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Giraffe: A Halakhically Oriented Dissection

A necropsy of a giraffe was performed in suburban Tel Aviv in January 2002 by a team of rabbis and investigators from a variety of disciplines. We will discuss the implications of the findings as they relate to: the *kashrut* status of the giraffe, the laws pertaining to its ritual slaughter (*sheḥitah*), and the required examination for lesions that may render it unfit for consumption (*tereifah*). We will briefly review the anatomical characteristics that the halakhah requires for an animal to be kosher and see how they relate to our observations in the giraffe. The topic of the giraffe in Jewish sources as well as the question of its *kashrut* status have recently been dealt with at length in other venues.¹ This article is limited to a brief review of that information, followed by presentation of new material and its possible halakhic implications for the kosher status and preparation of giraffe for Jewish consumption.

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The Giraffe as the Biblical *Zemer*

The Torah includes the “*zemer*” amongst the animals that Jews are permitted to eat (Deut. 14:5). A variety of suggestions have been proposed regarding the identity of the *zemer*.² Rav Sa’adyah Gaon (942-882) definitively translated *zemer* into Arabic as *zirafa*, i.e. giraffe.³ Many of the Arabic biblical commentators followed Rav Sa’adyah Gaon’s lead.⁴ Rabbi Shlomo ben Rabbi Natan Misigilemsa (12th century) cites this tradition that the giraffe is the *zemer*, and classifies it as a *ḥayah*, a kosher animal from which the *ḥelev* (a type of fat whose consumption is forbidden when it originates in a domestic species, *behemah*, such as an ox or sheep) may be eaten but from which the *gid ha-nasheh* (sciatic nerve and its tributaries) must be discarded.⁵ Rabbi Shimon Duran (14th century) concurred and added that it is an animal “. . . whose neck is long, its body is very large . . . and they have testified to me that they saw it in Fez [Morocco].”⁶ It has been suggested that the appellation *zemer* is derived from the Hebrew verb, *lizmor*, to prune, because giraffes are browsers that feed off the tops of trees.

Rav Sa’adyah Gaon’s non-ambiguous identification of the *zemer* as giraffe in the early middle ages had already appeared in the Septuagint, which translates “*zemer*” as “*kamelo-pardalis*,” “*camel-leopard*,” a name assigned to it based on its unusual appearance. This is also how it is translated in the Vulgate and it is also its current scientific name.⁷ Apparently, Rav Sa’adyah Gaon simply perpetuated a much earlier tradition that was already accepted in Egypt, his birthplace.⁸

Many modern commentators assumed that the biblical list of kosher animals was restricted to those indigenous to geographical Israel and therefore challenged Rav Sa’adyah Gaon’s choice. We suggest that the list more likely encompasses species that were known to the world of the Fertile Crescent, including Egypt. Although the natural habitat of the giraffe is currently sub-Saharan Africa, recent investigations have shown that the giraffe was part of the fauna of ancient Egypt and disappeared from it only at the time of the first Egyptian Dynasty. Subsequently it was reintroduced into Egypt via Ethiopia or Libya. The presence of the giraffe in ancient Egypt is well substantiated by the findings of bones, stone inscriptions, and illustrations on graves. There are even those who suggest that it was domesticated in Egypt during certain periods.⁹

There is evidence of the presence of giraffes in Israel in later periods. Second century B.C.E. depictions of giraffes have been found in the Sidonese caves in Moreishah,¹⁰ on the mosaic floors of synagogues in

Beit Sha'an (Tel Itztaba), and in sixth century drawings on Mount Nevo.¹¹ In *Sefer ha-Hayyot*, Timothy of Azza describes the animals that were found in Azza in the year 500 C.E. and tells the story in detail of a man who came from India via the Red Sea with two giraffes. He landed in Eilat and traversed the land route to Azza to deliver the animals to the Byzantine Caesar, Anastasias.¹² It is almost certain that giraffes arrived in Israel via Egypt where they were raised in game parks as described with admiration by many European Crusaders.¹³ Giraffes, while certainly not a common animal, were thus present in the biblical lands during the biblical and talmudic periods.

Despite this information, it is clear that the giraffe was not a common animal in the region of Israel and Egypt in ancient times and this may explain why it appears last in the Torah's list of kosher animals (Deut. 14:5). One would imagine that the enumeration of the ten ruminants listed by the Torah is a rigorous one. M. Kislev has shown that the animals listed do not refer to particular species (as classified by modern taxonomy) but rather to groups of ruminants; some represent large groups and others, such as the giraffe, represent small groups. He organizes the ruminants into two circles of taxonomic groups in a flexible manner that suits his proposal for their identifications. Kislev concludes: "it is hard to dismiss the identity of the 'zemer' as giraffe, for putting it into one of the outer circles [i.e. if it is not identified as one of the primary definitions of the ten but as one of the subsets] results in a number of problems."¹⁴

