful authenticity, speaks of Moses: it seems reasonable then to suppose that the ascriptions to the last three had not been made in the third or fourth century. The voluminous commentator Olympiodoros (fl. c. A.D. 425) makes no mention of them.

It may then be justifiable to postulate a 'DEMOCRITAN TREATISE' containing the practical recipes of the *Physical and Mystical Matters* and of the works of Isis, Iamblichos, and Moses, but not their mythological or pseudo-historical exordia and interpolations. This treatise would be a work similar to, but more elaborate than, the papyri of Leyden and Stockholm, and dealing with the same subjects, the artificial preparation of gold-like and silver-like alloys, and the dyeing of purple. This hypothetical treatise may be regarded as one source of Greek Alchemy.

Two features of early Alchemy are, however, notably absent from it. These are, first, the use of elaborate apparatus for distillation and sublimation and, secondly, the mystical content which distinguishes alchemy from mere metallurgy. Sources at least as early as that of the 'Democritan Treatise' can be found for these elements in Greek Alchemy.

The works which we have conjectured to be the *débris* of the Democritan treatise mention very few pieces of chemical apparatus. It is probable, but not certain, that distillation was known to Demokritos; sublimation was, however, certainly employed by him.

The School of Maria.

In the works of the Greek alchemists there appear for the first time the familiar apparatus employed for distillation; and in addition several types of complex apparatus, probably of the reflux type, are described.

The importance of these is best indicated by the illustrations¹² (figs. 1-3), in considering which it must be remembered that nothing whatever of the character of specifically chemical apparatus has been found in texts earlier than these, and that they show us the birth of practical chemistry. The drawings have, of course, been copied in the tenth or fifteenth century, and doubtless have been more than a little mutilated and distorted. They correspond, however, in all important respects with the descriptions in the texts.

Fig. 1 shows a flask, alembic, condenser, and receiver, and also a form of reflux apparatus. Fig. 2 shows distillation apparatus, tripod, reflux apparatus, 'handsbreadth furnace', waterbath or ash-bath. Fig. 3 shows a distillation apparatus of very modern type.

It should be remembered that the nearest thing to distillation mentioned by classical authors is the condensation of steam in a sponge (Aristotle) and the condensation of mercury on a pot-lid (Dioskorides).

¹² These and other drawings from Greek MSS. appear in Berthelot's *Introduction à l'Étude de la Chimie des Anciens et du moyen Âge*, pp. 104-172.

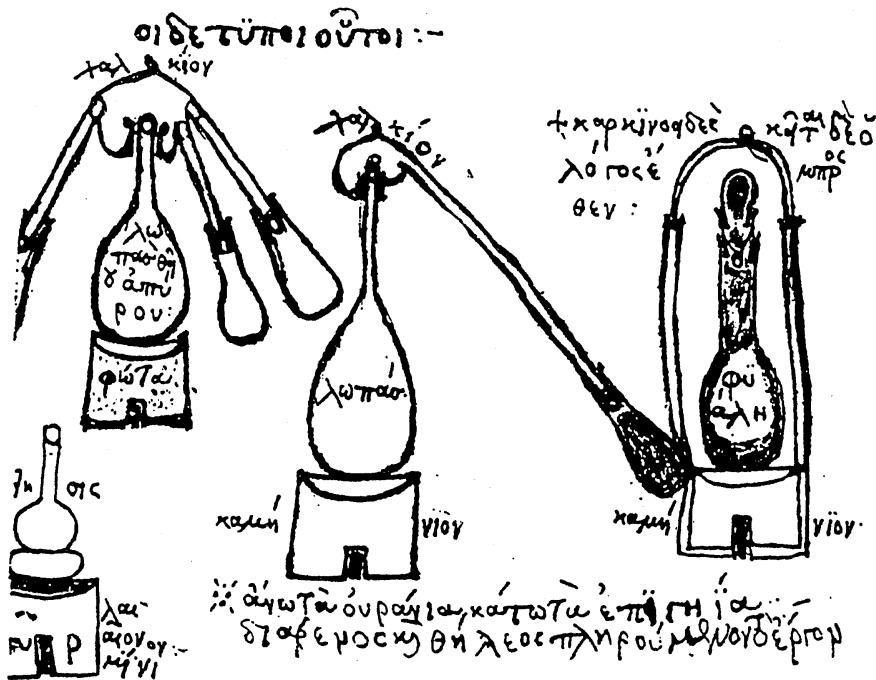


FIG. 1.—Chemical apparatus figured in MS. Parisinus 2327.

