Nepenthes and Cannabis in Ancient Greece

Luigi Arata
University of Genoa

Substantial evidence supports the perspective that the people of Ancient Greece had a language for and some use for drugs, both for the purpose of medicine and poison; however, the question remains whether Ancient Greek civilization held a concept approximating what we today call drug addiction. This article explores the textual evidence for the use of two drugs, nepenthes and cannabis, in Ancient Greece. While the existence of nepenthes remains in doubt, the use of cannabis is well documented. Either drug or both drugs may have been used in the rites of the Bacchic and Orphic mysteries, which might explain why there are so few references to these drugs in the Ancient Greek literature.

In Ancient Greece, there was not much use of drugs.[1] There is not even a word in Greek to identify the "addicted" nor does Greek contain any concept of drug dependence. However, Greek language did have a word to signify drugs, *pharmakon*, a *vox media*, which is understood either as medicine, a positive meaning, or as venom, a negative one. *Pharmakon* is literally a product of medicine, but, since ancient medicine was related to magic, it could also be the work of a magician, a type of enchantment. In addition, because magic can be used for good or ill, medicine is not always associated with the art of healing; it can also be an art of pain. As a consequence, it is natural that *pharmakon* has so many different meanings: It is the filter of Medea who killed her children and the future bride of her lover, Iason, but it is also the venom that has nothing to do with magic, which king Mithridates is said to have drunken everyday to become resistant to it; it is Hippocrates' mixture of herbs to cure illness, but also the herbs that some midwife sorcerers gave their patients to make their delivery faster and more painful, so that they could make them pay more for their intervention.

Modern times have rightly emphasized the negative side of addiction, and this emphasis upon the negative has tended to minimize the other significance of the word "drug": a substance used for medical purposes due to its ability to change the state or function of cells, organs and organisms. In the ancient Greek world, the positive sense of *pharmakon* was even associated with herbalist science and cooking, since all those herbs, generally of Oriental origin, such as pepper or marjoram, were used not only for their healing properties but also for their aroma or taste. In fact, these were also

Janus Head, 7(1), 34-49.

among the ingredients of ancient Greek medicine and, since they were not easily grown in Greece, they were imported from all over the Mediterranean area, especially Egypt. From immemorial times, in fact, Egypt was thought to be the most "pharmaceutical" of the lands of the entire world, as is attested in a plethora of literary passages. Thus, it is not by accident that the first of the two drugs upon which we will concentrate in this article, the nepenthes, is from Egypt.

The first of the evidence of nepenthes in Ancient Greece comes from the fourth book of *The Odyssey*. Telemachus, Ulysses' son, is compelled by Athena to go and search for his father who has yet to return from Troy to Ithaca, his home. On his journey, the young Telemachus first comes to visit Menelaus, who has come back from the expedition to happily reign over Sparta with his wife, Helena. Telemachus' arrival is not an entirely good event for Menelaus' court: He is glad to see the son of one of his most important allies in the war against the Trojans, but at the same time in his soul he recalls the horrible events of those years, which makes him and his followers sad. This is why Helena, who has been to Egypt where she was hosted by King Thonis, uses the nepenthes, mixing it with wine, to calm down all the bystanders and make them relax, forgetting their past suffering:

> Helena, Zeus' daughter, thought of something else
> and immediately put a filter in the wine which they were drinking,
> the nepenthes, which calms the enraged and gives oblivion of all evil.
> The man who has drunk it, mixed with wine in the vessel,
> will not shed tears down on his cheeks for all the day,
> neither if his father died nor his mother,
> nor if they tortured his brother or his son
> with the bronze (i.e., with a sword) in front of him and he saw it under his eyes.
> Zeus' daughter (Helena) knew those appropriate, salutary remedies:
> Thonis' wife, the Egyptian queen Polydamna, gave them to her;
> the fertile lang (Egypt) produces many such
> substances, many useful in mixture, many lethal;
> and there everybody is the most skilled physician
> of all men, since the Egyptians descend from Paeon's (the god's physician) family. (4, 219-233)

The drug has a magical effect. In spite of the tragic facts that must be told to Telemachus, there is not time for crying. The banquet is not the happiest (too many Greeks have not yet returned from Troy, and, most of all, too many Greeks have found their death on those plains); however, there is not so much pain in remembering due to Helena's intervention.[2] What is known about nepenthes? Almost nothing, it must be confessed. Etymologically, its name has the meaning of "painless," "giving no pain," or better, "cancelling any pain," which is nothing more than another means of expressing its function. Apart from these characteristics, the emphasis is placed upon the drug's Egyptian origin, which is another way to stress its magical identity. Egypt is a land of ancient wisdom, in which Helena is said to have been educated. There was more than one myth about her staying there.

