



Rhododendron Ponticum

Rhoda! if the sages ask thee why
This charm is wasted on the earth and sky,
Tell them, dear, that if eyes were made for seeing,
Then beauty is its own excuse for being
R. W. Emerson, 'The Rhodora'

"The Delphic priestess in historical times chewed a laurel leaf but when she was a Bee
surely she must have sought her inspiration in the honeycomb."
Jane Ellen Harrison, Prologemena to Greek Religion

Thy Lord taught the Bee
To build its cells in hills,
On trees and in man's habitations;
Then to eat of all
The produce of the earth . . .
From within their bodies comes a drink of varying colors,
Wherein is healing for mankind.
The Holy Koran

Mad Honey

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Mad Honey

Point of View and Introduction

It's no surprise to discover that honey, and the bees that produce it, play a notable role in mythology and religion throughout the world. What could be more wondrous: insects that perform a strange alchemy, transforming pollen and nectar into honey? These guardians of the only natural sweet known to many peoples are also important connectives between heaven and earth. And honey isn't the only thing they can produce. According to folklore these well-armed creatures absorb plant poisons to increase the potency of their own venom. Don't the gods themselves feast on honey sweet ambrosia, don't they drink mead or hydromel? In many regions when you have an important wish, or special news you must first tell the bees before you tell anyone else.

Is there more involved in the bee mystique than these allegorizations around the bees' behavior and honey. In this study we will encounter evidence that there may be operative as well as allegorical reasons for the ubiquity and importance of the bee and its products in myth and religion. There can be no doubt that at least on occasion, the interest in honey is based on more than its importance as a food source, a sweetener, a medicine or an allegory for a connective between levels, nature's alchemist, or the remarkable properties of honey.

When it comes to honey's operative nature an obvious aspect is related to honey wine (mead or hydromel) etc as historically very important intoxicants. A less studied aspect is that of the psychopharmacological substance that honey can contain under very specific circumstances. We will also focus on the possible link with this particular honey with the Laurel tree and the Pythoness at Delphi.

Our primary task in this material is to gather and summarize the information key to understanding the historical use, sources and mechanisms of this substance and its action.

This material is a first attempt to synthesize the information about *Meli Chloron*, the so-called *Toxic or Mad Honey*. We have tried to address a few basic questions about this substance. First, what the substance is. Second, how the substance was or is used. Third, how the substance works. Finally, there is a question, which we will not deal with here, about the global production and use of consciousness altering plant substances of which this is a particular case.

Summary

There is a particular type of honey that is referred to by a number of intriguing names, among them *meli maenomenon* (*mad honey*), *toxic honey*, *deli bal*, and *meli chloron*. There is also a *miraculum melis* which may be related (miraculous honey— which *Pliny tells us comes from Crete*), This material is of interest because of the particular psychoactive properties it contains. These *toxic* properties are present in the honey of bees that have gathered nectar and pollen from certain plants in certain climatic and seasonal conditions. There are cases of *mad honey poisoning* reported in agricultural bulletins and medical literature from around the world but especially from the region around the Black Sea. It is best known however through references in the literature of ancient Greece. The most famous cases involve toxins in the honey produced by bees that have fed on the nectar of certain rhododendrons (*Rhododendron ponticum*).

The special properties of this honey results from substances already in the plants. That is the substances are concentrated but not produced by the bees that feed on these plants. This is made obvious in a case in Scotland where, a man licked rhododendron nectar from his hands and almost immediately developed a range of symptoms including, loss of coordination and an inability to stand. The symptoms disappeared within a few hours (*Cooper MR, Johnson AW. 1991*). The bees role in making this substance available rather than produce it is easily understand when we consider that in the process of collecting pollen and nectar from a flower bees remove up to 80+% of the water content, concentrating whatever toxic phytochemicals are to be found in the plant material. There are other cases (see page 10 below) where there is a second insect intermediary between the plant and the bees.

Mad honey poisoning is often called *rhododendron poisoning*, *mad honey intoxication* or *grayanotoxin poisoning* and is attributed to *grayanotoxins* (formerly known as *andromedotoxin*, *acetyl andromedol* and *rhodotoxin*). It is easy to find descriptions of the physical symptoms caused by the toxins in this honey. Not surprisingly there is less precision when it comes to describing the internal registers. There are references to euphoria, madness, tingling, giddiness, whirling lights and tunnel vision etc, but little detail.

Some say classical sources say that this honey was usually reddish in color, there are ancient descriptions ascribing to it an acid or bitter taste. Other writers disagreed and said that it was indistinguishable from good honey, or even that a single honeycomb might contain both toxic honey and good honey. It has been noted that bees will bypass Rhododendrons and related plants when there are flowers with higher sugar and nectar content available. However, rhododendrons bloom early in the spring, and sometimes the dominant flora in an area. When these are the only flowers available the honey is likely to be toxic, particularly in the springtime. "Green," or unripened honey, i.e., uncapped honey whose water content has not yet been reduced by the bees, seems to be the most suspect honey for toxicity. As we will see this idea of "Green honey" will prove important.

It has been proposed the rhododendron that is the source of *meli chloron* would have been considered a laurel in ancient Greece. This is potentially an important detail because it would cast new light on the importance of laurel in those cultures, and in prophesy. It would also tie the use of this honey to Delphi where the Pythoness is described as chewing laurel leaves or burning them to inhale the fumes.

A “Classical bias” in scholarship can explain why this peculiar substance and its results, though found worldwide, are most often associated with areas on Turkey's Black Sea coast. This also led to the name *Pontic honey* in reference to the area of *Pontus* in the region of the former Empire of *Trebizond* on the Black Sea coast of Eastern Turkey. As we will see that does not mean that the occurrence or the intentional use of this substance is restricted to this area. We will find its use in areas that are geographically very dispersed.

Other plant sources can produce toxic honey. These include: *Kalmia latifolia*, the calico bush, mountain laurel or spoon-wood of the northern United States, and also related species such as sheep laurel (*Kalmia angustifolia*). The nectar of the *wharangi bush*, *Melicope ternata*, in New Zealand, *Datura* plants in Mexico and Hungary, belladonna flowers, henbane (*Hyoscamus niger*) plants from Hungary, *Serjania lethalis* from Brazil and *Gelsemium sempervirens* from the American Southwest. In South America there are various sources including *Rivea corymbosa* (see page 10 below).

Traditional usage of this honey continues until today in the Black Sea coastal zone. Doctors in this region are quite familiar with the symptoms of *mad honey* poisoning and it is not uncommon for them to have to treat people who intentionally or unintentionally ingest it. Cases of hospitalization due to mad honey poisoning continue to be reported in that zone even in recent years. Not all of these cases occur by accidental poisoning, or attempts to get *high*. Toxic honey is part of the local traditional *material medica* and is considered a treatment for various ailments. Besides being known to produce euphoria it is prescribed for duodenal ulcer and is also said to be both good for the digestion, and to act as an aphrodisiac. (*Biberoglu, Komsuoglu 1988*)

This honey was known as *deli bal* in Turkey was also used to make mead or added to alcoholic drinks to increase their effect. Though it has proven difficult to verify some experts claim that until the 19th Century, up to 25 tons a year were exported to Europe as *meli fou*, i.e. *mad honey* (*Mayor 1995*). Around the same time in the Eastern United States there seems to have been commercial production of a type of mead produced from *toxic Mountain Laurel honey*. (*Ott 1995*).

A History of Honey

Long before we learned the art of cultivating bees we, like certain non-human animals learnt to steal the honey from wild bees. Early rock paintings on cave walls in Africa and eastern Spain show people gathering honey from trees or rock crevices while bees circle around them. One well known example is a rock painting discovered in 1921 in the *Cueva de la Arana* in Valencia, Spain. The painting depicts a human figure near a cave where there is a beehive. The person is shown as having climbed up to gather honeycombs, while (what is assumed to be) stylized bees circle around. The painting dating back to the Paleolithic is believed to be approximately 10,000 years old, but there are others from 5,000 years earlier.



Paintings and descriptions from Egypt circa 2400 BCE supply the earliest known evidence of “domestication” of bees through the use of manmade. The next oldest existing physical evidence for the cultivation of bees is from thousands of years later. Homer for example, saw bees as wild, never tame, as when the Achaeans issued forth from their ship encampment *"like buzzing swarms of bees that come out in relays from a hollow rock"* (*Iliad*, book II).

Archeologists believe that the art of beekeeping spread by three routes all beginning in N Africa. One path of dissemination of this technology went from Africa to Spain, Rome and Sicily. Another went north as far as Asia Minor (not too Greece however). And a third went to Crete and then to the Aegean and the S.E. part of mainland Greece and finally to the upper part of the Indus Valley. (*Crane 1999*) For the ancient Greeks beekeeping was a craft associated with the Minoans, and mead was a Cretan intoxicant, older than wine.