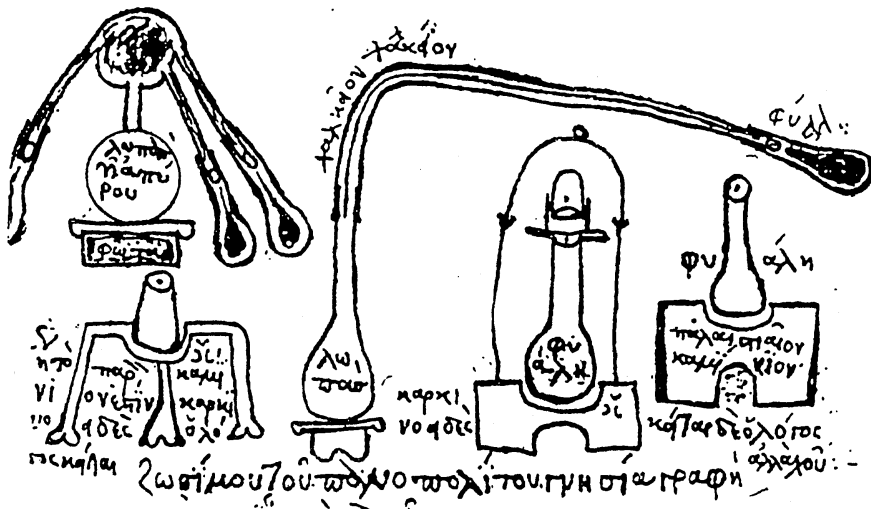


FIG. 2.—Chemical apparatus figured in MS. Parisinus 2327.

From Egypt, however, has come a doubtful hint of an earlier use of distillation apparatus. Two objects discovered at the Bucheum, close to the Egyptian town of Hermonthis, mentioned in our texts as a place where alchemy was practised, somewhat resemble still-heads, but the angle of the side-tubes suggests that they are probably enemas, or funnels used in the embalming of bulls. They may date from 200 B.C.

The *kerotakis* apparatus is peculiar to Greek Alchemy. The word means an artist's palette; the Greek painter's medium was wax, and his colours had therefore to be kept hot on a palette rather like a bricklayer's trowel. This was heated on a little stove. The *kerotakis* apparatus used by the Greek alchemists seems to have been a triangular palette on which metals were exposed to the vapours of sulphur, arsenic, or mercury. The apparatus always comprised a furnace, a place where the volatile substance was heated, a palette



FIG. 3.—Distillation apparatus, from MS. Parisinus 2327.

to support the metals and a condensing cup to condense and return the vapours. Its utility as a means of gold-making is very difficult to picture.

The passages describing all these types of apparatus are, with rare exceptions, to be found in the works of Zosimos and later commentators. It would appear that Zosimos was in the habit of using apparatus of this type, but that he did not devise it himself, and regarded the works of the Jews, especially those of Maria the Jewess, as the source of his information. He repeatedly quotes Maria's descriptions and directions. It may be noted, in passing, that in this early age of Alchemy women were prominent in the Art. Maria the Jewess, the alchemist Kleopatra, Theosebeia the sister of Zosimos, and Paphnutia the Virgin are mentioned. All four belong to the first three centuries of the Christian era.

The works of Maria are unhappily lost, but are quoted freely by Zosimos, who tells us that a great number of pieces of apparatus were devised by her, especially those of the *kerotakis* type, and also furnaces. The most extensive passage quoted by him reveals Maria as a practical chemist, and confirms our

belief that the name Maria is not a mere ascription, but is that of a real woman who knew the interior of a kitchen. Zosimos¹³ quotes her :—

'Make' she says, 'three tubes from ductile bronze, thin metal in thickness little more than that of a frying pan for cakes, in length a cubit and a half. Make three such tubes and make one of the diameter of about 3 inches adjusted to the opening of the copper still-head. Let the three tubes have openings adapted to their little receivers; let there be a little nail for the thumb tube so that the two finger tubes may be adapted to the two hands from the sides. Near the edge of the copper still-head are three holes adjusted and let it be soldered to fit closely to that part which carries the vapour upwards in the contrary direction. And placing the still-head on the earthenware flask containing the sulphur and having luted the joints with flour paste, put large glass flasks on the ends of the tubes, so thick that they will not break with the heat of the water carried up the middle.'

