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BEE HIVES OF THE ANCIENT WORLD. 1

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1. Introduction

The aim of this and a subsequent paper is to make a synthesis of the *evidence* about hives of the Ancient World from available sources of all types. Conjecture is also necessary, but we have tried to keep this separate from statements about what is known. The evidence has been collected during the past ten years; work has included excavations of hives in Greece (AJG), and studies of hives similar to those of the Ancient World which have been found still in use, especially in Egypt, Ethiopia, Greece, Italy and Kashmir (EC). In addition, specimens of relic hives from many countries, which more or less complete the range of hives known from ancient times, have been obtained for the IBRA Collection of Historical and Contemporary Beekeeping Material.

In this first paper we present all the evidence known to the authors from pictorial representations (Section 2), contemporary records (3) and literature (4). In the second paper we shall discuss archaeological evidence: existing ancient hives and questions about their management, and vessels that have been reported as hives but which must be questioned, or which have had to be rejected.

The term Ancient World has been used in its normal context, and includes especially Ancient Egypt, Greece and Rome. However, the period before the use of hives is not dealt with; rock paintings provide evidence of honey hunting from wild nests of honeybees, which preceded beekeeping with the use of hives: in Spain^{10, 19}, Africa^{34, 35, 47}, and India^{17, 28, 29}; a general discussion has also been published⁸. In principle our period ends with the fall of the Western Roman Empire, around AD 400. Nevertheless, some later but very relevant evidence is adduced, as well as evidence outside the classical world. For the Americas where prehistory is usually regarded as lasting up to the arrival of Columbus in 1492, the time scale is necessarily shifted forwards.

The literary evidence presented is probably as complete as it ever will be, though much is known to have been lost. There is still a chance that the pictorial and—especially—archaeological evidence may be enriched by further finds, and we hope that by putting on record what is now known we may increase the likelihood of further apicultural finds being recognized as such.

Perhaps the most notable outcome of the evidence presented is the immutability of beekeeping material and methods, over thousands of years, in areas where there has been no progress that demanded a change. It is always dangerous to say without proper evidence that such and such a hive *is* the same as that used by the ancients, for sometimes there have been significant changes. But it is refreshing to find today many of the hives described by Roman writers, even down to details of size and shape. They are still in living use, although in parts of the world quite distant from Rome.

2. Evidence from pictorial representations

The earliest known evidence for honey harvesting is pictorial, and dates from 7000 BC or even earlier, soon after the end of the Ice Age³⁶. Rock paintings in Europe, Africa and Asia show honey hunting scenes; see Introduction.

Wall paintings at Çatal Hüyük in Anatolia date from 7000 BC, and some of these have been interpreted³⁰ as representing honeybee combs; but even if this is so, they provide no information about hives. The earliest known certain evidence about hives is, however, pictorial, all of it from Ancient Egypt, the dates ranging from about 2400 to 600 BC. Then there is a gap of well over a thousand years in known pictorial records of hives, until they are depicted in some of the early illuminated manuscripts, around AD 1000. As far as we have been able to establish, no definite representation of a hive in the Greek or Roman art has survived to the present day. Those that have been taken as such are discussed in our second paper. (There are on the other hand many Greek and Roman depictions of *bees*, especially on coins but also on plaques, pottery, jewellery etc.; see e.g. Ransome³⁹.)

In Central America, a few of the drawings in the Mayan *Codex Tro-Cortesianus* show combs of stingless bees in containers of rectangular and circular cross-sections, which are presumably hives; the pictures are not very informative. Several of them are reproduced in Ransome's Fig. 29 and 30. The Mayas were the greatest honey producers of all the Central Americas, and the *Codex* is one of the few books that survived the Spanish conquest in the 1500s.

The depictions of beekeeping scenes in Ancient Egypt are therefore doubly important—for their great antiquity and for their rarity. There are four of them, listed below. The first is now in the Aegyptischer Museum at Berlin in the DDR, but the other three are still in situ in Egypt.

<i>Date</i> <i>Dynasty</i>	<i>Character and site</i>	<i>Where reproduced</i> <i>(all are in Crane⁸)</i>
1. c.2400 BC 5th	Stone bas-relief from wall of sun-temple of Neuserre at Abu Ghorab	Armbruster ¹ Fig. 1 Wreszinski ⁴⁸ Kuény ²⁴ Fig. 1
2. c.1450 BC 18th	Wall-painting of tomb (100) of Rekhmire	Armbruster ² Fig. 3 Kuény ²⁴ Fig. 2
3. c.1450 BC 18th	Wall-painting of tomb 73	Säve-Söderbergh ⁴²
4. 660-525 BC Saite	Incised and painted relief on stone pillar of tomb (279) of Pabesa	Armbruster ² Fig. 7, 8 Fraser ¹⁴ Fig. 6 Kuény ²⁴ Fig. 3 Crane ⁷ Fig. 19.32/1

In this paper we are concerned only with information provided about hives.