Evidence supports the idea that Egypt had the most advanced technique and practice. However, it is clear that the use of honey and even the production of

mead could come from a much earlier period. Mead is thought to be one of the earliest alcoholic drinks. *Bees are associated with Dionysius and it is said that in the archaic period, before he was a god of wine, he was a god of mead.* By deriving the word *methuo* meaning "to be drunken" from *methu* an Indo-European root meaning "honey" some etymologist maintain that the ancient Greek for drunk was "honey-intoxicated." However, this is derivation is doubted by some.

Honey in Religion, Myth and Folklore

In many cultures, honey has associations that go far beyond its use as a food. In language and literature, religion and folk belief, honey is frequently allegorically connected to everything desirable and pleasant. The bee correspondingly is seen as a the messenger par excellence between Earth and Heaven. (*Levi-Strauss 1966, Ransome 1937*)

Examples of the cultural, religious, and mythic importance of bees and honey are almost numerous, varied and almost universal. Perhaps most of them can be explained through allegorical analysis. Some are clearly rooted in the physical properties of the substance itself. See bibliography for a few sources.

Honey and the dead

In Egypt, the first recorded home of bee keeping it is said that when Ra wept, his tears fell to the ground and were turned into bees. In the 12th century BCE, Ramses III offered 15 tons of honey to Hapi, the god of the Nile. Jars of honey were buried with the dead as sustenance for the afterlife. Archaeologists have found clay pots filled with honey in a Pharaoh's tomb in the city of Thebes. Inscription on the clay pot read: Good Quality Honey. Large quantities of honey in jars were also found in the tomb of Tutankhamun

Burying the dead (especially nobility) in or with honey was common practice in Egypt, Mesopotamia [Iraq], and other regions. An early example of the later is recorded in the Iliad when Thetis uses ambrosia and nectar to preserve the body of the dead warrior Patroclus, the dearest friend of her son Achilles: "*To save Patroclus from decay, she treated his body with ambrosia and red nectar, which she instilled through his nostrils*". Ambrosia and nectar are normally thought to refer to or at least to be related to honey or mead (i.e. fermented honey). It is rumored that Alexander the Great was buried in honey.

The particular properties of the substance (page 11 above, and Appendix IV) that have led to still edible honey being preserved over thousands of years in some of these tombs also made them powerful preservatives. The same properties have been used by ancient medicine to fight infection. An ability only recently rediscovered by modern medicine.

A Cultural History of Toxic Honey

The trail left by this substance through history is long and complex, but specific and explicit written records dealing with the properties of *Pontic Honey* date at least to the very beginning of the 5th Century BCE. *Xenophon* relates in his *Anabasis* how in 401 B.C.E., after a disastrous campaign in Persia he was elected to take command of 10,000 Greek soldiers. He led them through mountains of Kurdistan, through Georgia and then Armenia. Then they made camp in the territory of Colchis, two days march from Trebizond... In the *Anabasis* (4.8.18-21) *Xenophon* tells how they were surprised to see that, “the swarms of bees in the neighborhood were numerous, and the soldiers who ate of the honey all went off their heads, and suffered from vomiting and diarrhea, and not one of them could stand up, but those who had eaten a little were like people exceedingly drunk, while those who had eaten a great deal seemed like crazy, or even, in some cases, dying men... On the next day, however, no one had died, and at approximately the same hour as they had eaten the honey they began to come to their senses; and on the third or fourth day they got up, as if from a drugging.” The story is repeated by *Diodorus* in his *History*, and others. (see Appendix 1 for this and other classical references)

Three centuries after *Xenophon's* misadventures this accident would supply the insight behind an early example of biological warfare. In his *Geography* *Strabo* notes how in 67 B.C.E., while campaigning against *Mithridates* the king of Pontus, *Pompey* camped near *Trebizond* in the same area where *Xenophon's* soldiers had camped three hundred years earlier. Allies of *Mithridates*, the *Heptakometes*, placed toxic honeycombs directly in *Pompey's* path. Like *Xenophon's* men the soldiers ate the honey and suffered its effects. This time the results were more extreme since the *Heptakometes* massacred *Pompey's* honey-drunk soldiers.

Around 77 C.E. in his *Natural History*, the Roman historian *Pliny the Elder* gave this substance the name '*meli maenomenon*,' or "*mad honey*". He said that, although the people of the area were able to pay a large tribute of beeswax to the Romans every year, they were unable to sell their honey due to its poisonous quality. *Pliny* was also one of the first writers to attribute the toxic source of the honey to the native *rhododendron*, *azalea* and *oleander* plants. Apparently he also called it "the honey of miracles" for its trance inducing qualities. He also referred to a miraculous honey from Crete which did not attract flies and which was known for its unusual medicinal properties (See Appendix I).

A generation later in his *Dioscorides* noted the particular nature of the honey produced in the Black Sea region and the flowers which produced the toxin. He refers to this in his *De Materia Medica*, an important source of herbal medical information for physicians over the next 1,500 years.

In his *Daphnis and Chloe* (1.25.2) the 2nd century poet *Longus* has *Daphnis* describes the effects of his first kiss from *Chloe*: “How lovely her eyes in sleep!

How sweet the perfume from her mouth sweeter than that of apples, sweeter than that from the Hawthorne. Yet I dare not kiss her. Her kiss pricks me to the heart and maddens me like green honey.” Even though they often translated “green honey as “fresh honey” most scholars have connected this honey with the infamous *Meli Maenomenon* (See Appendix I).

Mad Honey in the New World

As already pointed out (pg 6 above) there are a number of New World species that contain grayanotoxins. Not surprisingly then, it is not only in the context of classical culture that the question can be raised of whether honey and bees in myth and religion have an importance beyond the allegorical. Furthermore it is not only grayanotoxin that can cause honey to be intoxicating.

While *Levi-Strauss* (*Levi 1966*) mentions only mead when referring to the intoxicating effects of honey among tribal peoples in South America there are other psychoactive forms of honey in the southern hemisphere. In Brazil there is a traditional inebriating honey produced by the stingless bee *Trigona recurva*. It is called *feiticeira* ('sorceress') or *vamo-nos-embora* ('anyway let's go') apparently in "allusion to the reeling, half drunken condition in which one falls after partaking of this honey" (*Ott 1995*). A number of other plants and insects producing psychoactive honey have been noted throughout the region. Argentine stingless bee (*Melipona sp.*) honey had "inebriating effects owing to the fact that the little bees harvest it from some flowers with narcotic properties" Toxic honeys occur in *Chiquitos, Bolivia*; also a delicious honey, *omocayoch*, said to be as inebriating as liquor (*Ott 1995*).

Perhaps most remarkably there is evidence that among the Mayans of the Yucatan there is a toxic honey called *xunan kab* or *kolil kab i.e., Royal Lady*. It is derived from the plant *Rivea corymbosa* (also known as *Torbina corymbosa*) by the stingless bee *Melipona beecheii*. This honey may have been desired as a source of *LSA*, a psychoactive substance closely related to *LSD₂₅*. It may have even been farmed for that purpose. (*Ott 1995*). The image of *Ah-Muzen-Cab*, 'Great Lord Bee' can be seen above the entrances to temples at *Tulum* and *Coba*.

Australasia

While we don't know if it was ever intentionally used to produce altered consciousness, there is a case of a similar honey in New Zealand that is especially interesting. Certain areas in New Zealand frequently produce toxic honey. Unlike the case of rhododendron poisoning where the bees simply gathers the plants toxins along with the pollen and nectar this case involves what seems to be a multi-part, multi-species production. Here the toxic honey results when bees are in close proximity to *Tutu bushes (Coriaria arborea)* and the *vine hopper insect (Scolypopa australis)*. Both of which can be found throughout New Zealand.

Bees gather honeydew produced by the vine hopper insects feeding on the tutu plant. This introduces the toxin *tutin* into the honey. Symptoms of *tutin* poisoning include vomiting, delirium, giddiness, increased excitability, stupor, coma and violent convulsions. It's claimed that as little as one teaspoon of toxic honey may produce severe effects in humans.

Since December 2001, New Zealand beekeepers have been required to reduce the risk of producing toxic honey by closely monitoring *tutu*, *vine hopper*, and foraging conditions within 3 km of their apiaries. (*New Zealand 2003*)

Psychopharmacology

Selected Outbreaks: Several cases of grayanotoxin poisonings in humans were documented in the 1980s. At least eleven cases occurred in Turkey, and one in Austria apparently resulted from the consumption of honey that was brought back from Turkey. From 1984 to 1986, 16 patients were treated for honey intoxication in Turkey. The symptoms started approximately 1 hour after 50 grams of honey were consumed. In an average of 24 hours all of the patients recovered. The case in Austria resulted in cardiac arrhythmia, which required a temporal pacemaker to prevent further decrease in heart rate. After a few hours, pacemaker simulation was no longer needed. The Austrian case shows that with increased travel throughout the world, the risk of grayanotoxin poisoning is possible outside the areas of Ericaceae-dominated vegetation, i.e. Turkey, Japan, Brazil, United States, Nepal, and British Columbia. In 1983 British veterinarians reported a incident of grayanotoxin poisoning in goats. One of the four animals died. Post-mortem examination showed grayanotoxin in the rumen content.