The description corresponds closely to a pictorial representation reproduced from Marcianus 299 by Berthelot, *Introduction*, p. 139, fig. 15.

Maria was not a contemporary of Zosimos: we must therefore regard her works and 'the books of the Jews' as the source of the chemical technique appearing in these texts. It is stated in these texts that the Egyptians initiated the Jews into these alchemical secrets. Conformably to this, the only early author other than Maria who speaks of this apparatus is Agathodæmon, who writes as if from Memphis. Zosimos, moreover, writes to his sister Theosebeia, saying he has seen an ancient furnace in a temple at Memphis, and then goes on at once to quote Maria about distillation apparatus. The degree of credence to be afforded to such statements is a matter for individual judgment.

Maria was not only concerned with distillation. Her alchemical method is distinct, but most obscure, apparently being based on the treatment of copper and lead in the *kerotakis* with arsenical or sulphurous vapours. Her work had also some mystical content, her chief maxim being 'Join the male and the female and you will find what you seek'. The greater part, if not the whole, of practical Greek alchemy derives from the Democritan treatises and the lost works of Maria.

The Mystical Texts

The symbolic and mystical part of alchemy seems to derive in the main from other sources.

Certain texts, we have seen, have preludes and interpolations concerned with the supernatural. These have no direct bearing on alchemical procedure, but merely indicate the lofty source of the quite mundane matter which follows. The works of Demokritos, Isis, and Moses belong to this class.

Another class of text is truly symbolic, describing what may be a practical or a mystical process in terms of symbols which cannot be given a literal interpretation. The most important of these texts are the early and fragmentary

¹³ *On the Tribikos and the tube*: Berthelot, *Collection*, p. 236.

Dialogue of Komarios and Kleopatra and *Dialogue of Kleopatra and the Philosophers*, quotations from which appear below, and the page of symbolic pictures entitled the *Chrysopeia of Kleopatra*. Somewhat similar are the remarkable text of the book of Ostanes addressed to Petasius, the texts dealing with the Serpent Ouroboros and the obscure but impressive Visions of Zosimos (pp. 88–92 of this number).

To these must be added a number of short fragments, oracles of Apollo and Orpheus, fragments of the lost works of Hermes, etc.

In connection with these texts the question must necessarily arise as to whether their content is to be interpreted as a symbolic description of human regeneration or as a symbolic description of a metallurgical process. The question can only be settled by a careful study of the texts, and no doubt the two aspects are not mutually exclusive.

The central themes of the works attributed to Kleopatra are the Unity of All Things, and Death and Revivification by a symbolic Water.

The *Chrysopeia of Kleopatra*¹⁴ indicates these notions briefly. It consists simply of a page of symbolic drawings. In the centre of the Serpent Ouroboros who eats his tail are the words 'Ἐν τὸ πᾶν'—'One is all'. Another emblem contains the symbols of gold, silver, and mercury enclosed in two concentric circles, within which appear the words 'One is the serpent which has its poison according to two compositions' and 'One is All and through it is All and by it is All and if you have not All, All is Nothing.' A distillation apparatus is clearly figured, and also other alchemical apparatus and symbols not clearly understood.

A quotation may show the character of the text of the *Dialogue of Kleopatra and the Philosophers* :—

'Ostanes and those with him answered and said to Kleopatra :

"In thee is concealed a strange and terrible mystery. Enlighten us, casting your light upon the elements. Tell us how the highest descends to the lowest and how the lowest rises to the highest, and how that which is in the midst approaches the highest and is united to it, and what is the element which accomplishes these things. And tell us how the blessed waters visit the corpses lying in Hades fettered and afflicted in darkness and how the medicine of Life reaches them and rouses them as if awakened by their possessors from sleep ; and how the new waters, both brought forth on the bier and coming after the light penetrate them at the beginning of their prostration and how a cloud supports them and how the cloud supporting the waters rises from the sea."

And again :—

'For I tell this to you who are wise : when you take plants, elements and stones, from their places, they appear to you to be mature. But they are not mature until the fire has tested them. When they are clothed in

¹⁴ Berthelot, *Introduction*, fig. 12.

the glory from the fire and the shining colour thereof, then rather will appear their hidden glory, their sought-for beauty, being transformed to the divine state of fusion. For they are nourished in the fire and the embryo grows little by little nourished in its mother's womb and when the appointed month approaches is not restrained from issuing forth. Such is the procedure of this worthy art. The waves and surges one after another in Hades wound them in the tomb where they lie. When the tomb is opened they issue from Hades as the babe from the womb.'

