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HONEY: PAST, PRESENT, AND FUTURE

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NECTAR is produced by both wild and cultivated plants, wherever in the world they grow. In general it is a natural resource that is not accessible to man, and that is wasted unless bees or some other insects collect it — or, occasionally, tiny birds, mammals or marsupials. The performance of bees is truly astonishing. The fuel consumption of a flying bee is about 1 mg of honey a mile, or 7 million miles to the gallon. In providing one pound of surplus honey for market, the colony has had to consume something like a further eight pounds to keep itself going, and the foraging has probably covered a total flight path equal to three orbits round the earth — at a fuel consumption of about an ounce of honey for each orbit.[1]

Honey in the past

Looking back in time, social bees had evolved, and were producing honey, long before man existed. Bees have been producing honey in many parts of the Old World for 10 or 20 million years. In the New World there were no honey bees, but in the tropical and subtropical areas stingless bees produced substantial amounts of honey. Then, as now, honey was stored by the social bees and used in the next dearth period. Then, as now, the honey was sometimes taken instead by various animals — although not by man, since he had not yet evolved. Recent descriptions of honey-harvesting by primates such as baboons, gorillas and chimpanzees are of particular interest, especially the use of sticks as tools. For instance Merfield and Miller[4] describe how each chimpanzee of a group held a long twig, which he or she poked down the hole where the bees' nest was, and withdrew coated with honey. The behavior of human beings getting honey in early times is strikingly similar. In the Bible, the First Book of Samuel relates that Jonathan, son of Saul, "stretched out the stick that was in his hand, dipped the end of it in the honeycomb, put it to his mouth and was refreshed."

The earliest known direct record of honey hunting by man is a painting in a rock shelter in eastern Spain, made possibly as early as 7000 BC. Harald Pager from Austria has recently discovered many paintings in rock shelters in Southern Africa that show bees and combs, and also ladders such as that in the Spanish painting. One (Fig. 1), in the Matopo Hills of Rhodesia, portrays the honey hunter at work with a firebrand that is driving the bees from their nest — the prototype of the modern beekeeper's smoker.[5] Recently, Pager[6] has presented evidence from the caves at Altamira in northern Spain, to show that honey-hunting was a significant human activity as far back as the end of the Ice Ages — considerably earlier than the rock painting in eastern Spain.

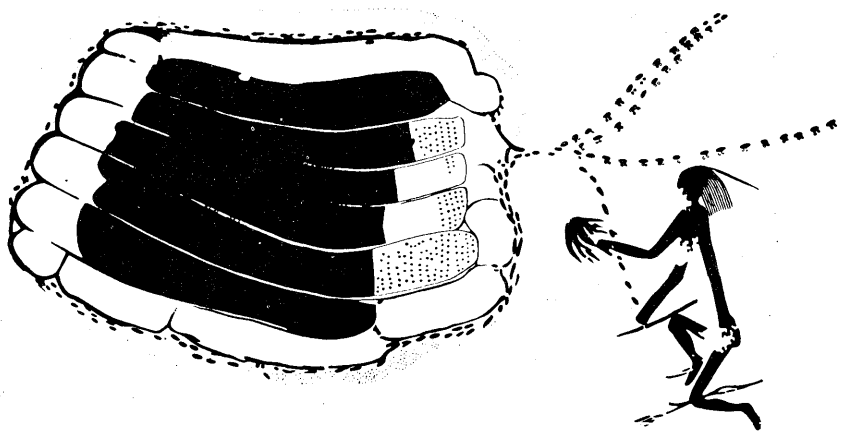

Fig. 1. Rock painting of a honey hunter near the Toghwana Dam, Matopo Hills, Rhodesia. It is the only such painting known where the use of smoke is shown. (From a copy by H. Pager.)

We have very early pictorial evidence that bees were taken from their natural environment and kept in man-made hives, from Ancient Egypt, where a stone carving in relief, made about 2400 BC, shows the treatment of honey and traces of horizontal hives. Hives are shown more clearly in an Egyptian tomb at Thebes, around 600 BC (Fig. 2). The shape of these hives shows a strong resemblance to hives made of mud, cow dung and straw that are still used in the High Simien mountains in Ethiopia (Fig. 3).

The very primitive nature of this Ethiopian hive serves to illustrate the fact that man has made hives for bees out of whatever materials he had available, for his own benefit and convenience in using the bees to provide him with a honey harvest.