Eustathius from Thessalonia (*ad Od.* 1, 161, 46-, 162, 6), the Homeric commentator who lived in the 12th century A.D., tells us about Thon or Thonis, the Egyptian king, who gave his name to the town Thonis and who was Menelaus' friend. When the Greek host gave him Helena to look after while he was visiting Ethiopia, Thonis fell in love with her and tried to force her to make love to him. According to another version, attributed to Helianus, Thonis' wife, the same Polydamna[3] who is said to have given Helena her knowledge of medicine, being extremely jealous, imprisoned the beautiful woman in a lighthouse where she was among horrible snakes.

Polydamna is another "talking name," which has a patent etymology: It means "giving pain in many ways" or, better, "to many people," as the scholia concerning this passage makes clear. In fact, it is not to be taken for granted that Polydamna is a proper name, since it could be referred to as an adjective connected to the medicines (they call it an *amphiboly*, e.g., *Sch. Vet. ad Od.* 4, 228), as interpreted first by one of the best known of all Homeric commentators, Aristarch from Samotracia (217-145 B.C.)[4].

The Homeric context shows us two other data: Nepenthes must have been a vegetal substance, since, as Homer says, it is one of those products grown in the Egyptian fields, and it must have been solid, not liquid, because it was stated that Helena *put* it into wine rather than *poured* it. It seems to have been an officinal plant as, for example, borage[5], which was mixed with wine to give joy and good humor, according to Plutarch (*quaest. conv.* 614b-c).

It seems natural that wine was the first ingredient of these mixtures

that provided euphoric effects. In fact, wine was so widespread an ingredient that it was the base of a large number of medicines.[6] Moreover, we are aware that it has various effects when ingested; alcohol, in fact, seems to make people more relaxed and breaks the "inhibiting controls." In addition, we must stress that, if we can dispute whether there were addicted people in ancient Greece, it is well-known that the ancient Greek world was aware of a phenomenon similar to alcoholism.[7] There are many examples of those who were ruled over by the mania of drinking. In later antiquity, polemics against wine excess was so widespread that some Christian sects asked for the destruction of all vineyards[8], an idea opposed by others on the principle that it was not the fault of the vine but of the intemperance of men.[9] Wine can have "relaxing" effects without the addition of any other substance. However, we should remember that modern herbalists were also aware of the important uses of this substance when mixed with other ones.

One of the most important effects of wine is that it can make people sleep. This narcotic property is the one that, quite naturally, Homer attributes to nepenthes. Egyptians were fond of these narcotic or euphoric medicines, as Eustathius points out (*ad Od.* 160, 30). The historian Diodorus Siculus, who lived in the 1st century B.C., noted that, still in his days, "people say that the Egyptian women make use of the powder (of this plant, *scil.* the nepenthes) and they say from ancient times only those women who lived in the 'Town-of-Zeus' [i.e. Thebes, which was also known as Diospolis] had found medicines which cure wrath and grief" (1, 97, 1-9; Eus. *PE* 10, 8, 9-12; cf. also Ps.Iustinus, *Cohort. ad gent.* 26e). Later, between the 12th and 13th centuries, the Christian historian Nicetas Coniates (*Hist.* 165) observed Egypt as a land where "still now, perhaps, there are to be found medicines which are stronger than the ancient ones and which not only can calm people's grieves and treat the soul's wounds with fast remedies [. . .] but also can soften enemies' violence and make them forget their force."

In the ancient interpretation of nepenthes, however, there are two opposite lines of argument: the most authoritative of these, namely Plutarch (*quaest. conv.* 616c) and Eustathius (*ad Od.* 1, 160, 30-45), found it impossible to take the episode literally and interpreted it as if it was symbolic. Helena, according to their idea, did not mix anything but her words. As Plutarch says, the magic is in the "speech which was absolutely apt to the suffered pains and difficulties," i.e. in her words about Ulysses (for which, cf. *Od.* 4, 242-244).