The Kosher Status of the Giraffe

The Torah defines an animal as kosher if it possesses two physiological features.¹⁵ It must be a ruminant and have hooves that are completely split. R. Yehosef Schwartz, an important nineteenth century researcher of the Land of Israel, wrote with regard to the giraffe: ". . . and I testify truthfully that in the year 5614 [1854] I saw several giraffes that came by way of Egypt. I had the opportunity to examine them and their characteristics in detail over a significant period of time. I saw that it was true and correct that they are kosher animals that chew their cud and have split hooves and all the requisite signs of kashrut. Therefore, it is perfectly true and correct to translate 'zemer' as giraffe."¹⁶

According to the Rambam and R. Yosef Karo, one may decide that an animal is kosher based solely on the anatomic "kosher signs." Based on this, R. Yosef Kapah responded to a questioner regarding the con-

sumption of giraffe flesh in our times as follows: “Only a bird requires a tradition to eat it since its signs are not clear.¹⁷ But animals, domesticated or wild, are eaten based solely on the ‘kosher signs’ and there is no need for a tradition. . . . If they are slaughtered properly one may eat them without doubt.”¹⁸ It is also possible to distinguish between eating the animal *per se*, for which the signs suffice, and eating its *helev*, for which a tradition would be required. Indeed this seems to be the straightforward reading of *Shakh* (YD 80:1) that is usually cited as the basis for requiring a tradition for animals, and this is how *Peri Megadim* (*Siftei Da’at*, YD 80:1) understands *Shakh*. Thus, in the words of one contemporary *posek* “One who finds an animal that has the *simmaneï kashrut* that are stated in the Torah, i.e., it is a ruminant and possesses split hooves, even if we do not have a tradition to eat that species—such as the giraffe or similar animals—one may eat it. But regarding the *helev*, a *masoret* is required. If there is none, then because of the doubt, we must apply the stringencies of a *behemah* and a *hayah*, as is the law with a ‘koi’, and perform the ‘covering of the blood’ but without a *berakhah*.”¹⁹

The requirement to have a direct tradition (*masoret*) in addition to the kashrut signs in order to permit the consumption of an animal was imposed by only a portion of later Ashkenazic decisors.²⁰ In this essay we are not focusing on the need for a *masoret*, but rather on the kosher signs and whether they are present in the giraffe based on our observations.

The Dissection

On 1 Shevat 5762 (January 14, 2002) a Masai giraffe (*Giraffa camelopardalis tippelskirchi*) abortus was examined at the Zoological Center Tel Aviv-Ramat Gan. The dissection was organized by Dr. Zohar Amar²¹ and included the participation of scientists, rabbis, ritual slaughterers (*shohatim*) and veterinarians.²² On Thursday, April 17, 2003 the 10 year old mother of the above mentioned abortus expired. We dissected her on Friday, April 18, 2003. The team this time included R. Shlomo Mahfud, Av Beit Din of the Badaž Yore De’ah in Bnei Brak.

The dissection was performed on a spontaneously-aborted male giraffe fetus weighing 29 kg. Its height from the heel of its foreleg to the top of its shoulder was 1.1 meters, and from its hoof to the top of the head was 1.6 meters. The normal average gestation of the giraffe is 420 – 465 days. At birth its height is 1.8 meters and its weight is 50 kg. According to the estimate of the veterinarians present this abortus was approximately two months premature, i.e. about 13 months gestation.

Nonetheless, most of its internal and external organs were fully developed and we will comment anon about some of those that were not. It was not immediately apparent why this fetus died. It was noted that his liver was enlarged and had rounded edges, which may be related to a fatal 'illness,' or alternatively may have been an artifact resulting from several days of refrigeration prior to the dissection.

The examination took three and a half hours and was performed in a sequential manner that was agreed to in advance. It was conducted by the veterinarians and after each segment there was a discussion during which R. Amitai ben David highlighted the salient halakhic points. The results of the examination will now be discussed in three categories: *kashrut* indicators, laws relating to *shehitah* and signs and laws relating to *treifot*.

Signs of *Kashrut*

Separation of Hooves:

According to the Torah one may eat an animal that has a "split hoof, which is completely separated into two hooves, and that brings up its cud" (Lev. 11:3-4; Deut.14: 6-7; Artscroll translation, Stone edition). In the giraffe it was found that the two digits (toes of the foot) were totally separated, inside and out, just as they are in the ox and in the other animals that are permitted by the Torah. The giraffe walks on two separate keratinized hooves that have no intervening skin or membrane. It walks on the third phalanx (unguligrade) of the third and fourth digits. There are two separate bones up to the level of the metacarpus (-tarsus) which is a single bone ('fused 3rd and 4th metacarpal [-tarsal]') but which has separate condyles to articulate with the proximal surface of the first phalanx of each of the two digits. This matter was verified by incision and separation of the skin up to the metacarpophalangeal joint.