Honey today

Nowadays the bulk of the world's honey crop is harvested from movable-frame hives, and the honey extracted by centrifuge from the framed combs. The hives are grouped together, commonly in a number convenient for transport in a truck or other vehicle. The natural distribution of individual colonies is, nevertheless, a population

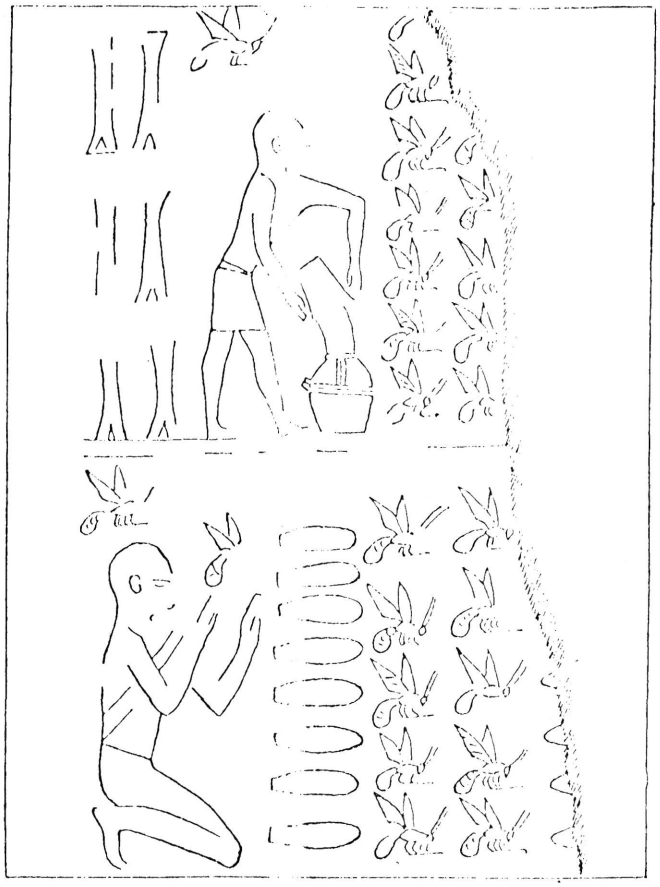

Fig. 2. Relief in the tomb of Pa-bu-Sa at Thebes (c. 625-610 BC). The person in the lower scene is probably a beekeeper getting honey from clay or mud hives at the back; compare Fig. 3. In the upper scene the honey is being poured, and possibly strained, into a second vessel. (After a drawing published by G. Kueny **(1950)**)

scattered over the countryside at a density low enough to give each colony enough food within its foraging range — enough food, that is, for the colony's own use in its annual reproductive cycle, and in its next dearth period, whether this is determined by cold or by rainfall. The unnatural crowding of colonies in an apiary brings increased risks of disease transmission. It would be an exaggeration to call it factory farming, but it benefits the beekeeper rather than the bees. The beekeeper's achievement is indeed to manage his bees so that they store a great deal more honey than they need. The total "surplus" of honey obtained in this way is something like 600 thousand tons a year in the world as a whole.

Table 1 shows how the production and the consumption of honey are distributed between the five continents. European countries have a long tradition of eating honey, and much more is consumed than is produced, imports making good the deficit. Even here the **highest** per capita consumption (Netherlands and the German Federal Republic) amounts to no more than 3 or 4 pounds a year, and in many countries people eat about 100 times as much sugar as honey. Second, there are countries with a much higher honey yield per colony, and also a high honey consumption: USA, Canada, Australia, New Zealand. These are all New World countries peopled from Northern Europe, with its tradition of eating honey. Here again, people eat up to 100 times as much sugar as honey.

A third group of countries, in South and Central America, can give high honey yields per colony, but the people eat little of the honey; they sell it for export instead. Sugar is also a commercial crop in many parts, and on average sugar consumption is 500 times the honey consumption. The average sugar consumption in Cuba is 170 pounds a head. At the other extreme is Asia, where consumption of both honey and sugar is very much lower, only one-eighth of an ounce of honey per capita and 15 pounds of sugar. Japan, recently, has changed its eating habits and become more like the USA with regard to honey and sugar. This leaves Africa where, traditionally, in many tropical regions, the honey was used for making beer i.e. drunk as alcohol, not eaten as honey. Honey consumption per capita is higher than in other continents with tropical regions, but sugar consumption is comparatively low.

Before leaving the question of honey and sugar consumption, I should like to clear up one common misconception. It is more or less true that, before sugar was widely known, "honey was man's only sweetener". But it is not true that man ate the amounts of sweet food that he does now. World sugar production (and consumption) has increased by fifty times since the early 1800s. It is my surmise that, before the use of sugar, the per capita consumption of honey was somewhere about the same as it is now. The 50-fold increase in sweetness of the diet is a new and — if you like — artificial development, related to the sugar industry, and having little to do with honey.