Bas-relief 1 is fragmentary. A kneeling man is carrying out an operation on one of a stack of six hives, blowing smoke through a vessel (part of which can be seen), but only the extreme ends of the hives remain, so their shape is unknown. In the reproduction in

the Catalogue of the Egyptian Museum in Cairo (and therefore in Fig. 1 below) a further three hives have been inserted in a reconstruction of a missing piece of the relief (Fig. 1). This relief can be interpreted only by reason of its similarity to the complete

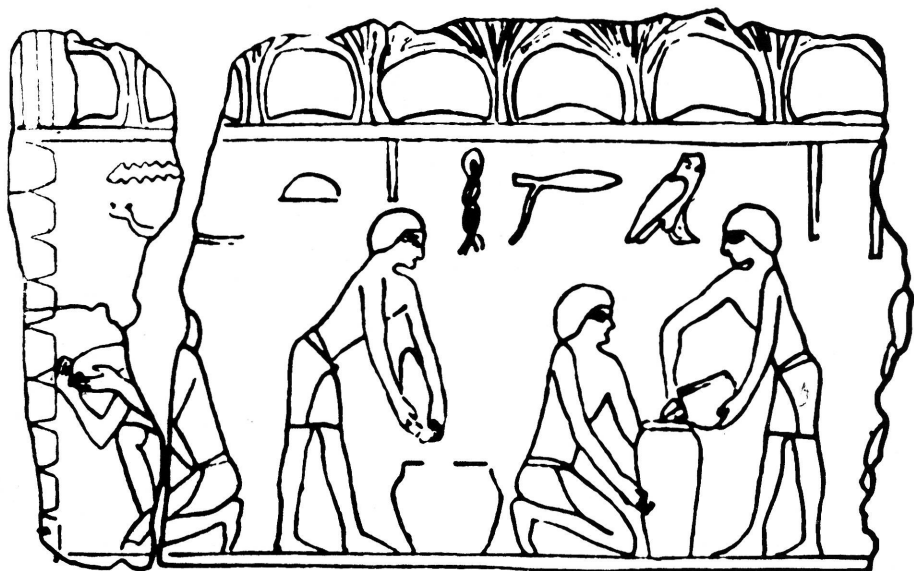


FIG. 1. Earliest known representation (c. 2400 BC) of hives (from which a beekeeper is taking honey combs, *left*); honey is being packed in jars (*right*). From the sun-temple of Neuserre, Abu Ghorab. Drawing from Egyptian National Museum Catalogue.



FIG. 2. Harvesting honey combs from hives (c. 1450 BC) using smoke, and (*left*) packing honey into jars. From tomb 100, West Bank, Luxor. Reproduced from Crane⁸.

picture in relief 4 (Fig. 4), which shows a stack of 8 complete cigar-shaped hives, with a kneeling man facing their flat end and bees flying beyond their other end, which is rounded.

Rekhmire's tomb is open to the public, and wall-painting 2 (Fig. 2) is still complete, near the entrance, where it can easily be seen in its full, fresh-looking colours. It shows a similar view to no. 1, but of three short straight-sided hives, presumably cylindrical, their length not much greater than their diameter. Again, the end nearer the operator is flat, and the opposite end rounded. The shape of the hives is discussed below.

Wall-painting 3 is mostly destroyed. The scene is largely reconstructed in Säve-Söderbergh's drawing (Fig. 3), and shows several similarities with that of Rekhmire (2) which is of the same period. We do not know the name of the occupant of the tomb, but he was, like Rekhmire, a very great official.

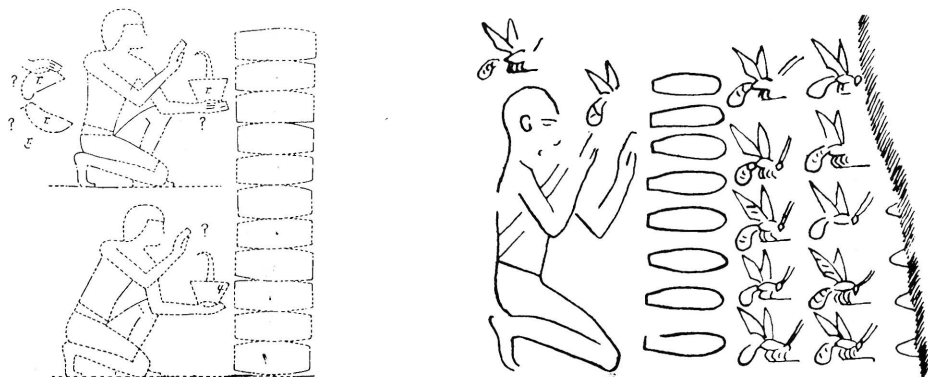


FIG. 3. (left) Honey harvesting from hives (c. 1450 BC) in tomb 73, West Bank, Luxor, as reconstructed by Säve-Söderbergh⁴². Reproduced with permission of the Griffith Institute, Ashmolean Museum, Oxford.

FIG. 4. (right) Honey harvesting from hives (660-625 BC), in tomb 279, West Bank, Luxor; ends of four further hives are shown on the right. From Kuény²⁴.

The painted relief no. 4 (Fig. 4) is on one of the pillars of a small open courtyard in a tomb that is kept sealed. The pillar has been broken off on the right (probably by soldiers of Alexander the Great), and part of the beekeeping scene is missing.

In 1978 one of us (EC) was able to inspect both representations that are reasonably complete (no. 2 and 4), and also to see traditional 'pipe' hives in use in Lower and Middle Egypt. The bluish-grey colour of the hives in representations 2 and 4 makes it likely that they were made of unbaked clay, as are the pipe hives used today. The only other coloured painting (no. 3) is described by Säve-Söderbergh, who writes about the hives: 'eleven leaden-coloured jars (?) . . . from their shape and colour they are probably beehives of unbaked clay'.

All these hives have been referred to as clay cylinders or pipe hives, probably because stacks of such hives are used today in Egypt. Many writers seem to regard them as

identical with those currently used, but this is not quite true. Existing hives measured in 1979 were externally about 120 cm in length, 8 times the diameter (15 cm); Mellor³¹ quotes 137 cm × 17 cm, which gives the same ratio. In scenes 2 and 4, where complete hives can be measured, the ratio is only 2.4 and 2.6–3.7 respectively. Moreover the construction of hives nowadays rolls them into a cylindrical shape, although hives in one apiary seen, made without the usual equipment, were bulbous and not unlike those in scene 4.