The Greeks and others believed that the giraffe and camel were related and even today we have heard *posekim* suggest that the giraffe is not kosher because it has a hoof similar to the non-kosher camel. The differences in hoof structure help to clearly demonstrate the lack of relationship between them. In contrast to the giraffe, camels walk on the third and second phalanx (digitigrade). They have broad, flat, leathery pads which make up the back part of the sole of each foot which is also fused at the heel. There are two toes that are split on top and in front, the front of each consisting of a small hoof/large fingernail/claw. The foot of the South American camelids (llama, alpaca, vicuna, guanaco) is similar in construction to the camel's (Dromedary and Bactrian) but is

more elongate than the more rounded foot of the camel. Because of the skin and solar pad that fuse the camel's foot externally, the camel is considered not to have split hooves (Lev. 11:4 and Rashi 11:26). The Halakhah is that all animals with "split hooves" can be considered kosher, even if the animal's status as a ruminant cannot be determined, so long as one is certain that it is not from the pig family, which have split hooves but are not cud-chewers.²³

Rumination

The Torah permits only animals that chew their cud (ruminants). The intention is to permit herbivorous animals, whose diet consists of grass and leaves. The anatomy of these animals is particularly adapted to tearing off vegetation, "storing" it, and then digesting it. These adaptations can be found from the mouth to the end of the digestive tract.

DENTITION (TEETH)

The dentition of ruminants is notable by the lack of incisors in the upper arcade, and by the lack of upper canine-teeth (eye teeth) in almost all ruminants. In the giraffe, we found no incisors or canines in the upper dental arcade, but did find them in the lower. In contrast, the camel, which is also a ruminant, has one pair of incisors and one pair of canines in the upper jaw, which the Talmud terms "nivi" (*Hullin* 59a). The camel is classified by the Torah as a ruminant (Lev. 11:4) and it is these "nivim" that distinguish it from the typical other ruminants, which are kosher. On this background the Talmud (*ibid.*) brings a statement in the name of R. Hisda: "If one was walking in the wilderness and found an animal whose hooves were missing, he checks its mouth. If it has no upper teeth (in front) then it is 'kosher' and if it does have them, it is not, provided that one is familiar with a camel," which does not have cloven hooves. Because the teeth of a juvenile camel are not developed, the Halakhah is that one must also be familiar with a "young camel." This is the accepted law.²⁴ In the giraffe fetus we found the expected dentition of the mandible (lower jaw) and the molars and premolars of the maxilla (upper). There were no upper incisors or canines. CT scans of the head showed no evidence that any were destined to emerge, as would be the case in animals that eventually develop these teeth. Subsequent dissection of the adult confirmed the findings.

THE DIGESTIVE SYSTEM

In almost all of the classical ruminant species one can distinguish four

compartments to the forestomach: the rumen (“keres”), reticulum (“beit hakosot”), omasum (“hemses”) and abomasum (“keivah”). The feed, which is ground-up in the mouth, passes through the esophagus to the rumen and reticulum, where it is fermented by microorganisms and the cellulose, of which it is composed, is broken down. Some of the feed returns to the mouth in a partially broken-down state (i.e. cud), is again mixed with salivary juices, is re-chewed and re-swallowed. When the contents of the rumen and reticulum have reached a fine enough state they move into the omasum and then to the abomasum (or “true stomach”). There, with the help of acid and digestive enzymes, digestion progresses as it does in the non-ruminant, and the ingesta then passes into the small intestine. The Mishnah (*Hullin* 3:1) specifically mentions the presence of the “hemses,” “beit ha-kosot,” “keivah” and “keres penimit”. There appears to have been some ambiguity over the years as to which term applied to which of the stomachs.²⁵ In a late midrash the “beit hakosot” is referred to as a definitive identifier of a kosher animal.²⁶ Rashi (*Hullin* 42a, s.v. *beit ha-kosot*) seems to be the first of the Jewish sources to describe the form and function of the ruminant stomach(s).

Some cud-chewing animals have only three stomach compartments; examples include the family Tragulidae and the camel. Nonetheless, the Torah considers the camel to be a ruminant (Lev. 11:4, Deut. 14:7). In fact, we find nowhere in the halakhic literature a requirement for four stomach compartments for an animal to be kosher. In any case, the giraffe necropsy revealed that its stomach has the four classic compartments just as they are found in the ox, sheep, and goat.²⁷ These four chambers are as follows: rumen (*keres*); Reticulum (*beit ha-kosot*), whose luminal surface is constructed in a reticulate pattern reminiscent of a beehive, hence the Hebrew and English names; omasum (*keivat ha-alalim/hemses*) whose luminal surface is constructed of a multitude of plies giving the appearance of the pages of a book; and the abomasum (“keivah”) or true stomach. It is worthwhile to point out that in this young individual the abomasum was relatively more developed than the other three compartments. Young giraffes, like calves, get their early nourishment from their mothers’ milk and only later when they begin to eat vegetation do the other three compartments of the forestomach fully develop. Despite this, and despite the fact that this was a pre-term fetus, we could clearly identify all four compartments based on their construction as being identical to those in other ruminants. Dissection of the adult showed her stomach(s) to be identical to that of adult cow, sheep or goat.