Such passages as the above may be interpreted in detail as referring to the mystical death and regeneration of the soul, and also to the destruction of metals in the interior of the kerotakis (referred to as the Hades) and their revivification in the smelting fire. In my belief, the alchemists who wrote this text saw in the practical operations a symbol of mystical regeneration and, moreover, regarded the practical process as essentially similar to the mystical, and even perhaps as having some magical effect in promoting the latter.

The texts we have just considered centre round the idea, essential to all mysticism, of death and revivification. The later Visions of Zosimos, printed on pp. 88-92 develop the same theme. These visions have something of the quality of an actual dream and are probably not merely allegories couched in dream-form. The visions can be read equally well as a mystical process for exaltation of man, or a practical alchemical process of exaltation of metals; and as the temper of the age was far more mystical than practical, we should do very ill to reject the former interpretation.

The Symbolism of the Serpent.

The tail-eating serpent who must be slain is a most interesting symbol which is found in several early alchemical texts. The symbolic use of the serpent is so universal a habit of religious thought that it gives no clue to the origin of the writings that make use of it. This symbolism dates back to the mesolithic (Azilian) culture, and almost every race has incorporated the serpent, at once wise and deadly, in its symbology. But the serpent of the alchemical text is Ouroboros, he who eats his tail. This symbol is much less common. The Gnostic text 'Pistis Sophia' describes the disc of the Sun as a great dragon with his tail in his mouth. In the same work the notion appears that the earth is encircled by such a dragon, beyond which is the outer darkness where souls incapable of redemption are cast. Again the fourth-century writer Horapollon says that the Egyptians represented the universe as a serpent devouring its tail. The same image is often found on Gnostic gems.

The dragon or serpent is also a guardian of treasure—witness the golden apples of the Hesperides. The notion of the tail-eating dragon is, then, that of the guardian of the treasure, the Sun, the universe, within which can be written the *Ἐν τὸ πᾶν*. The task of the adept or of the practical alchemist alike is to

destroy or dissolve this guardian of the treasure and use his corpse as a stepping-stone to the treasure itself ('Visions of Zosimus', see p. 90).

The imagery of the serpent is found in the early and strange texts attributed to Ostanes, the legendary Persian instructor of Demokritos. This text is notable for a curious symbolism.

Zosimos speaks of him as 'the very ancient Ostanes', and quotes him as follows:—'Another author speaks of a certain Sophar who formerly dwelt in Persia as saying "There dwells upon a pillar an eagle of bronze which descends into the pure spring and bathes each day, thence renewing itself".'

Again Ostanes is quoted as saying 'Go towards the current of the Nile, you will find there a stone which has a spirit'.

The text attributed to him has the appearance of being of early date. The first paragraphs may be quoted:—

'1. The unalterable nature rejoices in a little water. For mixtures (of mercury) alter it from its underlying nature. For every disease is healed by this precious and divine water. The eyes of the blind see, the ears of the deaf hear, the dumb speak clearly.

'2. Here is the preparation of this divine water. Taking the eggs of the serpent of the oak which dwells in the month of August on the mountains of Olympus or Libanus or Taurus. Put a pound of these which must be fresh in a glass vessel. Place on them, divine water, that is hot, and raise the sulphur without fire, four times into the sky until the distillate of oil is purple. Take 13 ounces of Amianthus, 9 ounces of the blood of the murex, 5 ounces of the eggs of the golden winged hawk . . .'

The Symbolism of the Egg.

The egg very naturally plays a large part in alchemical symbology, and it would indeed have been surprising if the egg, from which the living creature so mysteriously develops, had not been adopted by Alchemy, an art essentially creative. The symbol of the egg is of great antiquity. In one of the Egyptian cosmogonies Ra was produced as an egg from sky and earth, and Ptah the great artificer shapes the sun-eggs and moon-eggs on his potter's wheel. The notion reappears in the various Orphic cosmogonies which have in common the production of an egg of light (or, in some versions, of matter) from which the God emerges. In one version the two parts of the egg become heaven and earth. In the Upaniṣads (the *Chhandogya Upaniṣad*) the cosmic egg breaks into a silver half which becomes the earth, and a golden half which becomes the sky. Various parts become the mountains, rivers, seas, etc., while from the egg itself is born the Sun. In the Greek alchemical texts there appears a rather similar notion in which the parts of the egg are assimilated to various substances. These texts seem to represent a tradition independent of those already mentioned. The notion appears in Zosimos, and the texts whose substance he seems to draw on probably therefore belong to the early

period of Greek Alchemy. The symbolism does not occur in the Democritan text nor in the fragments of the work of Maria. Thus one of these ¹⁵ texts begins :—

'The Nomenclature of the Egg : it is the mystery of the Art.