Eustathius is even ampler in his analysis, calling in the concept of

friendship that ties together those who are invited to the same banquet: "Helena, in fact, moving those elogies which concern Odysseus and other histories and mixing them to the symposium, as if they were a medicine which makes people forget their pains, did not allow her guests to cry, got rid of the top of the sorrow and thus weakened it."

A more technical tradition, to which in particular ancient physicians belonged, tried to find a truly correspondent plant to nepenthes. Eutecnius, the scientist who paraphrased the didactic poem *Theriaca* by Nicander from Colophon and whose dating is a mystery, recognized nepenthes as a Beotic name for "miltos"[10], which is able, in fact, to make people forget their bad memories and bring them to joy and happiness (65, 26).

Earlier, we find the famous scientist from Pergamus, Galen (129-199 A.D.), interested in trying to discover the truth about this traditional "pharmakon." In the treatise *Quod animi mores corporis temperamenta sequantur*, he quoted from a popular source ("they say"), and it is interesting that an important physician like him talks about nepenthes. He tells us that he cannot explain the reason why drinking hemlock can make us luxurious or why drinking wine can calm our stress, but it is a fact that we see those things everyday. And then he adds:

> They say that also Enopia root [i.e. the root of the island of Aegina, which was situated in front of Athens] is very powerful and that it was the medicine of the Egyptian female foreigner, about which the poet [i.e. Homer] says: "she [i.e. Helena] immediately puts a filter in the wine which they were drinking, the nepenthes, which calms the enraged and gives the oblivion of all evil" [*Od.* 4, 220-221] (4, 776-777).

It is true, we must admit, that nepenthes can be nothing more than a legend that originated in Homer's text. The first attestation of nepenthes, it has been shown, is in a magical context, being as it was connected to Egypt, which was, in some ways, the land of magic for the more rational Greeks, and also connected to Helena, who has often been described as the first sorceress/female physician of the entire ancient world.[11] Moreover, as has been clarified, the subsequent literature, which evidently arose from the Homeric passage, tried to partly explain its meaning as symbolic. This is especially the case among those who were more informed about Homeric poems. Again, when its reality is not questioned, nepenthes is often connected with other "magic" receipts, which would be enough for us to take it for granted that

nepenthes did not exist at all.

However, if we take into consideration that antiquity was not entirely precise when distinguishing between magic and medicine, these simple facts we have now collected are only hints of the inexistence of nepenthes. Moreover, if there was no nepenthes, it would be sufficiently possible (and in fact sufficiently attested) that there were other narcotics in the ancient Greek world. We cannot be sure if such substances were conceived as creating what in modern times is called addiction, but the point is that the Greeks were aware of their proprieties and used them as medical ingredients.

And again: If nepenthes is an Homeric invention, it is equally attested that the Greeks had a habit of mixing wine with other ingredients in order to create this or that effect. In other words, although nepenthes probably had not really been used, other substances, which perhaps can be identified with it, were used, and this is an incontrovertible fact.

The 11th century A.D. historian, Michael Psellus (*Opusc. log.* 32, 1-2), who, putting together some *paradoxa* (some incredible matters) in his remarkable tentative, mentions nepenthes together with Epimenides'[12] "alimos"[13] and the Pithagoric Zenaria's "mnemonikon." The "alimos" is, as its name signifying "nourishing" makes clear, a mixture that allows people to stay alive without eating for many days. The "mnemonikon" is another mingle of "magical" plants that, if ingested, makes people forget their bad memories and remember only their happy ones, in a way similar to nepenthes. What is most interesting is that, as he does with the two other *pharmaka*, Psellus gives us the receipt of nepenthes or, better, he lists its ingredients. It is the only evidence we have (albeit, not really reliable evidence) of nepenthes as a mixture of plants rather than a single plant, as has been suggested until now. According to him, it would be made of hippomanes, Cretan purslane, henbane and mandragora. These are all magical ingredients and some of them have psychological effects, not to mention the well-known ritual significances of mandragora[14] and hippomanes, an extremely well known ingredient of sorcerers' filters, a plant which is difficult to find and which is often confused with the mysterious excrescence of a colt, which, if it ever existed, would be collected at the animal's birth.[15] Psellus quoted from the paradoxograph Prodromus, but the fact that his source is a little more ancient does not make the evidence any more reliable. It is one of the many tentatives of later writers that accounts for the existence of nepenthes, putting it in the same cauldron with other magic mixtures, the historical existence of which seems to be refuted.