The threshold for toxicity from "mad honey" is unknown but it is believed, from case histories, that as little as a teaspoonful of it is enough to make someone ill. In humans, symptoms of poisoning occur after a dose-dependent latent period of a few minutes to two or more hours. In general even those who are quite ill from it usually recover completely. The intoxication is rarely fatal and usually lasts for no more than 24 hours. (*USFDA 1992*)

Symptoms: external indicators

It is easy to find descriptions of the physical symptoms caused by the grayanotoxins present in this honey. They include: dizziness, weakness, excessive perspiration, nausea, vomiting, low blood pressure, bradyarrhythmia (slowness of the heart beat associated with an irregularity in the heart rhythm), sinus bradycardia (a slow sinus rhythm, with a heart rate less than 60), Ventricular tachycardia (an abnormally rapid ventricular rhythm with aberrant ventricular excitation, usually in excess of 150 per minute) and other cardiac disorders. Convulsions are also occasionally reported. Death is rare, but has occurred.

Symptoms: internal registers

Not surprisingly in contrast to the precise technical descriptions of physical indicators the descriptions of the psychological registers are not so clear. There are references to euphoria, madness, etc. etc but little detail. In a 1988 article the Journal of the American Medical Association said that, "Besides the physical symptoms it (grayanotoxin poisoning) includes tingling, numbness, dizziness, and even hallucinations such as whirling lights... With greater amounts of ingested toxin, victims experience vertigo, delirium, and unconscious." (*JAMA 1988*) Burton includes "psychedelic optical effects such as whirling lights and tunnel vision, giddiness and swooning, and impaired speech in which words and syllables are uttered out of sequence" (*Burton 1995*).

Substances

Analysis of the Substances: Honey

Honeybees begin the process of making honey by gathering nectar from flowers. From the plants point of view this substance (nectar) has fulfilled its function of attracting insects; in the process of gathering nectar, the insect transfers pollen grains from one flower to another and pollinates the flower.

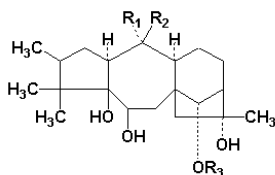
In general term nectar is sugar water i.e., a mixture of sucrose and water. Transforming nectar to honey is a two-stage process. The first stage begins with the bees producing an enzyme, invertase that turns most of the sucrose (a disaccharide) into two 6 carbon sugars, glucose and fructose (monosaccharides). Some of the glucose is in turn acted on by a second enzyme, glucose oxidase, and converted into gluconic acid and hydrogen peroxide. This is one reason for the "sanitary" nature of honey, the gluconic acid makes honey an acid medium with a low pH that is inhospitable to microbes, while the hydrogen peroxide gives acts against these same organisms when the honey is ripening or is diluted for larval food.

In the 2nd stage most of the moisture has to be evaporated, until approximately 18-percent water is left in the resulting honey that gives it a high osmotic pressure and reinforces its protection against microbes. This removal of moisture involves the bees externally manipulating nectar in their mouths and placing droplets on the upper side of some of the hive's cells. They then use their wings, fanning them rapidly so as to increase the air circulation and speed up the evaporation by driving away excess moisture.

Analysis of the Substances: Grayanotoxin

Grayanotoxin ($C_{22}H_{36}O_7$) was previously known as rhodotoxin, acetylandromedol, and andromedotoxin. It was first isolated by P.C. Plugge, in 1891. He identified what he called andromedotoxin from a sample of toxic honey from Trebizond. Now known as acetylandromedol, it is a type of grayanotoxin. The specific grayanotoxins vary with the plant species. All of these compounds are

diterpenes, polyhydroxylated cyclic hydrocarbons that do not contain nitrogen. (USFDA 1992)



| GRAY | R ₁ | R ₂ | R ₁ R ₂ | R ₃ |
|-------|----------------|-----------------|-------------------------------|----------------|
| GRAY1 | OH | CH ₃ | - | H |
| GRAY2 | - | - | =CH ₂ | H |
| GRAY3 | OH | CH ₃ | - | Ac |

as per U.S. Food and Drug Administration

Neurophysiological Action of the active Substances

As the grayanotoxins are *diterpene glycosides* they function as sodium channel antagonists. The sodium channel is a key mechanism governing muscle and nerve cell activation and deactivation. These compounds bind to specific sodium ion channels in cell membranes. These are the receptor sites involved in activation and inactivation. When the membrane of an excitable cell becomes depolarized beyond a threshold, the cell undergoes an action potential (it "fires" or "spikes"). This toxin prevents inactivation leaving excitable cells depolarized. This is similar to the action of the alkaloids of *veratrum* and *aconite* (*Aconitum napellus*). All of the observed responses of skeletal and heart muscles, nerves, and the central nervous system are related to the affect on nerve membrane.

Treatment

Because the intoxication is rarely fatal and recovery generally occurs within 24 hours, intervention may not be required. Severe low blood pressure usually responds to the administration of fluids and correction of bradycardia; therapy with vasopressors (agents that stimulate contraction of the muscular tissue of the capillaries and arteries) is only rarely required. Sinus bradycardia and conduction defects usually respond to atropine therapy; however as noted earlier in at least one instance the use of a temporary pacemaker was required. (JAMA 1988)

Honied Consciousness

Besides contemporary cases of accidental poisoning and the classical cases where toxic honey was used as an early form of biological warfare, there remains another possible usage. Mad honey or mead made with mad honey was almost certainly used as an intoxicant in certain religious ceremonies. At this point it is useful to recall that fermented honey likely supplied the first alcoholic drink, appearing long before, beer or wine, or distilled spirits. It's also been hypothesized that given the low alcohol level of early wines other ingredients were added to increase their potential. There are references to wax and mead as additions wine.

Perhaps the original contribution of the grape to alcoholic beverage was not in forming alcohol, a function that was already filled by fermented honey. As of 2004 the earliest evidence for fermented beverages indicated a drink made from honey, and a fruit (grapes and or hawthorn fruit). These were discovered in Chinese burial sites. Ceramic fragments indicated that inhabitants were brewing alcoholic drinks at least as far back as 7000 BCE. The production of alcoholic beverages may have existed far earlier. However, this is the oldest Chinese site with pottery - wood or leather containers would not have survived and so alcoholic beverage production could have gone even further back into Chinese history. Previous evidence pointed to the origins of alcohol brewing around 5400 BCE in what is now Iran.

Ancient Greece

Though definitive evidence for the connection of *meli chloron* to ancient “religious rites” is elusive, intriguing clues abound. However while the references to bees in classic and other mythology are legion it would seem excessive to interpret them all as references to mad honey. For example, the great musicians and poets were said to be inspired by the Muses who anointed the poets' lips with honey, or sent bees to do that job. The sweetness of honey, and the sweet words of the poet seems enough to account for that association without invoking honey as an inspiring intoxicant. Another example can be found in the English the term mellifluous meaning sweetly or smoothly flowing; sweet-sounding from the Latin meli (honey) and seems to derive from the same association.

Thought to be virginal, bees were from the earliest time connected with the great goddesses. They were an emblem of the Minoan-Mycenaean goddess *Potnia*. There was also *Melisseus* the daimon of honey and beekeeping. He has been related to the *Euboian Aristaios*, who was also the reputed discoverer of honey, as well as being a *Korybantic* nurse of the infant *Dionysus*. *Melisseus* may also be related to the Titan-god *Astraios* (the starry one), since **the honey the bees were believed to collect from flowers and trees was often described as *astron*, i.e. star-fallen.** The priestesses of *Demeter* and the *Ephesian Artemis* were also called *Melissai* (bees) as was the voice of the oracle of Delphi the *Pythoness (Pythia)* herself. See Appendix III.

The case of Delphi is one that interests us in particular. A number of very intriguing clues point to a connection between *Meli Chloron*, the *Melissae* and the *Pythoness*. While none of these proves anything with certainty, there are many and they all seem to be pointing in the same direction. Some of these are rooted in the importance of the bee as indicated by the term *Melissae* (bee) for the priestess etc. Others have to do with the identity of the plant or plants that are the source of meli chloron. Still others have to do with the history, or at least mythic history, of Delphi as a sacred place, indeed one of the most sacred spaces of the ancient world.

One problem for us is to show a clear link from bees, not to just any kind of honey but specifically to *meli chloron* or perhaps the *miraculum melis* the *miraculous honey that does not attract flies and which has special medicinal properties*. Pliny tells us that his *miraculous honey comes from Crete* (XXI, XLVI). Crete was an early center of bee cultivation and is thought to have received this technology directly from Egypt. *Once again we find a geographic triad that includes Anatolia or at least the coastal areas of the Black Sea (Trebizond), Crete and Egypt*. In any case this relation to early Crete is another link to the matriarchal and the archaic life of Greece in particular and that of Europe in general. The questions remain, do these clues point to something with an operative aspect and not just allegories derived from the obvious character of bees or honey? Is this honey linked (by laurel) to Delphi?