Horns

The Torah does not mention horns in the discussion of kosher animals. Reference to them is first made in the rabbinic literature that defines a *ḥayah*. “These are the signs of a *ḥayah* whose *ḥelev* is permissible to eat: any animal that has horns/antlers (*karnayim*²⁸) and (split) hooves (*telafaim*). R. Dosa says: ‘if it has horns you don’t have to check for hooves but if you see that it has hooves you must still check for horns.’ And a ‘keresh’ even though it has only one horn is permitted.”²⁹ The Talmud, and in its wake the *Shulḥan Arukh* (YD 80:1), refine the signs of a *ḥayah* to specific types of “horns” – they must be *mefuzalot*, and if not, then they must be *kerukhot*, *ḥarukot*, and *ḥadurot*. There is a great deal of debate regarding the meaning of these requirements, and as such we will not attempt to determine if the giraffe horns meet these conditions, and thus leave totally open the question regarding the status of a giraffe as *ḥayah* or *behemah*.³⁰

In a second use of horn signs, the *Mishnah* in *Masekhet Niddah* (51a) states a rule that: “All (animals) that have horns have hooves.” *Rashi* explains: “its hooves are split: for horns are only found on kosher animals.”³¹ In contrast, there are animals with split hooves that have no horns, such as the pig. Thus, *Rashi* views horns as another indicator of kosher animals. He is not alone. *Targum Yonatan* on both Leviticus 11:3 and Deuteronomy 14:6 adds the existence of horns to the biblical kosher indicators of split hooves and cud chewing. Commenting on that *mishnah*, R. Ovadyah Mi-Bartenura writes that there are no horns except on kosher *ḥayah* and *behemah*. *Tiferet Yisrael (Yakhin)* on that *mishnah* takes it to the final step and rules that an animal with horns is thus kosher without further inspection.

Rashi’s position, however, is not the only one. *Gera* (YD 79:3) explains that the *mishnah* and *Rashi*’s explanation of it follow the opinion of R. Dosa and not of the *ḥakhamim*.³² The *Shulḥan Arukh* entirely omits mention of the horn sign as a method of ascertaining the *kashrut* of an animal. *Rama* (OH 586:1), in prohibiting the use of a shofar made from a non-kosher animal, seems to indicate that in his opinion non-kosher animals can have horns.

On the head of the giraffe there are two to five horns—boney protuberances that are covered with skin.³³ Two horns protrude from the center of the forehead; at times, another pair of smaller horns emerges behind them and a smaller horn is found in the front of the forehead.³⁴ The giraffe horn differs from the bovid horn in not having a keratinous sheath and from the cervid antler in its permanence and lack of sexual

dimorphism. Like bovid horns, they contain a bony core, but the bone is not an extension of the frontal and parietal bones as in bovid horns but is separated from these bones and the underlying sinuses by a cartilaginous pad. It has its own center of ossification. The young individual that we dissected had not yet developed horns, but it was possible to feel the horn buds beneath the skin. The adult that we examined had two (parietal) horns. Their proximal 5/6 was covered with haired skin whose superior border is surrounded by a ring of (several inch) long hairs. The most superior 1/6 was covered with an un-calcified, dense connective tissue that has many features of glabrous skin. The outer surface has a dense keratinization, and is quite thick relative to the skin that covers the remaining, more proximal region of the horn. It is not a well-defined keratin such as that which covers the horn in other species, but more an unshed epidermal material that seats the hair follicles. According to the opinion that the horns are a sign of kashrut, the presence of horns may be another indicator that the giraffe is a kosher animal.

Mahalakh Besaro Shesi Va-erev

The Talmud (*Hullin* 59a), in the name of R. H̄isda, cites an additional sign of *kashrut*. “If one is traveling in the wilderness and comes across an animal whose mouth is mutilated and whose feet are severed, he can check the grain of its flesh; if it runs warp and woof, then he knows that it is kosher and if it does not, then he knows that it is not kosher, so long as he is also able to distinguish it from the *arod* (wild ass or onager). Where should he check? Abbayeī (some say R. H̄isda) said—under the ‘rump’ (*kenaf okez*).”³⁵ There is little agreement as to the definition of the location of this part of the animal.³⁶ In our dissection of the fetus we could see crisscrossing of the muscle fibers in the hind end. Nonetheless, we could not come to a definite conclusion on this issue. At the dissection of the adult giraffe, R. Mahfud, one of the most respected *shohtim* and *menakrim* in the world, who readily recognizes *sheti va-erev* in the domestic kosher animals and has dissected a horse to see the lack of it, dissected out the muscles that appear warp and woof in kosher animals. One important aspect that we noted was that it is not the direction of the fibers but the orientation of the two layers of muscle that are perpendicular.

Other

Lengthwise incision of the jugular veins revealed a long series of one-way valves that belie the misconception that it is impossible to ritually

slaughter a giraffe because it cannot lie down or safely be turned over, the preferred method of slaughter.

Physiologically a giraffe has two potential problems if it lowers its head or lies down. It might seem that if the head gets below the heart it would “explode” from the huge blood pressure³⁷ and when it raises its head it will faint, and if the head gets below the rumen, it would start pouring out its contents and the animal would aspirate.³⁸ In point of fact, giraffes often lower their heads to the ground to drink, a feat that requires spreading their front legs apart since their necks are so long. But the design of the giraffe was very cleverly planned by the Creator so as to prevent any problems. For example, it has unusually elastic blood vessels, arteries with exceptionally thick walls, special valves in the neck veins,³⁹ and a network of tiny veins (rete mirabile), all of which control blood flow to and from the head and prevent ruptured blood vessels in the head and syncope when the animal lowers and raises its head to drink. Furthermore, there is a special “sponge” just beneath the giraffe’s brain that absorbs blood when the head is lowered and squeezes the oxygenated blood into the brain when the giraffe raises its head. In addition to lowering their heads to drink, giraffes often lie down to sleep, although these sleeping periods tend to be brief—one to twenty minutes. Even giraffes that unintentionally fall on their sides can right themselves.