Nicetas Coniates (*Hist.* 165) remembered another similar case, that of Amerrigus, king of Jerusalem, who was allied with the Romans against Egypt but gave up the battle since, as the historican states, "as it seems, enchanted [by Egyptions] though his drink and being drunk because of the pot, he surrendered to a long-lasting sleep."

The other drug we will discuss is cannabis, which was a relatively widespread plant, used above all as material for the making of ropes and connectives of this type. Nevertheless, we will consider the evidence which refers to its medical or paramedical use and which is, we must anticipate, its widest use.[17]

Ancient medicine was founded on the utilization of herbs, and, generally speaking, physicians were nothing more (or little more) than developed herborists. Personal observations, popular superstitions, medical experience, and information from other sources were collected in ancient medical treatises, which concentrated on the description of plants and their uses. These treatises came to us under the name of various authors, but they were all connected in a network of relationships. Indeed, it is quite stimulating to find one author depending on another who wrote before and was "exploited" by a later one.

The starting point of this written tradition is again Galen, who in fact functions as a big "collector" of earlier traditions and is the most attested medium, thanks to whom they are transmitted to his successors. The letters bear the name of Dioscorides from Anazarbus (1st century A.D.), Oribasius from Pergamus (4th century A.D.), Aetius from Amidus (6th century A.D.) and Paul Aegineta (7th century A.D.), just to give a few examples. However, there were still some physicians who dealt with the scientific material but who nevertheless remained anonymous.

Galen speaks about cannabis in three passages. The largest is in *De alimentorum facultatibus* 6, 549-550, in which he deals with cannabis' seed, which is compared to the seed of agnocastus. This description and the one that appears in *De simplicium medicamentorum temperamentis ac facultatibus* 12, 8 were simply repeated by later physicians.

De alimentorum facultatibus is especially concerned with negative properties:

> the cannabis' plant is not similar to agnocastus' and the cannabis' seed is somewhat similar to agnocastus' as concerns its power, but it is very

> different, as it is difficult to digest and gives pain to the stomach and to the head and spoils humours. Anyway, some people eat it toasted together with other teasers.[18] What I call "teasers" is what is eaten for pleasure of drinking during the meal. [Cannabis' seed] heatens sufficiently and it is because of this characteristics that it hits the head, if it is ingested in too much quantity in a short time, and sends hot, in the meantime pharmaceutical fumes to it.

The very same description appears in Oribasius 1, 32, 1 and Aetius 1, 26, who refer to it as cannabis' fruit. They insist less on the alimentary use of cannabis and add, in this context, that it does not help the formation of gas.[19] Further, they note that the substance is so dessicating that, if eaten in a rather large quantity, it dries male seed. The same data are in fact reported by Galen in *De simplicium medicamentorum temperamentis ac facultatibus*:

> The cannabis' fruit does not create gas and is so dry that it can dry male sperm, if it is eaten in a quite big quantity. Some people, pulling out the juice from it when it is not ripe, use it against ears' pains[20] due to an occlusion, as I believe.[21]

What is to be inferred about cannabis is obviously its desiccating power[22], and it is in fact attested that cannabis was used to cure gonorrhea[23] and epistaxis.[24] But what is most interesting for our purposes is that fact that, as Galen states, cannabis is *kephalalgès* (literally "painful for the head," which is related to its heating characteristics). In other words, cannabis is so hot that it can cause cephalalgia, since it gives birth to unnatural fumes that go immediately to the head.[25] This is what is implied by the anonymous author of *De alimentis* 31[26]: "[among] things that hit the head [there are] . . . the fruit of cannabis . . . and red, dry wine: and all perfumed wines attack head and nerves." It is true that he is talking about wine, but the same things can be said of cannabis, too. And, again, Galen, in his third and last reference to cannabis in *De victu attenuante* 29, adds: "in the same way the agnocastus' seed and the cannabis' seed are not only pharmacological, but painful for the head."

The important historian, Herodotus, who lived in the 5th century B.C., knew of a strange utilization of cannabis' fumes among the Scythians, the people who lived between Europe and Asia:

> after the burial, they cleanse themselves in the following way: they annoint and wash their hands and, to clean their bodies, they prepare three poles leaning together and cover these over with wool mats. Then, in the most enclosed space as possible, they make a pit in the centre beneath the poles and the mats and throw hot stones into it (4, 74).