A clear statement about the intentional use of honey with psychoactive properties is to be found in the Homeric *Hymn to Hermes*, composed between the 8th and 6th centuries B.C. There we find a description of 'bee-priestesses', or *melissai* who revealed the future under the influence of "maddening" honey. These *melissai* lived by the cliffs of Mount Parnassus and fed on *meli chloron* thanks to which they are "*Divinely maddened, they are inspired to speak the truth. But if they are deprived of the divine honeycomb they cannot prophesy.*"

Translations usually render *meli chloron* as "golden honey" or "liquid honey" suggesting a mead, but this seems to be nothing more than overly helpful translators *improving* the text so it will *make sense*. More correctly *chloron* is simply the color green (Osborne 1968). It has been pointed out that *chloron* can also indicate "green," as in fresh or uncured. So the *green* when referring to *meli* can also mean unripened honey, spring honey, or mad honey. The mad honey interpretation is reinforced when the hymn also compares the religious frenzy of the *melissai* to that of the *Maenads*, the female followers of Dionysus. In the 5th century, playwright Euripides wrote of the *maenads* as waving wands flowing with honey and drinking an intoxicating mixture of honey and alcohol to achieve a prophetic state of mind. The possible connection to Delphi is even more intriguing (if not any more clear). As the anthropologist J.E. Harrison wrote in 1922 "*The Delphic priestess in historical times chewed a laurel leaf but when she was a Bee surely she must have sought her inspiration in the honeycomb.*"

Delphi

The temple of Apollo at Delphi was arguably the most important religious site of the ancient Greek world. Here was the home of the most powerful oracle in the ancient world. Delphi drew everyone from generals seeking advice on strategy, to people with questions about all the usual concerns, whether money, sex or prestige. The oracle's advice plays an important role in history and myth.

The oracle of Delphi spoke through the Pythoness; a female medium who spoke for Apollo the god of prophecy (for example see the Homeric Hymns). The Pythia had to be selected from the women of Delphi however she could be of any

economic class and of any age. Apparently her abilities didn't arise spontaneously she had to go through a long period of training.

One explanation for the title *Pythoess* holds that it came about because at Delphi Apollo slew the giant serpent Python and claimed this as his own sanctuary. But Delphi was already a center of worship of the goddess *Gaia* (Ge). *The story of Apollo and the Python also seems to hint at a change from a matriarchial civilization to a patriarchial one.* Just as Apollo took this shrine and center of prophecy from the old goddess he also took her priestesses (the bees) and made them his own.

Delphi, Apollo and Dionysius

By classical times Delphi was sacred to Apollo. The only other god who shared that honor with him was Dionysius. It was even said that Dionysius's bones were to be found here (in a tripod). The implication of this relationship, and those between Dionysius, Delphi, honey, and bees are intriguing and important but go beyond the immediate scope of this study.

Delphi and Daphne

The evidence linking Delphi to *Meli chloron* goes beyond the references to bees. The Homeric Hymn mentioned above contains a number of interconnected strands that converge on this peculiar honey/bees/altered consciousness/Delphi and also point to an archaic connection with the Great Goddess. On one hand we have the interesting comments in the Homeric hymn on the other the relation of Delphi and Daphne (laurel).

Apollo and Daphne

The best known tale of Apollo and Daphne is an odd story similar to that of Syrinx and Pan. There are many versions of the story but the basic plot is that that the nymph Daphne pursued by Apollo prays to be saved from him. Her father (a river god) grants her wish and transforms from *Daphne* the nature spirit into *Daphne* (Laurel) the plant. Apollo embraces the tree then cuts of some branches and weaves a laurel wreath to crown himself.



While the plant Daphne (*dhafni*) is Greek the English version of the name "laurel" likely derives from the Latin word *laus*, meaning "praise". In Hebrew laurel leaves still retain the name *Alyei Dafna*, meaning "the leaves of Daphne". There are various versions of the story of Daphne.

Another version of the story has *Apollo* and *Eros* comparing their bows and archery skills. Apollo insulted the god of love and Eros resolved to prove that his bow was the more powerful and shot Apollo with a golden arrow causing him to fall hopelessly in love with the woman Daphne. Eros then shot Daphne with an arrow of iron turning her against love.

And so Apollo was doomed to pursue Daphne and Daphne was doomed to refuse him. However, Daphne was not a goddess and had little chance against Apollo's might. In yet another telling it is not her father who saves her from Apollo but Gaia whom she prays to and who transforms her into a laurel tree. Disappointed, and with eyes full of tears, Apollo wove a wreath from the branches of the tree and wore the wreath made from the leaves of his beloved. Therefore, in honor of Apollo, the victor of his Pythian Games received a crown of laurel leaves.

Let us only add that Apollo will later rest Delphi from Gaia who, in this tale, interferes with his pursuit of Daphne.

But the relations between Daphne (Laurel), Delphi, Apollo, altered consciousness and honey are many layered. In the Homeric Hymn of Apollo we find the following verses in the reconciliation of Apollo and Hermes. After Hermes gives Apollo the Lyre which he invented, Apollo declares them brothers and offers him anything of his that Hermes might desire. Hermes asks for Apollo's gift of knowing the mind of Zeus but Apollo demurs explaining that this is forbidden. Instead he offers a substitute, a different secret of prophecy. One he learned as a

child. As noted earlier this gift is the secret of the *Thriae* the 3 bee women who can divine the unseen but only when intoxicated from eating *meli chloron*.

But I will tell you another thing, Son of all-glorious Maia and Zeus who holds the aegis, luck-bringing genius of the gods. There are certain holy ones, sisters born – three virgins gifted with wings: their heads are besprinkled with white meal, and they dwell under a ridge of Parnassus. These are teachers of divination apart from me, the art which I practiced while yet a boy following herds, though my father paid no heed to it. From their home they fly now here, now there, feeding on honeycomb and bringing all things to pass. And when they are inspired through eating green honey (meli chloron), they are willing to speak truth; but if they be deprived of the gods' sweet food, then they speak falsely, as they swarm in and out together. These, then, I give you; enquire of them strictly and delight your heart: and if you should teach any mortal so to do, often will he hear your response -- if he have good fortune..."

These three maidens who taught Apollo to prophecy even before Zeus granted him the ability to know the divine mind are usually identified as the *Thriae* (or *Thriai*, the name means *pebbles* and is thought to refer to small stones used in some system of divination. Most intriguing are their names. **They were called Melanie ("the Black"), Kleodora ("Famed for her Gift"), and Daphnis ("Laurel").**



7th century BCE Gold placques embossed with the winged bee-goddesses, perhaps the Thriai. Found at Camiros Rhodes.

Pausanias writing in the second century CE, relates in his *Description of Greece* (10.5.5) that **Daphnis had been the first prophetess of Gaia at Delphi.** "For they say that in the earliest times the oracular seat belonged to Earth, who appointed as prophetess at it Daphnis, one of the nymphs of the mountain..."

This might be enough for us to link mad honey to Delphi and the Pythoness but it is not the only connection between *Daphne*, *Delphi*, and *meli chloron*.

Like bees, laurel is deeply connected to Apollo but also directly to Delphi. Pindar (circa 522 BCE - 443 BCE) in his 8th Paeon and Pausanias (10.5.9-13) both tell how the present temple of Delphi is the most recent of a number of temples on that spot. Pausanias has it that the first temple of Delphi was a hut shaped structure made of laurel (brought from Tempe Valley in Thessaly). This was replaced by a second temple was built by bees using wax and bird feathers. The

third temple was made of bronze. Aeschylus (born 525 BCE) in his *Eumenides* (1-19) and Euripides in *Iphigenia in Tauris*, both give different orders of the earlier temples. (Appendix I).

Lucan tells us that the Pythoness chewed Daphne to enter into her particular state. As the English scholar Harrison has it "*The Delphic priestess in historical times chewed a laurel leaf but when she was a Bee surely she must have sought her inspiration in the honeycomb*". Plutarch, who was a priest at Delphi mentions that the Pythoness inhaled the fumes of the Daphne and Lucian tells us that she chewed Laurel leaves.

Rhododendron and Laurel

In her 1995 article on Mad Honey Adrienne Mayor proposed a link between *meli chloron* and Delphi. This could be argued on the basis of the evidence of the Homeric Hymns etc alone. Mayor went further and claimed that the Laurel, so important in the story of Apollo and Delphi was in fact the *Rhododendron Pontica*, or at least that the term *daphne* referred, not to a particular plant but to any one of a group of native plants with similar characteristics. Laurel and Bay are terms for what we would distinguish as separate species but which all share similar characteristics such as dark, glossy, and evergreen type leaves but include diverse species, such as rhododendrons.

A parallel can be found in the new world where there are of course a number of grayanotoxin producing Rhododendra, and Azaleas that go by the name Laurel, e.g. the North American Mountain Laurel. Further than that it is not clear whether there is any thing to support this notion other than that it would make a very neat link between Delphi, the Melissae, Daphne, honey and the bees.