Fig. 1 shows honey handling on the right; scenes from which Fig. 2 and Fig. 4 are taken have additional representations of honey handling, not shown here. It is interesting that in Kashmir in northern India, which derived much of its culture from the Middle East, the standard container for comb honey is a pair of (red) baked clay dishes, one inverted over the other and sealed together with mud. These are of exactly the same shape (ratio of height to diameter) as red pottery vessels on the far left of scene no. 2, and have the same low projecting base⁸. We do not know of their existence elsewhere, at any time in the 3400 years since scene 2 was painted.

No bees are visible in the incomplete scenes 1 and 3; in no. 2 (1450 BC) one is shown flying near the beekeeper and the opened end of the hives (referred to here as the back). In no. 4 (650 BC), two are similarly shown, and also many more flying beyond the hives.

Primitive hives are known in which there was no flight entrance for the bees except where the beekeeper got access to the honey combs to remove them. Other hives were less primitive, the bees flying from the front end and the honey being taken from the back; honey combs could be harvested from such hives by using smoke to drive the bees away from the opened back towards the flight entrance at the front, where they could fly out. Fig. 4 suggests that, at any rate by the time of Pabesa, beekeepers had advanced from the awkward system of removing honeycombs from the front of the hive (containing the flight entrance) to the more convenient one of smoking the bees through from the back of the hive towards the front, and some of them out through the entrance. We are unlikely to learn whether this is so. In our second paper hives are described similar to those shown in scene 4, that are currently used in this way in Ethiopia. Hives of a similar shape to those in scene 2, but of baked clay, will also be discussed.

It seems to us possible that the back of the hive was broken off to harvest the honey, as is done today with mud hives in Ethiopia. This is easy to do, and the hive is repaired with new mud obtained by mixing water with earth on the spot. It is worth noting that, in scene 4, four hives of a second row are just visible on the right, and that they are more pointed than the backs (or the fronts?) of the complete row.

The shape of the harvested honey combs in scene 2 is easily accounted for if the bees built their combs across the hive. This is usually favoured by beekeepers for ease of harvesting; nowadays it is achieved by fixing one or two combs across a hive before a swarm is put in it, or by smearing bands of wax across the top of the hive at the appropriate distance apart. This practice is known in Crete as well as Egypt.

Except for these scenes from the civilization of Ancient Egypt, which between them span 1900 years, no pictorial representations of hives are known until about AD 1000, when a number of illuminated manuscripts (described by Avery³; compare with Cavallo⁵) were produced in Italy, of which 20 show hives, and several depict a beekeeping scene. These are known as the Exultet Rolls, from the first word of the hymn in praise of the beeswax paschal candle, blessed in the service held by the Roman church on Holy

TABLE I. Beekeping scenes in the Exultet Rolls.
 In column 1 * = no note by Avery³; in final column C8, C25 etc. = Plate no. in Cavallo⁵.

Avery's Plate no.	Present location	Provenance	Date	Rectangular hives	Cylindrical hives	No. tiers	Length	
							width	Special features
IX*	Bari	Bari (1)	c. 1025	—	1?	—	2	Fig. 7, C8; see end of Section
XXII	Bari	Bari (2)	1050-1175	—	2?	1	3	C25, man, trees, birds, bees on flowers
XXVII	Capua	Capua	1000-1050	5	—	1 or 5	4	many flying bees
XXXII	Gaeta	Gaeta (1)	1000-1050	3?	or 3?	1	1½	each hive on legs; nativity scene
XXXVII	Gaeta	Gaeta (2)	1070-1100	—	4	4	5	trees, flying bees
XLI*	Gaeta	Gaeta (3)	1100s	9	—	3	2½	trees; ?bees in 5 hives
L	British Museum	Montecassino (1)	c. 1080	1 or 2	—	1	5	man taking honey from side/ bottom of hive; like part of CLI
LV*	John Rylands Library, Manchester	SE Italy	900s-1000s	—	2	1	3	shows inside of one hive, with bees on combs
LIX	Mirabella	Mirabella- Eclano		6	4	5	3	2 men taking honey from end of hive; flying swarm with queen
LXI*	Montecassino	S. Italy	1000-1100	—	2	1	2	Fig. 6; hives on legs; nativity scene
LXIX	Montecassino	Montecassino (2)	1105-1118	—	9 or 12	3	2-2½	hives barred, shape not clear
LXXIX	Bibliothèque Nationale, Paris	Fondi	1100-1130	—	4	2	3½	hive barred, trees, bees drawn as birds
XCIII*	Pisa	S. Italy	1000-1100	—	—	—	—	tree, flying bees, no hives
XCIV	same Roll as	XCIII	1000-1100	3?	or 3?	3	3	Fig. 5; man taking honey from end of hive
CXXVII*	Biblioteca Casanatense, Rome	Benevento	1100-1200	9	—	3	2	hives stacked 3 × 3, on stand with legs; see Crane ⁷ Fig. 38
CXLII	Biblioteca Vaticana, Rome	S. Vincenzo al Volturno	981-987	6	4	5	3½	cf. LIX, spikes through rectangular hives
CLI	Biblioteca Vaticana (Barberini), Rome	Montecassino (3)	1070-1100	3	—	1	5	2 men taking honey from side/ bottom; 2 men taking swarm; see Crane ⁷ Fig. 23
CLXI*	Salerno	S Italy	1200s	4	4	4	3	as in LIX and CXLII, the two types of hive alternate
CLXV	Troia	Troia (1)	c. 1050	10?	—	5?	—	C31, MS sewn across hives
CLXVIII	Troia	Troia (2)	1100-1130	10	—	5	4	C36; clearer than CLXV
CLXXXII	Troia	Troia (3)	1150-1200	7	—	7	6	C57; hives have projecting lids and 3 entrance holes

No. hives per tier (omitting XXVII): 1 (6); 2 (1); 3 (4); 4 (2); 5 (4); 6 (0); 7 (1).