Also, although it is generally preferable to *shehit* an animal with the knife above the neck to avoid the problem of *drisah*—cutting by pressure rather than by slicing with a to and fro motion⁴⁰—it is not an indispensable requirement. In fact, most bovine *shehitah* in North America actually takes place with the animal standing in a pen known as the “ASPCA pen” or “Elizabeth pen,”⁴¹ and to avoid *drisah* its head is supported by a metal chin lift.

The Laws of Slaughtering

There is a common misconception that giraffe is not eaten because we do not know where, along its long neck, to slaughter it. This error has even penetrated the erudite Torah community.⁴² The established *halakhah* is that “the entire neck is acceptable for kosher slaughter.” On the trachea one may cut anywhere between the cricoid cartilage (*taba’at ha-gedolah*) and the most cranial tip of the right cranial lobe of the lung (*kanfei reiah ha-tahtonah*).⁴³ On the esophagus one may cut from the point where the upper esophagus would shrink closed after being severed (as opposed to remaining open) to the area where it starts to look

like the stomach lining. Thus, the halakhah is speaking about a broad area; for a pigeon the valid region is a few inches long, for a cow over a foot, and for a giraffe, close to six feet. This alone should be sufficient to dispel this mistaken notion. But, to eliminate any doubt, we dissected the entire length of the neck of the giraffe and found that her anatomy was similar to that of other kosher animals. That is, the skeleton of the neck was composed of seven vertebrae, the trachea (*kaneh*) and esophagus (*veshet*) ran adjacent to each other and with the carotid artery and jugular vein for the full length of the neck as they are in other kosher animals. The trachea was composed of incomplete cartilaginous rings, with the exception of the uppermost ring (the cricoid). Above this was the thyroid (Gr. shield) cartilage referred to in the halakhah as the *shipua kova*.⁴⁴ The esophagus was also of the standard form. Several cuts along its length showed that it contracts closed, and at its end is the rumen as defined and required by the *Halakhah*.⁴⁵

There are two possible sources for this common misconception; one involves a mistranslation and the other a misunderstanding. *Shulḥan Arukh* (YD 20:3) requires “that the *sheḥitah* take place in the middle of the neck.” This may mislead one into thinking that there is a need to define the middle of the neck, which may be presumed impossible for a giraffe. But that is not what is meant, and is not done on any animal. The *Shulḥan Arukh* continues “. . . but if he slaughtered from the side it is *de facto* kosher.” In other words, *sheḥitah* is a transverse cut through the neck and this *halakhah* is stating that the preferable method is to make a frontal rather than a lateral cut. It is *not* discussing the height of that cut on the neck. The word “middle” is used in contrast to the side, rather than in contrast to the top or bottom. *Rama* (*Darkhei Mosheh* YD 20:5) and *Arukh ha-Shulḥan* (YD 20:2) do note that *ab initio* one should slaughter in “the middle” of the neck and they do seem to be addressing the question of top to bottom. But their use of the word middle does not imply a precise center; it means central region as opposed to the periphery.⁴⁶

A second possible source of this misconception is the statement of *Rama* (YD 20:2) that there is a tradition among the early sources which identifies the location of the upper bound for *sheḥitah*.⁴⁷ It is the point that is reached by the ear of the animal when it is folded over. This guideline might not be applicable to the giraffe, and therefore might not be useful to determine the correct location. Clearly the statement of *Rama* was not meant as an exclusionary rule. However, even if this ancient indicator does not apply to giraffe (and we are not saying it

doesn't), the talmudic landmarks certainly do apply, and the region in which slaughtering is acceptable is sufficiently well defined. Rama was simply giving a handy external indicator of the uppermost area to cut. He was not proffering a required region.

Laws of *Treifot*

The following discussion will address points relevant to *hilkhot treifot*. In the dissection we attempted to verify various anatomical points that every *shohet* needs to recognize and be able to inspect. Herein we discuss some of these points that are particular to the giraffe and different from the more common kosher animals.

Gall Bladder

These giraffes had no gall bladder, as is the case in all giraffes.⁴⁸ The lack of a gall bladder does not affect its kosher status in any way. *Shulḥan Arukh* (YD 42:8) discusses the laws of the gall bladder and mentions that certain species of birds, such as the pigeon and turtledove, do not have a gall bladder. However, continues *Shulḥan Arukh*, “this is not a reason to prohibit them since the entire species is such.” Similarly the deer’s (*zevi*⁴⁹) gall bladder is unusually located, and this being the norm for the species does not render it prohibited. This is similar to the ruling of *Keneset Ha-Gedolah* (YD 35) that if two accessory lobes of the lung (*inunisa de-varda*) are found in a ‘buffalo’ (Bubalus?) or wild ruminant (Cervidae excluding musk deer) then it is kosher since all animals of those species have them.