Customs involving Laurel

As with bees and honey there are an enormous quantity of myths, legends, and folklore related to the laurel. The crown of laurel (Bay Laurel) became the symbol of victory, triumph and recognition. The Roman's continued the Greek custom. Emperor *Tiberius* always wore a laurel wreath during thunderstorms, believing that it would protect him from the wrath of the gods' thunderbolts. Roman Generals received it for important victories. Nero believed that Bay Laurel trees purified the air and Roman victors would wipe the blood from their swords with the leaves.

Just as we are told that the Pythoness chewed on laurel before she entered into trance there is also evidence it was chewed by others for luck or protection. In his *Characters* Theophrastus description of the Superstitious Man begins "*The Superstitious man is one who will wash his hands at a fountain, sprinkle himself*

from a temple-font, put a bit of laurel-leaf into his mouth, and so go about the day.” However, it seems likely that the importance of laurel may well have been based in more than superstition.

Appendix I Classical References

-Aeschylus

Eumenides Prologue

PRIESTESS

In my prayer, I hold Earth in highest honor,
as the first of prophets among all gods.
Then, after her came Themis. That goddess,
so the legend goes, followed her mother
at this seat of prophecy. Third in line,
another Titan, Phoebe, child of Earth,
was then assigned to occupy this throne.
There was no force—Themis approved the change.
Phoebe then gave it as a birthday gift
to the god who takes his name from her,
Phoebus Apollo. He left the island Delos,
moving from his lake and ridge to Pallas,
to those shores where ships sail in to trade.
Then he came to live on Mount Parnassus.
A reverential escort came with him—
children of the fire god, Hephaestus,
highway builders who tame the wilderness
and civilize the land. As he marched here,
people came out in droves to worship him,
including their king and helmsman, Delphus.
Then Zeus inspired in him prophetic skills,
and set him on this throne as fourth in line.
Here Apollo speaks for Zeus, his father.
My prayers begin with preludes to these gods.
My words also give special prominence
to the goddess who stands outside the shrine,
Pallas Athena. I revere those nymphs
inhabiting Corycia's rocky caves,
where flocks of birds delight to congregate,
where holy spirits roam. I don't forget
how Dionysus, ruler of this land,
divine commander of those Bacchic women,
ripped Pentheus apart, as if he were
a cornered rabbit. I also call upon
the streams of Pleistus and Poseidon's power,
and Zeus most high, who fulfills all things.
I'll take my seat now on the prophet's throne.
May I be fortunate, above the rest,
to see far more than previous attempts.
If any Greeks are in attendance here,

let them draw lots and enter, each in turn,
as is our custom. I will prophesy,
following directions from the god.

<http://classics.mit.edu/Aeschylus/eumendides.html>

Diodorus

Historical Library 14.30.1-3

[6] When the natives gathered here against them, the Greeks overcame them in battle and slew great numbers of them, and then, seizing a strong position on a hill, they pillaged the territory, gathered their booty on the hill, and refreshed themselves plentifully.

[1] There were found in the regions great numbers of beehives which yielded valuable honey. But as many as partook of it succumbed to a strange affliction; for those who ate it lost consciousness, and falling on the ground were like dead men.

[2] Since many consumed the honey because of the pleasure its sweetness afforded, such a number had soon fallen to the ground as if they had suffered a rout in war. Now during that day the army was disheartened, terrified as it was at both the strange happening and the great number of the unfortunates; but on the next day at about the same hour all came to themselves, gradually recovered their senses, and rose up from the ground, and their physical state was like that of men recovered after a dose of a drug.

Euripides *Iphigenia in Tauris*

(Last Chorus)

Oh, fair the fruits of Leto blow:
A Virgin, one, with joyous bow,
And one a Lord of flashing locks,
Wise in the harp, Apollo:
She bore them amid Delian rocks,
Hid in a fruited hollow.

But forth she fared from that low reef,
Sea-cradle of her joy and grief.
A crag she knew more near the skies
And lit with wilder water,
That leaps with joy of Dionyse:
There brought she son and daughter.

And there, behold, an ancient Snake,
Wine-eyed, bronze-gleaming in the brake
Of deep-leaved laurel, ruled the dell,
Sent by old Earth from under
Strange caves to guard her oracle--
A thing of fear and wonder.

Thou, Phoebus, still a new-born thing,
Meet in thy mother's arms to lie,
Didst kill the Snake and crown thee king,
In Pytho's land of prophecy:
Thine was the tripod and the chair
Of golden truth; and throned there,
Hard by the streams of Castaly,
Beneath the untrodden portal
Of Earth's mid stone there flows from thee
Wisdom for all things mortal.

He slew the Snake; he cast, men say,
Themis, the child of Earth, away
From Pytho and her hallowed stream;
Then Earth, in dark derision,
Brought forth the Peoples of the Dream
And all the tribes of Vision.

And men besought them; and from deep
Confused underworlds of sleep
They showed blind things that erst had been
And are and yet shall follow
So did avenge that old Earth Queen
Her child's wrong on Apollo.

Then swiftly flew that conquering one
To Zeus on high, and round the throne
Twining a small indignant hand,
Prayed him to send redeeming
To Pytho from that troublous band
Sprung from the darks of dreaming.

Zeus laughed to see the babe, I trow,
So swift to claim his golden rite;
He laughed and bowed his head, in vow
To still those voices of the night.
And so from out the eyes of men
That dark dream-truth was lost again;
And Phoebus, throneed where the throng
Prays at the golden portal,
Again doth shed in sunlit song
Hope unto all things mortal.

Homeric Hymns (ll. 550-568)

To Hermes (Apollo speaking...)

But I will tell you another thing, Son of all-glorious Maia and Zeus who holds the aegis, luck-bringing genius of the gods. There are certain holy ones, sisters born – three virgins gifted with wings: their heads are besprinkled with white meal, and they dwell under a ridge of Parnassus. These are teachers of divination apart from me, the art which I practiced while yet a boy following herds, though my father paid no heed to it. From their home they fly now here, now there, feeding on honey-comb and bringing all things to pass. And when they are inspired through eating green honey (*meli chloron*), they are willing to speak truth; but if they be deprived of the gods' sweet food, then they speak falsely, as they swarm in and out together. These, then, I give you; enquire of them strictly and delight your heart: and if you should teach any mortal so to do, often will he hear your response -- if he have good fortune. Take these, Son of Maia, and tend the wild roving, horned oxen and horses and patient mules.'

Longus *Daphnis and Chloe Book One*

What sweet Eyes are those that sleep? How sweetly breathes that rosie mouth? The Apples smell not like to it, nor the flowery launes, and thickets. But I am afraid to kisse her. For her Kisse stings to my heart, and makes me mad, like new honey. Besides, I fear, lest a Kisse should chance to wake her. O ye prating Grasshoppers, ye make a noyse to break her sleep!

Strabo

Geography 12.3.18

Ptolemy vs. Mitharadtes V

Now all these peoples who live in the mountains are utterly savage, but the Heptacomitae are worse than the rest. Some also live in trees or turrets that the ancients called them "Mosynoeci," the turrets being called "mosyni." They live on the flesh of wild animals and on nuts; and they also attack wayfarers, leaping down upon them from their scaffolds. The Heptacomitae cut down three maniples of Pompey's army when they were passing through the mountainous country; for they mixed bowls of the crazing honey which is yielded by the tree-twigs, and placed them in the roads, and then, when the soldiers drank the mixture and lost their senses, they attacked them and easily disposed of them. Some of these barbarians were also called Byzeres.

Pausanias

Descriptions of Greece

Book 10 Phocis and Ozolian Locri Chapter 5 Section 5

From here the high road to Delphi becomes both steeper and more difficult for the walker. Many and different are the stories told about Delphi, and even more so about the oracle of Apollo. For they say that in the earliest times the oracular seat belonged to Earth, who appointed as prophetess at it Daphnis, one of the nymphs of the mountain.

Descriptions of Greece Book

Book 10 Phocis and Ozolian Locri Chapter 5 Section 9

They say that the most ancient temple of Apollo was made of laurel, the branches of which were brought from the laurel in Tempe. This temple must have had the form of a hut. The Delphians say that the second temple was made by bees from bees-wax and feathers, and that it was sent to the Hyperboreans by Apollo.

Another story is current, that the temple was set up by a Delphian, whose name was Pteras, and so the temple received its name from the builder. After this Pteras, so they say, the city in Crete was named, with the addition of a letter, Apterei. The story that the temple was built of the fern (*pteris*) that grows on the mountains, by interweaving fresh stalks of it, I do not accept at all.

It is no wonder that the third temple was made of bronze, seeing that Acrisius made a bedchamber of bronze for his daughter, the Lacedaemonians still possess a sanctuary of Athena of the Bronze House, and the Roman forum, a marvel for its size and style, possesses a roof of bronze. So it would not be unlikely that a temple of bronze was made for Apollo.