Saturday. Wax, not honey, was the product of the bees that mattered here.

Table 1 gives information on hives shown in these manuscripts, of which only 2 are copies from others, and Fig. 5–7 are reproduced from three of them. In many respects the hives conform to descriptions from Ancient Rome, and they are therefore important in the present context. Cylindrical hives are shown in 11 and rectangular hives in 12 of the paintings; both types are shown in some. Hives are shown lying singly in 6 paintings; they appear to be stacked two deep in 1, three deep in 4, four deep in 2, five deep in 4 and seven deep in 1. We suspect (especially with high numbers) that hives may have been drawn to complete a certain area in the design. None of the paintings show any evidence of a wall or platform, such as the Romans used; on the other hand 5 show clearly that the hive(s) stood on four legs of wood cut from a suitable tree.

The length of the hives is usually 2 to 3½ times the width or diameter; in 5 manuscripts the ratio is more (up to six times) and in 1 it is rather less than 2. We know that these are not scale drawings, but in general the proportions conform fairly well with the Roman practice.



FIG. 5. Honey harvesting from hives as shown in an Exultet Roll made in southern Italy between 1000 and 1100 (Avery³ Plate XCIV). Reproduced from original in Museo Civico di S. Matteo, Pisa.

All hives shown are long horizontal containers; they are often stacked vertically, tightly together, although in a few manuscripts the hives represented could alternatively be side by side. The hives resemble those of both Ancient Egypt and Rome in their parallel arrangement, the flight entrance in an end, and in the fact that where a beekeeper is working at a hive he is usually opening it at one end. A manuscript made in southern Italy in the 1000s (Fig. 5) shows a scene very reminiscent of the Egyptian ones, with a kneeling beekeeper with hives on his right, holding a smoker in one hand and, with the other, piling honey combs into a stemmed vessel. No bees are shown flying outside the hives. The hatchings across the hives perhaps indicate combs inside them. In the original, two bees are visible inside the top hive, towards the right, and two in the bottom hive, towards the left. The egg-shaped vessel on top of the three hives is puzzling. No hive in any of the



FIG. 6. Scene from an Exultet Roll (Avery³ Plate LXI) of a similar provenance to Fig. 5; it includes two hives on platforms with legs, and bees flying in and around the hive. See text for further details. Reproduced from original in the Library of the Abbey of Montecassino.

other scenes has a shape like this. Cylindrical hives in Avery's Plates LXIX, LXXIX and CLXI³ carry somewhat similar bands, and all we can say is that it is more likely to represent a hive than anything else. According to her note: 'The scene progresses from right to left: the honey is taken from the hives, the comb is tested and finally the honey presented in a gold vessel to the master by the foreman, whose garments (but not the feet) are restored as a woman's.'

Of the hives that are rectangular in cross-section, some seem to be made of planks. Two manuscripts from Montecassino (c. 1080) show honey being taken from the hives which are opened not at the end, but by removing the side (or bottom) rather in the way that traditional hives in Carniola (N. Yugoslavia) are worked today. One of the manuscripts (Avery Plate CLI) is reproduced in colour elsewhere⁸.

The two hives with flying bees in Fig. 6 fill in the top corners of a nativity scene. Each is clearly a horizontal cylindrical hive on a platform supported by legs or small pillars.

Fig. 7, taken from a manuscript made in Bari (Avery Plate IX), shows much action and also equipment used. Cavallo⁵ describes it as 'rich in realistic movement; the activity of the beekeepers, the production of the wax, the capture of a swarm' . . . 'outside any traditional iconographical scheme'. In our view the two men on the left could well be dealing with a wild colony in a log (rather than with a hive), smoking the bees and collecting their honey combs.



FIG. 7. The 'beekeeping' scene from an Exultet Roll made in Bari about 1025 (Avery³ Plate IX). It shows much action as well as equipment; see text. Reproduced from original in the Cathedral Archives, Bari.

3. Evidence from contemporary records

Inscriptions in stone and on clay tablets, and written records on papyri, provide us with clues as to the status of beekeeping and the numbers of hives kept, and some of the difficulties that beset the beekeepers of ancient times. They do not, however, explain what the hives looked like, or what they were made of or how they were constructed; the literary evidence (Section 4) is a better source for information on these points.

The Hittite Law Code, as it is called, is a text which was written in cuneiform on two clay tablets. It has been preserved for us on fragments from numerous copies. The language and some of the contents of the Code show that it is at least as old as the 1500sBC^{15, 21, 37}. Among the laws regulating prices, paragraph 181 deals with honey: 'one tub (*zi-pid-da-ni* [value unknown]) of honey costs one shekel of silver'; a tub of butter had the same price*, and so did a sheep.

* The prices of honey and butter were commonly about the same, for instance, all through the Middle Ages in Europe.

Two paragraphs relate to the theft of bees and hives:

91. If someone steals a swarm of bees, previously they paid 1 plus x [number missing] shekels of silver, but now he pays five shekels of silver, and the person wronged has the right to distrain on the house of the wrongdoer. [For the translation of this last phrase, a matter of long dispute, see now Güterbock¹⁸.]