Lungs

The laws of *tereifot* mandate a meticulous inspection of the lungs and their lobes. In *Shulḥan Arukh*, YD 35, which is dedicated to these laws, there is a description of the typical lung: it has three lobes on the right and two lobes on the left (35:1) and a small accessory lobe on the ventral side on the right. With regard to animals with extra lung lobes the *Rambam* (*Hilkhot Sheḥitah* 8:4) wrote: “if the extra lobe was on the side of the lobes or in front of the lungs opposite the heart – it is permissible.” To this Rama adds (35:3): “There are those who prohibit every additional lobe of the lungs which does not lie in the longitudinal row under each side of the vertebral column (*dari de-oni*). The custom is to prohibit an extra lobe even when it is on the underside of the lung, and we do not distinguish between the underside and the outer side but only whether it sits in the longitudinal groove. . . .”

Because the first giraffe we examined was an abortus,⁵⁰ it had never inflated its lungs, as it was never alive outside of its mother's womb. Attempts to inflate them to accurately ascertain their construction and whether they were imperforate were unsuccessful. We therefore resigned ourselves to examine them 'closed'. The typical mammalian respiratory system is composed of left and right lungs. The left lung has two lobes, one cranial and one caudal, and the cranial lobe is itself divided into cranial and caudal lobes. The right lung consists of four lobes, cranial, middle, caudal and accessory. Amongst domestic animals this is true for the carnivores and swine. In the horse the left cranial lobe is not divided into cranial and caudal lobes and the right lung has only three lobes with the middle lobe missing. In the typical ruminant the right lung has four lobes but the cranial lobe is itself divided into cranial and caudal parts.⁵¹ The giraffe was found to have a right lung consisting of a divided cranial, middle, caudal and accessory lobes. The middle and caudal are joined. The left lung consists of a cranial lobe that is split into cranial and caudal lobes, and middle and caudal lobes that are attached. The lobes appeared to lie in a groove under the ribs as the lungs of all (kosher) animals do and thus, after recognizing the normal architecture, one could distinguish additional lobes that would define the slaughtered animal as a *tereifah* (*huz mi-dori de-oni*) from the normal state that would not.⁵²

Kidneys

The morphology of the kidney in various species relates to the degree of fusion of the various basic components of the primary reniculus; i.e., the cortex, medulla and calices/pelvis. The ox has a multipyramidal kidney with a clear lobar pattern observed both externally and internally. Its kidney has multiple calices and no renal pelvis. The sheep kidney is unipyramidal with fusion of cortical and medullary components. The giraffe kidney appeared to be multipartite with fusion of the cortex but division of the medulla. Externally it appears like that of the sheep, but internally it appears to have multiple calices and a renal pelvis.⁵³

Gid Ha-nasheh

The prohibition of the Torah to eat from the sciatic nerve and its tributaries, "gid hanasheh" (Gen. 32:33), applies to all animals, both *behemah* and *hayah* (*Mishnah Hullin* 7:1). Dissection of the hip of the giraffe revealed a sciatic nerve that arborized into two branches (tibial and peroneal) similar to that found in other kosher animals.

Summary

The dissection proved beyond doubt that the giraffe possesses all of the signs required of a kosher animal. It does not differ in the majority of its organs from the rest of the kosher animals except for the size of its limbs, which are not proportional. According to most decisors, who do not require a *masoret*, the giraffe is kosher. The laws described in this article have not been practically applied because consumption of giraffe is not popular anywhere that Jews live. However, the status of giraffe in Africa is currently quite secure, with healthy populations in most savannah parks and reserves. They do not survive outside of protected areas and have been successfully reintroduced in reserves such as Phinda Private Game Reserve and Madikwe Game Reserve in South Africa.⁵⁴ It is indeed true that giraffes are among the most difficult animals to restrain and anesthetize. Giraffes react defensively with well-aimed kicks, and one kick from a giraffe can certainly kill a human. In addition, there is a high immobilization mortality rate with giraffes. However, several zoos have constructed giraffe restraint devices that have been successfully used for clinical and research procedures.⁵⁵ When the goal is to slaughter the animal, the concern of high mortality rates is, of course, immaterial. Nonetheless, habituation and desensitization of the giraffe would be critical prerequisites for the successful restraint of a giraffe prior to *shehitah*.⁵⁶ In light of this, domestication of giraffe and raising it in significant quantities might eventually lead to practical deliberations regarding the *kashrut* of the giraffe. It is our hope that the data presented herein will be useful to the *posekim* that will have to deal with the questions that will then arise.