'It is said that the egg is composed of four elements because it is the image of the world and contains in itself the four elements.'

The text goes on to say that the shell represents Earth and the metals ; the white represents water, and the divine water ; the yellow of the egg is said to be chalkanthum (vitriols) ; the oily part of the egg is fire.

This is, however, merely a philosophic rationalization of a primitive symbol. When Olympiodoros (fifth century) tells us that Hermes wrote of the Egg in the Pyramid : that the egg is the reproduction of the universe, and is the 'world with golden hair' we may be coming nearer to the source of this symbol.

Symbolism of Planets and Metals.

A type of symbolism which can be traced to sources much more ancient than any we have for Alchemy is the association of metals with the planets, discussed by Prof. J. R. Partington on pp. 61-64 of this number, and need receive no further notice here. It is uncertain how early such symbolism is to be found in alchemical texts. The Leyden papyrus uses the signs of Sun and Moon for gold and silver, so that a part at least of the planet-metal symbolism was in use in the late half of the third century. The apparently early text, the *Chrysopæia of Kleopatra* also shows these symbols, and it is fair to suppose that the adoption of the assimilation of the metals to the heavenly bodies is contemporary with the beginnings of alchemy itself.

Hermes as Founder of Alchemy.

The legendary founder of the Art of Alchemy is Hermes, who, however, makes but a small appearance in the Greek alchemical writings.

Hermes Trismegistos was regarded by the Greek alchemists as a remote and lofty figure. Among the alchemical texts we find only three attributed to him. One is not alchemical, but is concerned with divination. Another is doubtfully alchemical. The third is the Enigma :—

'Unless you disembody the bodies and embody those without bodies, nothing which is expected will occur.'

Several quotations from the lost works of Hermes are to be found in the works of Zosimos and Olympiodoros. They tell us very little, but indicate that his works had both mystical and practical aspects, and would perhaps suggest that they were allied to the work of Demokritos rather than that of Maria,

¹⁵ Berthelot, *Collection*, i, iv, p. 20.

The famous Emerald Table of Hermes is not found in Greek Alchemy, though its mention in an eighth-century Arabic text, and the existence of the Greek word *telesmus* in the Latin version hint at a Greek original. It may confidently be asserted that it was unknown to the Greek alchemists whose works survive. These do not quote it, and indeed its ideas and expression differ widely from anything contained in Greek alchemical texts.

The conjecture that the Emerald Table, and indeed much that was known by the Arab alchemists, was derived from an independent early source is a tempting one, though the evidence is too scanty to allow of anything more than speculation.

Numerous Independent Sources of Greek Alchemy.

All the important early texts have now been considered, and it is clear that no one of these can be regarded as the original source of the alchemical tradition. The following groups of texts appear to represent different schools of alchemical thought, and there is no reason to suppose that any one of them is earlier than the others:—

The Democritan Treatise. (Practical colouring of metals.)

The lost work of Maria. (Operations involving elaborate apparatus.)

The works attributed to Kleopatra. (Mystical.)

The work attributed to Ostanes. (Mystical and practical.)

The fragments of Hermes. (Mystical and practical.)

The Egg-symbolists. (Symbolic.)

It must be concluded that, at the date when these earliest treatises were written, Alchemy was already a well-developed system with several schools of thought. There is, however, no direct evidence in the Greek alchemical texts of any remote antiquity for the origin of Alchemy. The definite assertion of the texts, their place of origin, and the character of their mythology and symbolism indicate that their immediate source was Egyptian; but the acceptance of the assertion that the texts are based on secret knowledge immemorially in the possession of the Egyptian priesthood must be a matter for individual judgment. If we accord even a tentative adherence to such a theory, we may be comforted by the certainty that the evidence for any other origin of Alchemy is even more slender.