92. If someone steals two or three beehives, previously he was exposed to the stings of bees, but now he pays six shekels of silver. If someone steals a beehive in which there are no bees, he pays three shekels of silver. [The previous punishment in the second of these provisions is expressed by a word which is difficult to interpret, but scholars now generally accept that it means exposure to bee stings, which one interpreter takes to be a special form of capital punishment²⁰.*]

These provisions supply clear evidence of hives—literally ‘bee houses’—which had a value either occupied or empty. Moreover the reference to earlier, more severe, penalties suggests that bees had been kept in hives for a long time. The fine for stealing a domestic animal was usually the restitution of six animals, so the 5-shekel fine meant that a swarm of bees was worth roughly a shekel—the same as a sheep. A hive on its own was worth an appreciable amount, so it was probably a specially constructed container⁴.

A few inscriptions attest a tax on hives levied by certain cities in Asia Minor. At Theangela (modern Etrim), a small inland city in Caria, about 15 km east of Halicarnassus (modern Bodrum), the incomplete beginning of a fragmentary inscription dating from perhaps 315–314 BC contains the words ‘and of the hives each one is to pay’ (Robert⁴⁰ no. 52 lines 4–5, and commentary on pp. 78–79). At Teos, an Ionian city on the coast (modern Siğaçak), in perhaps 304–303 BC, a tax on hives is mentioned in combination with one on gardens; the provision runs ‘and they shall also be exempt from the taxes on gardens and beehives’⁴⁰. At Pidasia (modern Cert Osman Kale), a small community high in the mountains south-east of Miletus (Mount Grion in antiquity, modern Labada Dag), an inscription, probably to be dated 176–175 BC, shows that hives were taxed together with olives and flocks: ‘And on the hives they will pay a tax of equal amount for three years’⁴⁰.

It seems probable that a tax on hives was widespread in Asia Minor in the Hellenistic period, taking its place beside the numerous taxes on agricultural products. If so, it suggests that beekeeping was important in the economy of those states. There is plentiful evidence for taxes paid by Egyptian beekeepers, on papyri dating from Ptolemaic right through to Byzantine times. The taxes were sometimes paid in kind, both honey and wax, sometimes in coin⁴⁴.

At Theangela, mentioned above, we happen to have other evidence of the importance of honey: it was the practice there to present two jars of honey to distinguished foreigners honoured by the state. [It is decreed] . . . to give him also gifts of hospitality, two jars of honey.’ At Athens, people similarly honoured were invited to partake of the free meal provided by the state to the councillors^{16, 40, 41}.

All the above records are inscribed in stone or on clay tablets. The honey of Theangela is also mentioned on a papyrus in the great archive of Zenon’s correspondence. Zenon

* For valuable help and advice in understanding and translating these passages we are most grateful to Professor H. G. Güterbock, Dr Douglas Kennedy and Dr Sara Kimball.

was a Greek official living in the Fayyum, and his archive records agricultural and economic activity in Egypt in the middle of the third century BC. One letter from 259 BC lists imports of honey into Egypt—from Theangela, Rhodes, Athens, Lycia, Korakesion in Cilicia, and Chalybon in Syria⁴⁰. It is likely that this honey was imported for its special quality, since the same correspondence provides impressive evidence of large-scale honey production in Egypt itself at the same period. A letter written by two Greeks in Egypt on 26 July 240 BC includes the statement: ‘We owned already under the present king’s father 1000 hives, which were leased out.’ (*P. Cairo Zenon* 59368 lines 12 ff.⁴⁴). One may compare Varro’s statement (*De re rustica* iii, 16, 10) that Seius leased out his hives and received an annual rent of 5000 pounds of honey.

A fragmentary papyrus of 8 October 256 BC has an entry beginning: ‘The 5000 beehives are . . .’ (*P. Cairo Zenon* 59151⁴⁴). A petition from two unfortunate beekeeping brothers (September AD 16), in a recently published papyrus, again indicates extensive beekeeping activities in Ancient Egypt. The beekeepers’ stock had been wilfully destroyed by sealing up the hives:

To Herostratus, the strategus, from Heraclius and Onnophis, both sons of Sarapion, who are among the beekeepers of the city of Oxyrhynchus. We (together with the sons of Heraclius) possess 487 beehives, of which we had 87 in the village of Toka . . .⁴⁴.

Around 250 BC, probably one autumn, some other beekeepers had sent a petition to Zenon (Ransome³⁹ p. 27; Edgar¹¹ No. 59467). The beekeepers were desperate for the return of donkeys he had borrowed from them, as they urgently needed to move their hives away from the site they were on, which was due for irrigation flooding.

It is often stated that in ancient Egypt hives were moved up the Nile each year when flowering started, and put on rafts which were floated downstream to Cairo, keeping pace with the blossom continuously from October until February, when the flowering (and the rafts) reached Cairo, and the honey was sold. This practice was described by a French traveller De Maillet in 1740³⁹, and may indeed have been customary for many centuries, but no direct evidence has been found. There is, however, evidence that hives were migrated by boat in Ancient Italy. Pliny the Elder (*Nat. Hist.* xxi 73) reports as follows: ‘The village of Hostilia lies on the River Po. When food for the bees is lacking in the immediate neighbourhood, the inhabitants put their hives in boats and take them by night five miles upstream. The bees emerge at dawn, feed and return every day to the boats. They change the position of the boats until they sink low in the water under the weight, and it is realized that the hives are full. Then the boats are brought back and the honey harvested. In Spain they convey hives on mules for a similar purpose.’