Table 1 includes a summary by con-

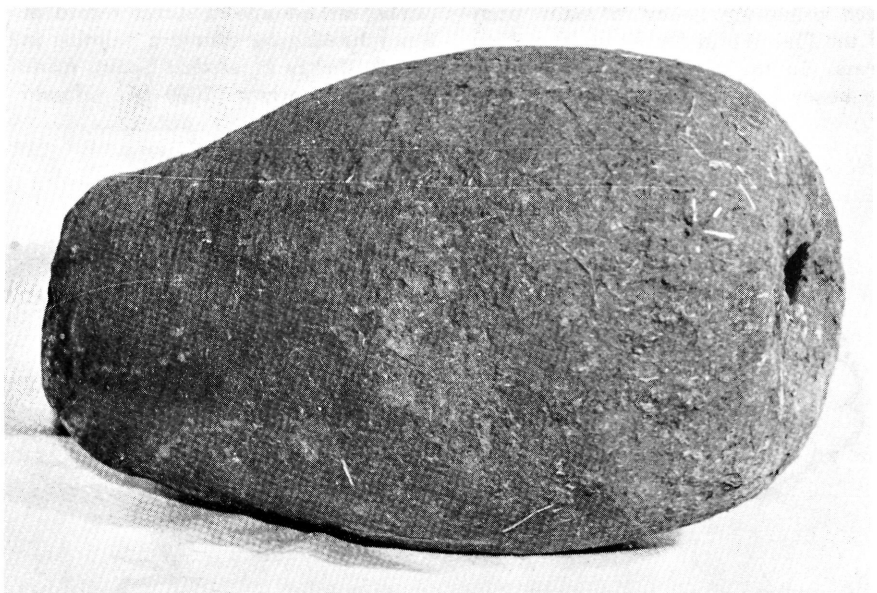

Fig. 3. Primitive hive made of mud, cow-dung and broken straw, used today in the High Simien mountains of Ethiopia. The bees fly from a hole at the right-hand end. Compare the shape of this hive with those in Fig. 2. (Brought from the High Simien in 1972 by John Rea, now No. B72/15 in the IBRA Collection.)

tinent of figures for honey production of individual countries, published in full elsewhere.[2] The most striking differences in honey productivity (honey yield per hive) are those between the New World and the Old World. In Fig. 4 the black areas represent the New World and the white areas the Old World. Only 10% of the world's beekeepers are in the New World, but they have 19% of the world's colonies of bees, and produce 40% of the world's honey.

The difference is shown even more strikingly in Fig. 5. Here the Old World is taken as standard, and the New World compared with it. In the New World the honeybee colony density is less than half that in the Old World, but each beekeeper owns twice as many colonies on average, and his honey harvest per colony is 3 times as high. His total honey harvest is thus 6 times as great as in the Old World, and he can export a good proportion of his honey crop to satisfy the traditional honey-eating countries.

Honey in the future

One significant result of man's travels to the moon is that many people on the earth are now familiar with photographs of their planet as an isolated sphere in space. This has brought home, as nothing else could, the fact that the earth is a single entity whose resources are strictly limited.

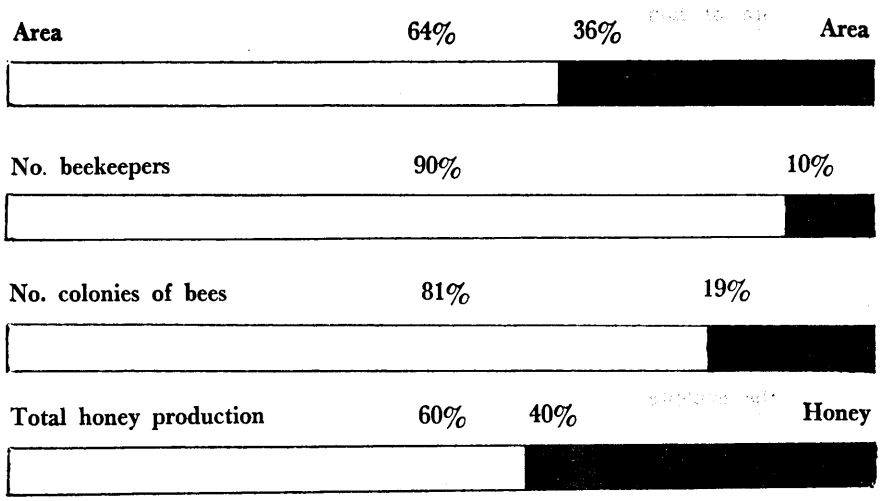

Fig. 4 Beekeeping in the Old World (white) and the New World (black) compared.