The rest of the story I cannot believe, either that the temple was the work of Hephaestus, or the legend about the golden singers, referred to by Pindar in his verses about this bronze temple:

Above the pediment sang Golden Charmers. Pindar, work unknown

These words, it seems to me, are but an imitation of Homer's account of the Sirens. Neither did I find the accounts agree of the way this temple disappeared. Some say that it fell into a chasm in the earth, others that it was melted by fire.

The fourth temple was made by Trophonius and Agamedes; the tradition is that it was made of stone. It was burnt down in the archonship of Erxicleides at Athens, in the first year of the fifty-eighth Olympiad, when Diognetus of Crotona was victorious. The modern temple was built for the god by the Amphictyons from the sacred treasures, and the architect was one Spintharus of Corinth.

Pliny

Natural History

Book XXI Chapter 45

Maddening Honey

Aliud genus in eodem Ponti situ, gente Sannorum, mellis, quod ab insania, quam gignit, maenomenon vocant. id existimatur contrahi flore rhododendri, quo scatent silvae. gensque ea, cum ceram in tributa Romanis praestet, mel, quoniam exitiale est, non vendit. et in Perside et in Mauretaniae Caesariensis Gaetulia, contermina Massaesyliis, venenati favi gignuntur, quidamque a parte, quo nihil esse fallacius potest, nisi quod livore deprehenduntur...

In the country of the Sanni, in the same part of Pontus, there is another kind of honey, which, from the madness it produces, has received the

name of *mænomenon* (*maddening*). This evil effect is generally attributed to the flowers of the rhododendron, with which the woods there abound; and that people, though it pays a tribute to the Romans in wax, derives no profit whatever from its honey, in consequence of these dangerous properties. In Persis, too, and in Gaetulia, a district of Mauritania Cæsariensis, bordering on the country of the Massaesyli, there are poisonous honeycombs found; and some, too, only partly so, one of the most insidious things that possibly could happen, were it not that the livid color of the honey gives timely notice of its noxious qualities. What can we suppose to have possibly been the intention of Nature in thus laying these traps in our way, giving us honey that is poisonous in some years and good in others, poisonous in some parts of the combs and not in others, and that, too, the produce in all cases of the self-same bees? It was not enough, forsooth, to have produced a substance in which poison might be administered without the slightest difficulty, but must she herself administer it as well in the honey, to fall in the way of so many animated beings? What, in fact, can have been her motive, except to render mankind a little more cautious and somewhat less greedy?

And has she not provided the very bees, too, with pointed weapons, and those weapons poisoned to boot? So it is, and I shall, therefore, without delay, set forth the remedies to counteract the effects of their stings. It will be found a very excellent plan to foment the part stung with the juice of mallows or of ivy leaves, or else for the person who has been stung to take these juices in drink. It is a very astonishing thing, however, that the insects which thus carry these poisons in their mouths and secrete them, should never die themselves in consequence; unless it is that Nature, that mistress of all things, has given to bees the same immunity from the effects of poison which she has granted against the attacks of serpents to the Psylli and the Marsi among men.

Book XI Chapter 15

How Honey is tested

The crop of honey is most abundant if gathered at full moon, and it is richest when the weather is fine. In all honey, that which flows of itself, like must or oil, has received from us the name of acetum. The summer honey is the most esteemed of all, from the fact of its being made when the weather is driest: it is looked upon as the most serviceable when made from thyme; it is then of a golden color, and of a most delicious flavor. The honey that we see formed in the calix of flowers is of a rich and unctuous nature; that which is made from rosemary is thick, while that which is candied is little esteemed. Thyme honey does not coagulate, and on being touched will draw out into thin viscous threads, a thing which is the principal proof of its heaviness. When honey shows no tenacity, and the drops immediately part from one another, it is looked upon as a sign of its worthlessness. The other proofs of its goodness are the fine aroma of its smell, its being of a sweetness that closely borders on the sour, and being glutinous and pellucid.

Cassius Dionysius is of opinion that in the summer gathering the tenth part of the honey ought to be left for the bees if the hives should happen to be well filled, and even if not, still in the same proportion; while, on the other hand, if there is but little in them, he recommends that it should not be touched at all. The people of Attica have fixed the period for commencing this gathering at the first ripening of the wild fig; others have made it the day that is sacred to Vulcan.

The third kind of honey, which is the least esteemed of all, is the wild honey, known by the name of ericeunm. It is collected by the bees after the first showers of autumn, when the heather alone is blooming in the woods, from which circumstance it derives its sandy appearance. It is mostly produced at the rising of Arcturus, beginning at the day before the ides of September. Some persons delay the gathering of the summer honey until the rising of Arcturus, because from then till the autumnal equinox there are fourteen days left, and it is from the equinox till the setting of the Vergiliæ, a period of forty-eight days, that the heather is in the greatest abundance. The Athenians call this plant by the name of tetralix, and the Eubœans sisirum, and they look upon it as affording great pleasure to the bees to browse upon, probably because there are no other flowers for them to resort to. This gathering terminates at the end of the vintage and the setting of the Vergiliæ, mostly about the ides of November. Experience teaches us that we ought to leave for the bees two-thirds of this crop, and always that part of the combs as well, which contains the bee-bread.

From the winter solstice to the rising of Arcturus the bees are buried in sleep for sixty days, and live without any nourishment. Between the rising of Arcturus and the vernal equinox, they awake in the warmer climates, but even then they still keep within the hives, and have recourse to the provisions kept in reserve for this period. In Italy, however, they do this immediately after the rising of the Vergiliæ, up to which period they are asleep. Some persons, when they take the honey, weigh the hive and all, and remove just as much as they leave: a due sense of equity should always be stringently observed in dealing with them, and it is generally stated that if imposed upon in this division, the swarm will die of grief. It is particularly recommended also that the person who takes the honey should be well washed and clean: bees have a particular aversion, too, to a thief and a menstruous woman. When the honey is taken, it is the best plan to drive away the bees by means of smoke, lest they should become irritated, or else devour the honey themselves. By often applying smoke, too, they are aroused from their idleness to work; but if they have not duly incubated in the comb, it is apt to become of a livid color. On the other hand, if they are smoked too often, they will become tainted; the honey, too, a substance which turns sour at the very slightest contact with dew, will very quickly receive injury from the taint thus contracted: hence it is that among the various kinds of honey which are preserved, there is one which is known by the name of acapnon.

Book XXI Chapter 44

Poisoned Honey.

Indeed, the food of bees is of the very greatest importance, as it is owing to this that we meet with poisonous honey even. At Heraclia in Pontus, the honey is extremely pernicious in certain years, though it is the same bees that make it at other times. Authors, however, have not informed us from what flowers this honey is extracted; we shall, therefore, take this opportunity of stating what we have ascertained upon the subject.

There is a certain plant which, from the circumstance that it proves fatal to beasts of burden, and to goats in particular, has obtained the name of "ægolcthon," and the blossoms of which, steeped in the rains of a wet spring, contract most noxious properties. Hence it is that it is not every year that these dangerous results are experienced. The following are the signs of the honey being poisonous: it never thickens, the color is redder than usual, and it emits a peculiar smell which immediately produces sneezing; while, at the same time, it is more weighty than a similar quantity of good honey. Persons, when they have eaten of it, throw themselves on the ground to cool the body, which is bathed with a profuse perspiration. There are numerous remedies, of which we shall have occasion to speak in a more appropriate place; but as it will be as well to mention some of them on the present occasion, by way of being provided for such insidious accidents, I will here state that old honeyed wine is good, mixed with the finest honey and rue; salt meats, also, taken repeatedly in small quantities, and as often brought up again.

It is a well-known fact that dogs, after tasting the excretions of persons suffering from these attacks, have been attacked with similar symptoms, and have experienced the same kind of pains. Still, however, it is equally well ascertained, that honeyed wine prepared from this honey, when old, is altogether innocuous; and that there is nothing better than this honey, mixed with costus,⁶ for softening the skin of females, or, combined with aloes, for the treatment of bruises.

Book XXI Chapter 46

Aliud in Creta miraculum mellis: mons est Carina VIII passuum ambitu, intra quod spatium muscae non reperiuntur, natumque ibi mel nusquam attingunt. hoc experimento singulare medicamentis eligitur.

Honey that Flies will not Touch

Another marvelous fact, again, connected with honey in Crete. Upon Mount Carma in that island, which is nine miles in circuit, there is not a fly to be found, and the honey that is made there no fly will touch.¹ It is by this circumstance that honey said to have come from that district is usually tested, it being highly prized for medicinal preparations.