Not all beekeeping in the Ancient World was on a large scale. Commercial beekeeping was distinguished from small-scale domestic activity in a large inscription from North Africa, dating from AD 100–300 (*Corpus Inscriptionum Latinarum* VIII. 25902). In laying down the dues to be paid by tenants on the produce of their holdings, beekeepers had to pay one pint of honey per hive, but only if they possessed more than five hives at the time of the honey harvest.*

* The common interpretation (e.g. Sullivan⁴⁴, that the beekeepers had to hand over every bit of produce above that from five hives, seems clearly mistaken to me (AJG).

Hives were among the property listed on inscriptions as confiscated from rich and noble Athenians who were condemned as malefactors for committing sacrilege in 415 BC³⁸. Hives are also included among seizable securities, along with land, houses, etc., in a papyrus of about 250 BC⁴⁴.

The documentary evidence thus implies that beekeeping was important and extensive in ancient societies in the Mediterranean region and the Near East. We shall see that the literary evidence confirms this. The inscriptions also give some indications of the economic and social status of beekeeping. But they throw no light on the hives themselves, and not much on their management.

The same is true of early Celtic sources towards the end of the period covered here. The ancient laws of Ireland, dated to the 500s/600s AD and later, have been studied in detail by Charles-Edward and Kelly⁶. The ancient laws of Wales survive in manuscript form from the 1200s but relate to an earlier period; their bee-related material has also been discussed in detail⁹.

Information about hives, which concerns us here, is very scanty. They were probably very small, in order to encourage swarming, because the laws are so much concerned with swarms and their values. In the Welsh laws a hive of bees had the same value as a wild colony nesting in a tree. So—unlike the Hittite hives referred to earlier—the hive itself was not regarded as valuable.

4. Literary evidence

The literary evidence for ancient beekeeping comes to us entirely from Greek and Roman writers. It has been well treated by Fraser¹⁴ and Klek and Armbruster²³, and other useful accounts^{22, 32, 33} are available. More recently Forbes¹³ has also made a rich collection of material, although this is marred by some inaccuracies.

In view of this abundant modern literature on ancient beekeeping, we shall confine ourselves here strictly to the few passages which provide information about hives.

It has been suggested that Homer referred to hives in *Odyssey* xii, lines 105–106: 'In the cave there are mixing bowls and two-handed jars; and the bees store up honey there.' But it seems to us more likely that empty jars had been occupied by bees of their own accord.

The earliest certain reference to hives in literature is a passage in Hesiod's *Theogony*, lines 594–599. Hesiod, who lived in Greece, may have flourished about 700 BC, a little later than Homer. He was a thorough-going misogynist, and in these lines he compares women to drones:

as when the bees in their roofed hives feed the drones, which conspire to evil deeds. Every day the bees work eagerly all through the day till sundown and set the white combs, while the drones stay within the roofed hives and gather into their bellies the toil of others. Just so high-thundering Zeus has made women to be an evil for mortal men.

Hesiod uses here two words for hives (*smenos*, *simblōs*) which were standard in later Greek, so we should disregard the proposal of a recent commentator (West⁴⁶, commentary on line 594), that the poet may have been referring to bees' nests rather than man-made hives. West bases his suggestion on unjustified inferences from certain occurrences of the two words in the works of other authors; he was not very familiar with

the subject in general, since he did not know whether man-made hives had been invented by the time of Hesiod.

Commentators and translators have also been led into error by the two adjectives chosen by Hesiod to describe the hives. The two words (*katerephes*, *eperephes*) are very similar and have a similar basic meaning, viz. roofed, covered over, sheltered. Since house roofs in Hesiod's time were thatched, some authorities have thought that his adjectives meant, by transference, that he was thinking of wicker hives, and have actually used the word *skep* or (German) *Korb* in their translations (e.g., Evelyn-White¹², Marg²⁷). But this is a quite unjustified and unnecessary line of argument. Since it was and is common practice to shelter hives from the elements, either by individual coverings, or by putting a roof over a group of hives, Hesiod chose descriptive adjectives which express perfectly naturally one aspect of the appearance of hives. They do not, however, tell us anything specific about the shape, material or positioning of the hives.

Greek literature once contained at least two monographs on beekeeping: one by Philiscus of Thasos and one by Aristomachus of Soli (Pliny. *Nat. Hist.* xi, 19). Both were written during the Hellenistic period (i.e. 323–31 BC), and neither has survived. We know only what Pliny tells us about them: that Aristomachus devoted 58 years entirely to beekeeping, and his book was called *Melissourgika*. In the Greek literature that *has* survived there is much interesting material about bees, most notably by Aristotle, but his only specific statement about hives is a remark that an average hive produces 6–9 pints of honey, a good one 12–15, 18 being considered an exceptional yield [5–7, 10–12, 14 kg] (Aristotle, *Historia animalium* 627b, 1 ff.)

In contrast to the scant information about hives in Ancient Greece, the literature of Ancient Rome provides informative descriptions of hives used in Italy, several centuries later. Varro (116–27 BC) says of hives (*De re rustica* iii, 16.15–17):

Some make them round out of withies, some make them of wood and bark, some from a hollow tree, some of earthenware, and others again from the fennel plant, making them rectangular, about three feet long and one foot across . . .

We have seen the evidence from Aristotle on the honey-producing capacity of ancient Greek hives, but have no way of knowing if their size was similar to the hives described by Varro. Varro continues with a rather odd passage (in the second sentence quoted below). The narrow-waisted hives were not necessarily so shaped to imitate the bee but, as in the first sentence quoted, to accommodate a smaller colony of bees. Such hives still exist, and will be discussed in our second paper.