Herodotus starts a discourse about cannabis, saying that it grows in their country and that it is so like flax that they even make garments out of it, which are very similar to linen. About the burial rites, he adds: "The Scythians take the seed of this cannabis and, crawling under the mats, throw it on the hot stones, where it smoulders and sends forth such fumes that no Greek vapour-bath could surpass it. And they howl in their happiness at the vapour-bath" (4, 74).

Given the connection made in medical tradition between the effects of cannabis and wine and taking into consideration that cannabis was used as a stupefacient by Scythians, as we have seen in Herodotus, we must suspect that ancient Greeks knew that cannabis could have neurological effects because they observed it. In fact, cannabis was firstly burnt or toasted and then reduced to powder in almost all medical receipts.[27] Greek people knew about its fumes, obviously, and about its effects.[28] The fact that almost nobody directly described abuse of this stupefacient was perhaps due to its rarity (cannabis was not a Greek product, it seems[29]) or its unusual utilization. Yet, it is not at all strange if we bear in mind the silence of our sources about the drugs that were used by the Maenads in Bacchic mysteries and by the initiates in Orphic mysteries.[30]

We know that those people who found their way of happiness celebrating those rites tried to come into communion with gods through orgies and narcotics.[31] Sex and drugs were thus the media through which men and women became gods or, better, similar to gods, redeeming a life of privation, as it is demonstrated, for example, in Euripides' *Bacchants*. Here, Pentheus, the unlucky king of Thebes, is described as torn to shreds by the Bacchants, among whom there was also his mother, Agave, who arrived to town in ecstasy with her son's head in her hands.[32] There, Cadmus, her old father, talked to her and tried to make her return to normal, as if she had been under the effect of a drug:

> -Look to the sky!
> -Here I look. But why have you made me do that?

-Is your look always the same or is it changed?
-It has more light than before and it seems more transparent.
-And is your soul still lost?
-I cannot understand . . . but I feel as I have come again in my senses, my thoughts are changed and me too . . .
-Can you hear me and reply to me, and in a clear manner? can you?
-It is strange how I have forgotten everything that I said; father!
(1264-1272)

Who knows? Perhaps, nepenthes or cannabis were the drugs that were used in those rites, and this would be the reason why we know so little of them and about how they were used.

Notes

[1] Rudgley 11, 27, 36, 111; Gourevitch 9-11. Cf. the scant news on the classical world in Austin's *Synoptic Chronology*.

[2] We can compare, e.g., the sadness that hits Aeneas, when, at his arrival in Carthago, he tells his hosts about his last night in town. Virgil insists on his physical, not only moral, pain in doing so. It is typical, in fact, of ancient times, since it was firmly believed that telling a story of the past was really just a re-living of it with all its dramatic aspects.

[3] According to Ptolemaeus, she was called Thoumis, cf. *Sch. vet. ad Od.* IV 22-28.

[4] However, according to Eustath, *ad Od.* 1, 161, 34-36, this was also Euphorion's interpretation, and it is interesting to observe that he connects Polydamna to Medea: "the filters which Polydamna knew attacked men's minds, as those of Medea from the Colchis."

[5] Borage is known to depurate blood and thus was considered a panacea.

[6] Preiser 296-303. On medical uses of wine, Jouanna.

[7] On alcoholism in antiquity, Rolleston; Leibowitz; Villard, "Pathologie et thérapeutique"; Villard, "L'alcoolisation dans l'Antiquité classique"; Sournia; Villard "L'ivresse."

[8] On various Christian attitudes towards wine, cf. Escohotado 25-26.

[9] Cf. John Chrysostom (345-407 A.D.), bishop of Constantinople: "I

hear many men cry, 'Would there be no wine!' O folly! O madness! Because of the sins of others you accuse God's gifts: and of what folly? It is not wine that causes this abuse, but the intemperance of those who enjoy it. Then you ought to say, 'Would there be no drunkenness! Would there be no dissoluteness!': for if you say 'Would there be no wine,' you will say, going further: 'Would there be no iron!' because of the assassins, 'Would there were no light!' because of the informers, 'Would there be no night!' because of the thieves, and 'Would there were no women!' because of adultery." *(In Matth*. 58, 564).