Notes

1. R. A. Ben David, *Siḥat Ḥullin* (Jerusalem, 1997), 417-418[Heb]; R. A. Hamami, The Giraffe-Kashrut, *Tehumin* 20(2000):89-93[Heb.]; R. Y. Yosef, *Yalkut Yosef*, vol. 10, *Issur ve-Heter* (3), (Jerusalem, 1999), 553-557[Heb]; R. A. Zivotofsky, "What's the Truth about Giraffe Meat?," *Jewish Action* (Fall 2000): 37; idem., "Buffalo, Giraffe, and the Babirusa ("Kosher Pig"): The Halakhic and Scientific Factors in Determining their Kashrut Status," *BDD* 12 (Winter 2001):5-32; J. D. Bleich, "Is the Giraffe a Kosher Animal?," *Tradition* 35 (2001):70-75.
2. See: R. I. M. Levinger and M. Dor, "The Seven Kosher Non-domestic Animals," *Torah U-Madda* 4 (1975):37-48[Heb.]; Y. Aharoni, *Memoirs of a Jewish Zoologist*, 1 (Tel Aviv, 1943), 103-111 [Heb.]; Y. Felix, *Flora and Fauna in the Torah* (Jerusalem, 1984), 33 [Heb.]; M. Dor, *Fauna in the Times of the Bible, Mishnah and Talmud* (Tel Aviv, 1997), 40 [Heb.]. Information

regarding other suggested identifications of the *zemer*, such as the *taḥash* and the *keresh* (“unicorn”), kosher animals found in Jewish literature, can be found in the articles referenced in footnote 1.

3. R. Y. Kafikh, *Commentaries of Rabbi Sa'adyah Gaon on the Torah*, (Jerusalem, 1984), 175, note 8 [Heb.].
4. For example, Ibn Genah and R. D. Kimḥi, *Sefer ha-Shorashim*, Shoresh Zemer; R. Ashtori Haparkhi, *Kaftor va-Ferah* (Luntz ed., Jerusalem 1899), Vol. 2, p. 768.
5. *Siddur R. Shlomoh ben Rabbi Natan*, OB^m (edition of S. Hagai) (Jerusalem, 1995), pp. 163 and 170.
6. *Yavin Shemu'ah, Hilkhhot Tereifot*, p. 5b [Heb.].
7. The word “giraffe” seems to have stemmed from the Arabic word “xirapha” meaning one who walks swiftly. The specific name *Camelopardalis* was apparently coined by the Greeks who, when first confronted with the creature, thought it a cross between a camel and a leopard! The Zulu call the giraffe “ndhlulamithi”—which means “taller than the trees.”
8. The identification of *zemer* with giraffe had wide circulation. The 12th century Crimean Karaite Yehuda Hadassi in his *Eshkol Hakofer* (Gozlov, 1836, page 25c) identifies the *zemer* with the giraffe. More information on this passage can be found in Alexander Schreiber, “Elements Fabulleux Dans L'Eshkol Ha-kofer,” *Revue des Etudes Juives* 108 (1948): 44. He describes it as tasty meat, although it is unlikely he ever saw, let alone tasted, a giraffe. (We thank Professor Daniel J. Lasker for this reference.)
9. D. Huyge, “Giraffes in ancient Egypt,” *Nekhan News* 10 (1998), 9-10; compare S. Bodenheimer, *Fauna in the Lands of the Bible*, 1 (Jerusalem, 1950), 78 [Heb.].
10. A. Hamerstein, “These are the Drawings of the Animals Whose Images have Faded and Disappeared from the Walls of the Caves of Afolonses in Mareisha,” *Teva va-Areẓ* 21 (1978): 33 [Heb.].
11. M. Pitzirilo, “Sixty years of Archeological Investigation,” *Kadmoniyot* 110 (1996):118-133, table 1 [Heb.].
12. Bodenheimer (see note 9) part 2, p. 83.
13. A. Freidman, “The Concept of Sacred and Secular in the Land of Israel in the Eyes of 14th Century Pilgrims” [Heb.], in *Israel in the Period of the Mamlukes*, ed. Y. Drori (Jerusalem, 1992), 134; Bodenheimer (see note 9), Part 2, pp. 221, 225, 227.
14. M. Kislev, “Taxonomic Identification of the Ten Kosher Ruminants,” *Sinai* 125 (2000):216-225 [Heb.].
15. The Torah provided both physical signs and a list of acceptable kosher animals. The need for both signs and a list is unclear. It seems that one who can identify the listed animals may consume them without further inspection. Alternatively, one may rely on the signs even in the absence of knowledge of the listed animals. As our sole goal is to present the available evidence and make it accessible to those who may have to decide on the kashrut of the giraffe, we have presented evidence related to both its identity as one of the ten listed animals as well as related to its possession of the physical signs.
16. R. Yehosef Schwartz, *Divrei Yosef* (Jerusalem, 1862), 159b.
17. In regard to the requirement for a tradition to establish the kashrut of a bird, see: Ari Z. Zivotofsky, “Is Turkey Kosher,” *The Journal of Halacha and Contemporary Society* 35 (Spring 1998):79-110.
18. See: Z. Amar, “On a Few of the Principles in The Position of Rav Yosef

Kafikh in the Identification of Plants and Realia,” in *Sefer Zikkaron le-Rav Yosef Kafikh*, ed. Z. Amar and H. Seri, (Ramat Gan, 2001), 73. This also seems to be the opinion of R. Y. Razabi. In his opinion there is no disagreement regarding the permissibility of eating a giraffe or its *helev*. Furthermore, according to the *halakhah* the crux of the matter is the signs of *kashrut*, and the identity of the species is irrelevant. See also *Shulhan Arukh ha-Mekuzzar*, YD 1, (Bnei Brak, 2000), 178-9. R. Razabi expressed in a letter to Z. Amar his joy that in the dissection described herein the *simmanim* of *kashrut* were clearly demonstrated and if so “it is clear that (giraffe) may be eaten.” See also in the appendix (*Luah Tikkunim*) to *Siḥat Hullin* (above footnote 1, 8th ed. Iyyar 2001) where he brings in the name of R. Azaria Basis the view that it is permissible today to eat giraffe even according to those that require a *masoret*, because Yemenite Jews have a *masoret* based on the translation of Rav Sa’adyah Gaon.