Many areas in the temperate zones of the earth's surface are now more or less fully exploited for honey production. There is, however, still room for expansion in the tropics and subtropics. Some of the reasons why beekeeping development there has lagged behind that in the temperate zones apply to agriculture in general, but many difficulties that are specific to beekeeping still have to be overcome. These vary between the three tropical land masses, in Latin America, Africa and southern Asia, but some general comments can be made.

Parasites and other enemies of honeybees are more onerous in the tropics than in temperate zones. Diseases are less so, but may be introduced with honeybees brought in from elsewhere. Tropical climates can be more extreme, and thus more hazardous to bees. Further, keeping bees for commercial honey production has been developed in the temperate zones, using temperate-zone honeybees, and some of the procedures involved are incompatible with characteristics of tropical honeybees. Some of these characteristics in turn are not conducive to honey harvesting by the beekeeper. The bees build smaller colonies, and further, when nectar and pollen sources are no longer avail-

Table 1. Annual honey production and consumption in the different continents

	Europe*	USSR	USA + Canada	Australia + New Zealand	S. and C. America	Asia*	Africa	World Total	*Old World* / *New World*
Area (million square miles)	1.8	8.6	7.6	3.1	8.0	10.8	12.5	52.5	34 = 64% / 19
Total honey harvest (1000 tons)	119	101	123	24	100	72	81	620	373 = 60% / 247 = 40%
Average honey harvest per colony (lb)	21	23	58	77	56	27	15	28	20 / 60 (x 3)
Average honey consumption per capita (lb)	0.9	1.1	1.5	1.1	0.2	0.01	0.6	0.4	0.29 / 0.84 (x 3)
Average sugar consumption per capita (lb)	79	99	108	126	93	15	24	44	33 / 101 (x 3)

* excluding USSR

able, they may migrate elsewhere leaving no store of honey in the hive. Stores that enable a stationary colony to survive a dearth period are irrelevant to a colony which reacts to dearth by moving on as a unit to new forage elsewhere. Temperate-zone honeybees — which modern methods of honey production are designed for — do not have such adaptations for survival which are suited to the tropics, and may not thrive there.

Much more knowledge about the honey bees in the tropics must be acquired before the honey resources there can be exploited fully. And it is wide basic knowledge that is needed; we must not be misled by newsworthy characteristics — such as stinging human "enemies" — away from the fundamental issues that determine the bees' capacity for survival, and traits that may either allow or prevent their use for storing honey that beekeepers can harvest.

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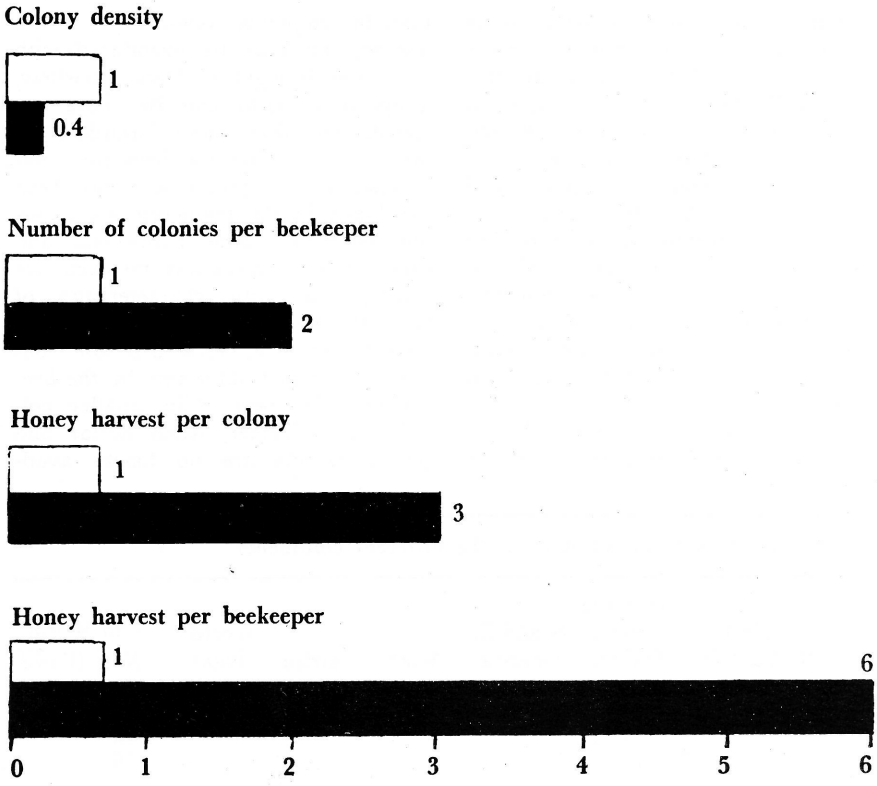

Fig. 5 Effectiveness of honey production in the Old World (white) and the New World (black) compared.