Xenophon

Anabasis 4.8.20 VIII

When they began running in that way, the enemy stood their ground no longer, but betook themselves to flight, one in one direction, one in another, and the Hellenes scaled the hill and found quarters in numerous villages which contained supplies in abundance. Here, generally speaking, there was nothing to excite their wonderment, but the numbers of bee-hives were indeed astonishing, and so were certain properties of the honey. The effect upon the soldiers who tasted the combs was, that they all went for the nonce quite off their heads, and suffered from vomiting and diarrhea, with a total inability to stand steady on their legs. A small dose produced a condition not unlike violent drunkenness, a large one an attack very like a fit of madness and some dropped down, apparently at death's door. So they lay, hundreds of them, as if there had been a great defeat, a prey to the cruelest despondency. But the next day, none had died; and almost at the same hour of the day at which they had eaten they recovered their senses, and on the third or fourth day got on their legs again like convalescents after a severe course of medical treatment.

Appendix II

More on Melissa

In Greek mythology *Melissa* i.e. honey bee is the name of a nymph that saved Zeus from his father Cronus. She hid Zeus and fed him on *honey* and goat's milk. The goat is named Amalthea (the tender goddess) is sometimes said to be the goat who suckled the infant-god in a cave in Crete's Mount Aigaion (Goat Mountain). In other stories she is a nymph who fed him on milk from her goat. In any case when Cronus discovered what Melissa had done he turned her into a worm. Zeus changed her into a queen bee. us, in gratitude, changed her into a queen bee.

In the version told by Apollodorus, Rhea put the infant Zeus in the care of the Kouretes and the Nymphs Adrasteia and Ide, daughters of Melisseus (masculine form of the name). Diodorus Siculus (Diodorus Siculus, Library of History 5.70.1) tells a similar tale as does Parmeniscus the Grammarian (Circa 2nd Century BCE).

"Parmeniscus [Grammarian 2nd BC] say that *Melisseus* was king in Crete, and Zeus was given to his daughters to nurse. "Melisseus ... true to his name, he imitated the bee up in arms with her terrible sting." - Nonnus, Dionysiaca 28.275

Melisseus is also associated with the Korybantes who protected Dionysus comrade to Idaeus." - Nonnus, Dionysiaca 13.135

Not all such associations are Greek. Josephus tells us in *Ant. Jud.* 5.200. that the name of the poet and prophet Deborah meant "bee".

Appendix III

Botany and Sources of Grayanotoxin

Grayanotoxin poisoning most commonly results from the ingestion of grayanotoxin-contaminated honey, although it may result from the ingestion of the leaves, flowers, and nectar of rhododendrons. Not all rhododendrons produce grayanotoxins. And the specific grayanotoxins vary from species to species.

Botany

Among other plants these toxins are known to occur in *Mediterranean oleander*, members of the heath family (*Ericaceae*) which includes the rhododendron, *azaleas* of the Black Sea and Caucasus area, and the *mountain laurel* of the Eastern United States and Pacific Northwest.

Rhododendron ponticum grows extensively on the mountains of the eastern Black Sea area of Turkey. This species has been associated with honey poisoning since 401 BC. A number of toxin species are native to North America. Of particular importance are the *western azalea* (*Rhododendron occidentale*) found from Oregon to southern California, the *California rosebay* (*Rhododendron macrophyllum*) found from British Columbia to central California, and *Rhododendron albiflorum* found from British Columbia to Oregon and in Colorado. In the eastern half of the United States grayanotoxin-contaminated honey may be derived from other members of the botanical family Ericaceae, to which rhododendrons belong.



Mountain laurel (*Kalmia latifolia*) and *Sheep Laurel* (*Kalmia angustifolia*) are probably the most important non-rhododendron sources of the toxin. Other sources of grayanotoxin include *Labrador tea* (*Ledum glandulosum*), *Sierra laurel* (*Leucothoe davisae*), *mock azalea* (*Menziesia ferruginea*), *Japanese pieris* (*Peiris japonica*). The leaves of Labrador tea (“trapper’s tea”) were used by the native Americans, early settlers of North America, and even by modern campers as a “bush tea”. It has been thought that perhaps low concentrations of the toxin in this tea may have produced a restorative or relaxing effect similar to those resulting from caffeine.

The *diterpenoid grayanotoxins* and their analogues are known to occur in honey derived from the nectar of some species of rhododendron and can produce gastrointestinal symptoms and life-threatening cardiovascular effects. Rhododendron honey is said to be toxic only if very recently produced by the bees, so commercially produced honey is unlikely to produce any effects. In addition, honey produced in the spring during the rhododendron flowering season is mostly consumed by the bees and is rarely harvested.

Rhododendron (from the Greek: rhodos, "rose", and dendron, "tree") is a genus of flowering plants in the family Ericaceae. Also called the heath family or ericaceous plants, they are most common in temperate areas. These are mostly calcifuge (lime hating) plants that thrive in acid soils. Other members of the family *Ericaceae* include: cranberry, blueberry, heath, heather, huckleberry, and azalea.

It is a large, widely distributed genus with over 1000 species and most have showy flower displays. Rhododendrons occur throughout most of the Northern Hemisphere except for dry areas, and extending into the Southern Hemisphere in southeastern Asia and northern Australasia. While Rhododendrons have not been found in South America or Africa, other members of the family certainly have.

The highest species diversity is found in the Sino-Himalayan mountains from central Nepal and Sikkim east to Yunnan and Sichuan, with other significant areas of diversity in the mountains of Indo-China, Korea, Japan and Taiwan. In addition, there are a significant number of tropical rhododendron species from southeast Asia to northern Australia, with 55 known species in Borneo and 164 in New Guinea alone. Relatively fewer species occur in North America and Europe.

.The genus Rhododendron is characterized by shrubs and small to (rarely) large trees, the smallest species growing to 10-20 cm tall, and the largest, *R. arboreum*, reported to 50 m tall. They may be either evergreen or deciduous. Some of the best known species are noted for their many clusters of large flowers. There are alpine species with small flowers and small leaves, and tropical species such as subgenus *Vireya* that often grow as epiphytes (i.e. that grow on other plants but do not receive nourishment from their host).

Appendix IV

Honey, and Healing Ancient and Modern

Ancient Writings

Besides the texts quoted here there are abundant references to the medicinal uses of honey in ancient literature. It was prescribed for a variety of illnesses and injuries. Mesopotamian inscriptions make it clear that honey played an important role in their pharmacopoeia. Key Egyptian medical papyri show honey was the most frequently used ingredient, for both internal and external use, in all their drug recipes. Honey was a treatment of stomach pain, urinary retention and as ointment for dry skin. It was also used for wounds and burns, skin irritation, and eye diseases.

Ancient Greek, Arabic and Roman materia medica as well as traditional Chinese, and Indian medicine use honey in combination with other herbs and on its own, to treat wounds and various other diseases.

Modern research

There is no lack of examples of modern usage of honey's healing properties. Medical literature from the early decades of 20th century contains many reports on the antimicrobial and healing properties of honey. Among these is the use of honey by Russian soldiers during the first World War to prevent infections in wounds and to accelerate healing. It was only the success of antibiotics that caused honey to be forgotten as a powerful and effective medicine.

The effectiveness of honey to heal wounds spurred research into its antimicrobial activity. Its effectiveness in the treatment of wounds, and burns was acknowledged in many studies. At one point its power was attributed to something called *inhibine*. In 1963, inhibine was identified as hydrogen peroxide.

In the last few decades there have been papers confirming that honey is effective in treating various wounds, burns and serious infections. This effectiveness seems to be due to a number of factors:

- Osmotic effect: Honey is a supersaturated sugar solution of fructose. The interaction of the sugar molecules with water molecules leaves very little water available to support the growth of microorganisms.
- Acidity: Honey is acidic, with a pH ranging from 3.2 – 4.5 which is low enough to inhibit the growth of many pathogens.
- Hydrogen peroxide is the major antibacterial compound in honey. This is a break down product from the conversion of glucose.
- Non-peroxide antibacterial factors: There have been reports of isolation of various antibacterial chemical substances from honey that are not hydrogen peroxide but their concentration is reportedly too low to contribute much antibacterial activity.
- Honey has been reported to have an inhibitory effect to around 60 species of bacteria both aerobic and anaerobic. An antifungal action has also been

observed for some yeasts and species of *Aspergillus* and *Penicillium* as well as all the common dermatophytes. *Staphylococcus aureus* is one of the species most sensitive to the antibacterial activity of honey.

Studies show other beneficial effects of honey. These include

- Stimulation of the healing process especially leg ulcers and diabetic ulcers.
- Speedy clearance of infection when used as dressing on infected wounds.
- Honey is reportedly extremely effective in the treatment of wounds infected with antibiotic resistant bacteria – MRSA as well as wounds infected with multi-resistant bacteria.
- Cleansing action on wounds: Honey has a debriding effect on wounds so that surgical debridement is unnecessary or only a minimum required.
- Stimulation of tissue regeneration: Honey promotes the formation of clean healthy granulation tissue and growth of epithelium over the wound, thus helping skin regenerate. It has also been reported that dressing wounds with honey gives little or no scarring.
- Comfort honey dressings: Honey is non-irritating and the pain or discomfort associated with changing dressings is minimized.