[10] No other evidence for "miltos" can be found in ancient Greek literature. Miltos is, in fact, the name of the clay with which they made minium (cf. e.g., Hdt. 4, 191, 1).

[11] Arata.

[12] Strataridaki; Pòrtulas.

[13] Cf. *Sch. vet. in Hes. Op*. 41.

[14] Borghini; Bader (who connects mandragora with Helena's nepenthes). On pharmacological effects, cf. Rudgley 109, 113-117.

[15] Doyen; Watson.

[16] Arr. *Bythinic*. fr. 13, 38, 39.

[17] On the historical roots of the use of hemp, Rudgley 28-39. For a closer reading of the subject, cf. Zias, "Early Medical Use" and Zias, "Cannabis sativa." Against, Brunner.

[18] Cf. Eustath. *ad Il.* 3, 519, 12-13.

[19] Orib. *Ecl.* 3, 22; *Syn.* 4, 21; *Eup.* 1, 38; Aet. 2, 258.

[20] Diosc., *Eup*. 1, 54.

[21] Cf. Diosc. 3, 148; PAeg. 7, 3, 10.

[22] Aetius (2, 209) and Oribasius, on four occasions (*Ecl.* 14, 23; 15, 1, 10; *Syn.* 2, 13, 1; *Eup.* 2, 1, 12), put cannabis among the driest nourishments. Oribasius also puts it among the hottest (*Ecl.* 3, 31; *Syn.* 4, 31), and Aetius puts it among the most mitigating (2, 240, 1-27; cf. Orib. *Ecl.* 3, 2, 1; *Syn*. 4, 1; *Eup*. 1, 18).

[23] Aet. 11, 33 (quoting from Galen); Orib. *Eup*. 4, 107. It is extremely possible that the receipt quoted by the author of *De remediis parabilibus* 14, 548, 11-14, in which cannabis is used against urinary problems, has to be referring instead to gonorrhea.

[24] Ps.Gal. *remed. parab*. 14, 548, 15-17.

[25] Other medical uses of cannabis are attested though: its root is believed to treat inflammations and melt corns (Diosc. 3, 149; cf. *Eup*. 1,

54), and it is one of the ingredients of a medicine used against tumors of various types (Aet. 15, 7; Orib. *Syn*. 3, 29). In veterinary medicine, it seems to have been used in cataplasms against inflammations (*Hippiatr. Berol*. 10, 11, *Hippiatr. Paris*. 154, 219) or as a cathartic of wounds (*Hippiatr. Paris*. 216), especially of the rachis *(Geop*. 16, 15; *Hippiatr. Cantabrig*. 17, 3) or even against taenias (*Hippiatr. Cantabrig*. 70; it is interesting to observe that a portion of cannabis is said to be useful against taenias in human beings by Archigenes fr. 17) or for injuries (*Hippiatr. Paris*. 270).

[26] Cf. Orib. *Ecl.* 3, 21; *Syn*. 4, 20.

[27] Toasted cannabis: Orib. *Ecl*. 1, 32, 1; Aet. 1, 26; 11, 33. Desiccated cannabis: Orib. *Syn*. 3, 29; Aet. 15, 7; Ps.Gal. *remed. parab*. 14, 548, 15-17; *Hippiatr. Berol*. 10, 11 (*Hippiatr. Paris*. 154, 219); *Hippiatr. Cantabrig*. 70, 10. Boiled cannabis: Archig. fr. 17. Burnt cannabis: *Hippiatr. Cantabrig*. 17, 3; *Geop*. 16, 15.

[28] Aet. 1, 26; Orib. *Ecl*. 1, 32, 1.

[29] Cf. Athen. 5, 40, 23-24.

[30] On Eleusinian mysteries, cf., e.g., among the vast scientific literature: Sabbatucci; Mylonas; Wasson-Hofmann-Ruck; Sfameni Gasparro; Kerenyi; Veyne-Lissarrague-Frontisi-Ducroux. On the use of drugs in Eleusinian mysteries, cf. Schmidbauer.

[31] On the use of intoxicants in initiations, Ridgley 95-104; Escohotado 16-18. Rites and stupefacents, cf. Rosenweig 24-25.

[32] Cf. Thomson

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Author's note: Correspondence concerning this article should be addressed to Luigi Arata, Corso Vittorio Veneto 26A-9, 17100 Savona, Italy 0039-019804279. E-mail: luigiarata@hotmail.com.