. . . except that, when the bees are too few to fill them, they reduce the size, so that they do not lose heart in a wide empty space. All these vessels are called *alvi* from the nourishment (*alimonia*) of the honey, and it seems that they make them most narrow in the middle, in order to imitate the shape of the bees. The wicker hives [not those of earthenware, as Fraser¹⁴ (p. 46) mistakenly says] they smear with cow dung within and without, so that the bees are not frightened by their roughness. They place the hives on ledges on a wall in such a way that they do not shake and do not touch each other, when they have been placed in the row. They make similarly a second and third row below, leaving a space between the rows, and they say that one should rather reduce this number than add a fourth row. [This sentence is misunderstood in Tilly's commentary to the passage⁴⁵; it is correct in Storr-Best's translation⁴³.] In the

middle of the hives they make small holes right and left, by which the bees may go in. At the ends, where the beekeepers may take out the comb, they place lids.* The best hives are made of bark, the worst of earthenware, because those ones are most affected by the cold of winter and the heat of summer. In the spring season and summer the beekeeper should inspect the hives about three times a month, smoking them gently, and should clean the hive of dirt and eject grubs. He should especially see that there are not several rulers, for they cause harm by the quarrels they make.

In Virgil's famous passages on bees in *Georgics* IV, he makes the following references to hives:

As for the hives themselves, whether you have them made of hollow pieces of bark sewn together, or woven of pliant withies, let them have narrow entries; for the winter cold congeals the honey, and heat makes it liquid. Both forces are equally to be feared by the bees. (lines 33–37)

But you must make their homes snug, and fill up their crevices by smearing them all round with smooth mud. Throw a few leaves on top of them too. (lines 45–46)

Columella (ix. 61–2), who wrote in the first century AD, develops at greater length a similar list of materials to that provided by Varro:

Bee hives are to be made according to the character of the region. If there is an abundance of cork trees, we shall certainly make the most useful hives from their bark, because they will not be cold in winter nor hot in summer. If there are plenty of fennel stalks, good vessels for bee hives can be constructed out of them, because they have similar natural properties to cork. If neither of these materials is available, they can be woven out of withies by means of basket-work. If this material too is not available, they will be made out of wood, either a hollow tree or from wood cut into boards. The earthenware hives have the worst properties, because they are burnt by the summer heats, and frozen by the winter's cold.

Columella then passes to two types of hive not mentioned by Varro, only to reject them (ix. 6.2–3):

There remain two sorts of hives: they can be fashioned out of dung or built of bricks. The former sort was rightly condemned by Celsus [one of the chief Roman authorities on agriculture], because hives of dung are specially liable to catch fire. However, he approved of brick hives, even though he did not conceal their particular disadvantages, i.e. that they cannot be moved when circumstances demand it.

A little later Columella turns to the siting of hives (ix. 7.2–6):

'A platform made of stone is constructed across the whole apiary, three feet high and three feet wide. It is carefully smoothed over with plaster, so that there is no way up for lizards, snakes or other harmful creatures. On it are placed the hives, whether, as Celsus prefers, they are built of bricks, or, as I prefer, they are walled round except at the front and back; or again—as is the virtually universal practice among those

*Here we accept the reading of the manuscripts *extrema* (ends) in preference to Keil's correction *extremam* (end), which is printed in modern editions, including that of Tilly⁴⁵. The plural *opercula*, lids, implies that Varro was referring to both ends, not just one. There are plenty of examples of *extremum*, *extrema* used substantively in this way (AJG). The word closure(s) seems to us appropriate, and is used in a later quotation.

who take trouble in the matter—they are arranged in a row and held firm by bricks or concrete, in such a way that the individual hives are contained by two narrow walls, and both ends are left free. For the hives must sometimes be opened at the front, from which the bees issue forth, and, much more frequently, at the back, through which the colony is repeatedly tended. But if no walls are interposed between the hives, they must be positioned in such a way that there is a small distance between them, and, when they are being inspected, the one which is being handled does not cause the next one to vibrate—as it will if they are touching—and frighten the neighbouring bees, which fear every movement as a disaster, since their works are weak, being made of wax. Three hives placed one above the other is plenty, since even then the beekeeper does not inspect the top row with sufficient ease.

The fronts of the hives, which provide the bees with their entrance, should be lower than the backs, so that rainwater does not flow in, and, if it has chanced to penetrate, does not stand in the hives but flows out through the entrance. For these reasons it is useful to protect the hives with a roof above, or otherwise to cover them with leafy branches smeared with Carthaginian clay*. This covering will keep off the cold, rain and heat.

For that reason also [i.e. fear of the cold] the holes which provide entry and exit must be very narrow, in order that they admit as little cold as possible. It is sufficient if they are bored no larger than to accommodate a single bee. Thus the venomous newt, the vile tribe of beetles and moths, and the light-shunning cockroaches, as Virgil puts it, will not enter by doorways made too wide and lay waste the combs. It is very useful also to have two or three entries (according to the populousness of the hive) in the same lid some distance apart from each other, in order to frustrate the lizard's trick, which, standing on guard at the vestibule, with wide-open mouth brings destruction to the bees as they come forth. Fewer of them will die, as they will be able to avoid the siege of this pest by flying through another escape-hole.

The Elder Pliny, who lived from AD 23/24 to 79, gives much varied and fascinating information about bees in his *Natural history*. It includes the following discussion of hives (xxi. 80):

The best hive is made of bark, the second-best of the fennel plant, and the third of withies. Many have also made hives out of transparent stone in order to look at the bees working inside. It is very advantageous for hives to be smeared round with cow dung, and for the lid at the back to be movable, so that it can be pushed forward into the hive, in case the hive is large or the bees' labour unproductive, to prevent the bees from abandoning their task through desperation. The lid can be pulled back little by little in such a way that the bees do not notice the addition to their work.