Honey has a limited but growing acknowledgement in modern medical practice, especially in ambits where drug resistant infections are a problem. Contemporary usage is focused on infected wounds, chronic leg and skin ulcers, and bedsores. In 1999 the agency of the Australian government which oversees medicine approved a medication for wounds containing only honey produced from the flowers of the Tea Tree (*Leptospermum*). In 2001 the Netherlands approved 2 products. One is a wound dressing consisting of a neutral matrix infused with pure honey. The second is a compound of honey and other material (e.g. lanolin, sunflower oil and zinc oxide).

Russian and Indian ophthalmologists are said to prescribe honey in the treatment of conjunctivitis, infections, ulcers and burns (chemical and thermal) to the cornea. Peptic ulcers and gastroenteritis are among the other ills traditionally treated with honey. It has been speculated that the antibacterial property of honey might be the active agent if something like *Helicobacter pylori* is the cause of the ailment. There is at least one (small) study indicating that 5% honey is enough to inhibit the growth of *H. pylori* isolated from gastric ulcers.

Of course, honey is no panacea and its consumption is not without risks. While in many traditional cultures honey is given to newborns the possible presence of spores of *Clostridium Botulinum* is a potentially life-threatening problem. Hence, it is normally recommended that young children not be fed honey. The same problem raises concerns about the use of unsterilized honey in medical treatment.

Appendix V

Properties of Ethylene (C₂H₄)

In mild doses, ethylene produces states of euphoria, associated with stimulus to the pleasure centres of the human brain.

It's not hard to understand why Ethylene was an anesthetic of such great importance. It has little or no carcinogenic or mutagenic properties and although there may be moderate hyperglycemia. Post operative nausea while higher than with nitrous oxide is less than in the use of some other drugs. During the induction and early phases of anesthesia blood pressure may rise a little quickly returns to normal. It has very few and mostly mild cardio-vascular effects. A concentration of 37.5% for 15 minutes may result in marked memory disturbances.

Loss of consciousness results when the air contains about 11% of oxygen. Death occurs quickly when the oxygen content falls to 8% or less. 50% ethylene in air reduces oxygen availability to 10% producing a complete loss of consciousness and imminent death. There is no evidence to indicate that prolonged exposure to low concentrations of ethylene can result in chronic effects. Prolonged exposure to high concentrations may cause permanent effects because of oxygen deprivation.

Ethylene has a very low order of systemic toxicity. When used as a surgical anaesthetic, it is always administered with oxygen with an increased risk of fire. In such cases, however, it acts as a simple, rapid anaesthetic having a quick recovery. Prolonged inhalation of about 85% in oxygen is slightly toxic, resulting in a slow fall in the blood pressure; at about 94% in oxygen, ethylene is acutely fatal.

STAGE 1) INDIFFERENCE

- Percent of O₂ Saturation at 90%
- Night vision decreased
- Mild euphoria reported.

STAGE 2) COMPENSATION

- Percent of O₂ Saturation at 82 to 90%
- Respiratory rate has compensatory increase
- Pulse, also a compensatory increase
- Night vision is decreased further, focus is simplified
- Performance ability is somewhat reduced, mild distortion to speech, utterances increasingly ambiguous.
- General Alertness level is somewhat reduced to anything but central concerns
- Symptoms may begin in those patients with pre-existing significant cardiac, pulmonary, or hematologic diseases.
- Euphoria

STAGE 3) DISTURBANCE

- Percent of O₂ Saturation at 64 to 82%
- Compensatory mechanisms increasingly become inadequate
- Air hunger, gasping for breath
- Fatigue, lassitude, inability to maintain balance
- Tunnel Vision, out-of-body experiences
- Dizziness
- Mild to Persistent Headache
- Belligerence, certainty of truth
- Extreme Euphoria, belief in capacities of the self enhanced
- Visual acuity is reduced, dreamlike seeing of visions
- Numbness and tingling of extremities
- Hyperventilation
- Distortions of judgement, abnormal or illogical inferences drawn
- Memory loss after event
- Increased Cyanosis
- Decreased ability for escape from toxic environment

STAGE 4) CRITICAL DISTURBANCE

- Percent of O₂ Saturation at 60 to 70% or less
- Further deterioration in judgement and coordination may occur in 3 to 5 minutes or less
- Total incapacitation and unconsciousness follow rapidly

Appendix VI

Entrances: Food, Drink, Enema

As for many drugs there are a number of options for getting the active ingredients in *meli chloron* into the nervous system. Most obvious, besides eating the honey it could be made into, or added to, a beverage. Pliny wrote that well aged *meli maenomenon* made a good mead or *metheglin* (flavored mead). The people of the Caucasus area have used toxic honey for centuries to add to alcoholic drinks. The purpose was to intensify the alcoholic effect. Toxic honey was known as *deli bal* in Turkey and was a major Black Sea export in the eighteenth century. Toxic honey, known as *miel fou* to consumers in Europe, was shipped in amounts of 25 tons yearly, to be used in European taverns. In the United States during the 18th century mead made from toxic mountain laurel honey was sold commercially as *Metheglin* i.e. a type of spiced honey wine.

In the New World another system of administering a honey based drug was used particularly by the Maya. Archeologists excavating Mayan tombs turned up tubes (of rubber?) whose function was unclear. Paintings found on a number of vases illustrate in detail the use of these tubes. One illustration shows a recumbent figure with his legs spread. He is receiving an enema which is being administered by a person (woman?) standing beside him holding a container connected to a tube. There is also another male ladling enema fluid out of a large jar. Another painting of this kind shows an attractive young woman (goddess?) removing the clothing from a to a male (god?). In front of her are the enema container and what looks like a rubber enema bulb syringe. Besides paintings there is even statuary with the same theme.



Guatemala Escuintla Maya culture, Escuintla, Middle-Late Classic periods, A.D. 400-850

Some of these paintings show the enema containers full of a foaming liquid which archeologists generally identify as *Balche*, a mead like drink made with fermented honey and the bark of the *Balche* tree.

Honey for eating, mead for drinking, or for enemas. Other entrances than the mouth have been used for intoxicants. The cases of snuffs and fumes that are taken in through the nose, and unguents taken in through the skin. Of all the

possible entrances there are at least three good reasons for using this lower entrance for administering an intoxicant like *Balche*.

In the first place the rectal entrance has an advantage in that it maximizes the absorption of many substances by minimizing the effect of the livers' filtering function. When a drug is swallowed the active substances end up in the liver. While blood from the rectum goes straight into our general circulation and thence via the heart to the brain, blood from the small intestine goes first to the liver, which acts as a filter. The liver is evolved to allow nutritious foodstuffs into the general circulation but to keep out toxins that enter the small intestine. Drugs administered via enema manage to short circuit the small intestine's direct connection to the liver. That is, when orally administered drugs end up in the liver it acts to prevent exactly what is being sought—getting the intoxicant to the brain. The lungs, nose, tongue, mouth, eyes, skin or rectum are ways to avoid that problem. In addition numerous drugs that would be powerful irritants to the lungs or eyes are tolerated by the rectum.

Another advantage of that entrance is related to how quickly the drug begins to act. The subjective intensity of a *high* is multiplied by rapid-onset. The more quickly the drug reaches the brain the more intense the subjective experience. Many drugs, like heroin, can be taken through a number of the bodies entrances. Leaving aside other issues, the method that most quickly allows the highest concentration in the brain is the one that feels most powerful. Snorting would be more intense than swallowing, smoking more than snorting and intravenous injection directly into the blood stream – where the intoxicant reaches the brain almost immediately – the most effective means of all. Before the existence of the hypodermic the enema was the fastest means of drug delivery for many substances.

This anal advantage is compounded by a chemical one. An orally administered drug has to pass through the stomach to reach the small intestine where most of the absorption will take place. Depending on the type and quantity of stomach contents that might take hours – reducing the enhancement of rapid onset. However, for certain drugs this entrance can also be chemically inefficient. Opiates, cocaine, nicotine, mescaline, LSA, etc. are members of a class of substances known as alkaloids. As their name suggests the alkaloids are alkali, i.e. they are bases which when they reach the acid environment of the stomach interact with hydrogen ions which slows the absorption of the psychoactive chemical. In fact there is almost no absorption from the stomach and the absorption in the small intestine is slow. However, the rectum, compared to the stomach is not an especially acidic environment and so doesn't suffer from this problem. It also has an abundance of blood vessels that could absorb the drug. Administering the substance through this entrance would approach the effectiveness of hypodermic injection directly into the blood stream.

Another problem resolved by the rectal entrance is that of nausea. Opiates, many hallucinogens from peyote to amanita, tobacco (smoked, snorted or swallowed) can cause vomiting. Besides the unpleasantness of the

experience this implies a disruption and even is a loss of the interesting substance. If the drug doesn't reach the small intestine absorption is reduced. The rectal entrance using an enema eliminates that problem as well. Drugs taken in that way don't upset the digestive tract to the same degree. Vomiting expels the contents of the stomach and small intestine but not the large intestine, so if retching was produced the active substances would not be vomited out and lost.

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As a convenience to the reader I've included relevant sections of the text in Appendix 1.

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