Fraser¹⁴ (p. 46) apparently confused this passage with that in Varro, when he stated that Varro advocated hives which could be enlarged and contracted by pushing in and drawing out the ends. Varro does not mention moving the lids.

Palladius (or to give him his full name, Rutilius Taurus Aemilianus Palladius) wrote his *Opus Agriculturae* at some time in the fourth century AD. This is what he had to say about hives (i. 37.6,8):

* This (*lutum Punicum*) seems to have been a very tenacious clay which set hard, but we do not know why it was called Carthaginian.

The best hives will be those made out of bark taken from the cork tree, because they do not let in the cold or the heat; but they can also be made from the stalks of the fennel plant. If these are lacking, make them of sprigs of willow or of wood, either a hollow trunk or boards (as for barrels). The worst hives are of earthenware, because they are freezing in winter and boiling in summer.

All the entries should be exposed to the winter sun. There should be two or three in a hive, no larger than the size of a bee; for the narrow entry will thus obstruct harmful creatures. If, on the other hand, they wish to besiege the bees, as long as these have another exit, they will go out by that.

There is a curious source on ancient beekeeping in the thirteenth of the declamations falsely attributed to Quintilian. The whole is very literary in character, and Fraser noted its remoteness from the realities of the bees' world with gently irony (Fraser¹⁴ pp. 113–114). For the sake of completeness we include the passage about hives from this work, which cannot unfortunately be more closely dated than from the second to the fourth century AD.

It gave me pleasure to weave the pliant withies with spring twigs, and to fill the gaping fissures with clinging mud, to prevent either the heat of summer or the cold of winter from penetrating the teeming hive. (Ps. Quint. *Dec.* xiii. 3)

There is, finally, a work on agriculture compiled in Byzantine times, given its present shape in AD 950, called the *Geoponica*, which claims to quote large numbers of famous writers from classical antiquity. There is good reason to suppose that these quotations are bogus, and so to regard the *Geoponica* as a quite unreliable guide to ancient ideas on agriculture. It has, however, been taken seriously in the past (e.g. by Fraser¹⁴ pp. 102–107), so we include the passage on hives, with the warning that it is more likely to refer to mediaeval Byzantine practices than to ancient ones; however, these may not have differed very much.

The best hives are made of boards of beech and fig, or, equally, of pine or oak. Let them be one cubit wide, two cubits long. Smear them outside with a covering of lime and cow dung. They will rot less. (*Geoponica* xv. 2.7–8)

Lerner²⁵ mentions references to beekeeping in Byzantine manuscripts, and a miniature from one in the Bibliothèque Nationale, Paris, is reproduced in colour by Marchenay²⁶ (p. 53). Three yellow horizontal hives stand singly among trees: they are highly stylized and look like little dog kennels made of boards. Bees are flying from two entrances near the bottom of one end of each hive.

As well as the direct statements about hives from ancient writers, a number of other passages provide by implication indirect evidence. We give them here in chronological order, as before.

Virgil gives the following advice on feeding bees (*Georgics* IV lines 264 f.):

At this time [i.e. when the bees are cold and hungry] I urge you to burn sweet-smelling galbanum [*Ferula galbaniflua*] and to introduce honey to the hives through reed pipes.

Columella's careful practical advice on harvesting the honey (ix. 15.11) runs:

When the honey is cut out of the hives, if any of them have combs crosswise in the entrance, they must be turned round, so that the back becomes in turn the entrance.

Pliny (xxi. 82) writes:

If the bees are thought to be short of feed, it would be advisable to place by the entries of the hives raisins or crushed dried figs etc.

Pliny's description of the combs (xi. 23) shows that he understood quite clearly which parts of the comb the bees attached to the hive walls, and which they kept free:

The combs are fixed at the top and, for a short distance, to the sides; so they are both attached and hanging. They do not touch the bottom of the hive, and are either oblong or round, as the shape of the hive requires.

Finally, we have Pliny's intriguing statement about the special observation hives owned by an ex-consul at Rome (xi. 49). After describing the emergence of the young bees from their cells, he says:

This was seen at Rome in the suburban villa of an ex-consul, whose hives were made of the transparent horn used for lanterns.

The passage reads as if these were a less usual hive than those made of transparent stone which the Elder Pliny also mentioned (xxi. 80, quoted above), but he often wrote hastily, and it is possible that both passages refer to the same sort of hive; when he wrote this later passage he may even have forgotten the earlier one. Pliny's transparent stone (*lapis specularis*) is believed to have been mica, and neither horn nor mica could have been produced in large enough sheets to make a hive. Presumably one or more windows were inset to give a view of the interior.

There is, finally, a passage in the *Geoponica*, which Fraser thought showed that the ancients had hives from which the top could be removed (Fraser¹⁴ pp. 106-107). The passage describes a way of destroying drones (xv. 9.1-3):

If you wish to destroy the drones, sprinkle the closures of the hives with water early in the evening. About daybreak open the hives, and you will find the drones adhering to the drops on the closures. For as they are always stuffed with honey, they are thirsty, and having an insatiable desire for water they will not leave the moisture on the closures. Thus it will be possible to destroy all of them . . .

The closures need not have been at the top; they could well have been at the ends of a hive lying horizontally, as in the other passages cited.

As far as we know, this is the sum total of literary evidence from the Ancient World *on hives*, although there are many other passages relating to bees and honey and to other bee-related topics. The above nine types of hives described by Roman authors, often quite explicitly, have been discussed elsewhere, with illustrations of the equivalents of eight of them in use today in one country or another⁸.

Recent archaeological and other discoveries have shown that still further types of hive were used in Ancient times, in lands bordering the Mediterranean and also in other regions whose beekeeping had a separate origin from that of the Classical World. These will be discussed in our second paper.