19. R. Dovid Taharani, *Divrei Dovid*, vol. 2 (Beitar-Ilit, 2001), YD, 111:1-5, p. 82.
20. For a discussion and sources, see Ari Z. Zivotofsky, “Kashrut of Exotic Animals: The Buffalo,” *The Journal of Halacha and Contemporary Society* 38 (5760/1999):117-28. It is posted on line with permission at: <http://www.kashrut.com/articles/buffalo/>. See also the discussion in the articles by Rabbis Hamami (pp. 91-92), Zivotofsky, and Bleich (footnote 1, above). The Orthodox Union and other kashrut organizations in the USA reject this requirement.
21. Special thanks to Ms. Nurit Shachter for her initiation and support and to the staff of the Ramat Gan Safari.
22. The following is an alphabetical list of some of the participants: Dr. Zohar Amar (Dept of Land of Israel Studies, Bar Ilan University [BIU]), R. Amitai Ben David (Author – *Siḥat Hullin*, see footnote 1), Mr. Eli Chakak (Dept. of Life Sciences, BIU), R. Avraham Hamami (author of an essay on the Kashrut of giraffe, see footnote 1), Dr. Ari Greenspan (*Shoḥet u-Bodek* [*Sh”B*], dentist), Dr. Yigal Horowitz (veterinarian for the Safari), Ms. Einat Matlin (veterinary assistant), R. Hananeil Seri, Mr. Yaron Seri (Dept. of Arabic, BIU), R. Natan Slifkin (the “Zoo Rabbi”), Dr. Amelia Turkel (Zoologist and Curator of the Safari), R. Dr. Ari Zivotofsky, (*Sh”B*, Lecturer in Brain Sciences, BIU), Dr. Doni Zivotofsky (Large-animal veterinarian, private practice, Jerusalem). David Zivotofsky and Avital Slifkin photographed and video-taped the event.
23. *Hullin* 59a; *Rambam, Hil. Ma’akhalot Asurot* 1:2; *Shulhan Arukh* YD 79:1.
24. *Rambam, Ma’akhalot Asurot*, 1:3; *Shulhan Arukh* YD 79:1. It should be noted that this is a uni-directional sign. An animal without front upper teeth is kosher (assuming it is not a juvenile camel). The presence of such teeth does not prove that the animal is not kosher. An example is the elk (*Cervus elaphus*) which has “ivories” so prized by hunters, which are upper incisiform canine teeth.
25. By the Amoraic period the naming of the forestomachs had already become unclear. See *Shabbat* 36a and *Hullin* 50b. Also, Y. L. Katznelson, *Ha-Talmud ve-Hokhmat ha-Refu’ah* (Berlin, 1928), 98-99, note 1.
26. Midrash “*Rav Kahane ve-Salik Beno*” (This is a later and less well-known midrash that was found in the genizah) found in “*Batei Midrashot*” (ed. of A. Y. Vertheimer), Part 1 (Jerusalem 1968), 305.
27. This is in contrast to reports in the literature that the giraffe has a three-

compartment stomach. e.g. Y. Felix, “*Ḥai ve-Zomeah ba-Torah*” (Jerusalem, 1984), 93. Prof. Felix is aware of this error and expressed to one of us (AZZ, personal conversation, April 2001) his desire to publish an updated version of his book in which he would correct it.

28. Karnayim can mean any type of “headgear”: horns, antlers, or the more specialized headgear of the giraffe. The distinction between horns and antlers derives from their method of development, their composition and their permanence. Horns have an external keratinous layer (like nails, hair, hooves, scales, claws, and feathers) that is not living or sensate. Under this are epidermal and bony layers that cover the extension of the frontal sinus that comprises the inside of the hollow horn. They grow throughout the life of the animal and are found on males and females. Antlers are a seasonal (annual) growth on the head of (usually just) the male of the species. They are living tissue that closely resembles bone in physiology, chemical composition, and cellular structure. Rather than growing outwardly by growth at ossification centers at either end, the growth is supported by a rich vascular network that is supplied by a velvety skin that contains a rich supply of blood vessels and nerves. As the mating season progresses the antlers ossify completely and the velvet is shed. At its completion, the antlers themselves are shed and a few months later the whole process is repeated.
29. *Hullin* 59b; *Tosefta Hullin* 3:21.
30. With the only caveat being that if the giraffe is indeed the *zemer*, it is *ḥayah*. In addition, it would seem that all *behemot* can be subsumed under the three first animals listed, bovine, ovine, or caprine, and thus to treat a giraffe as a *behemah* would require classifying it in one of those three categories.
31. Cf. *Arukh Ha-Shulḥan*, *YD* 80:3.
32. See also *Tosafot* (*Hullin* 59a, s.v. *elu hen*) and *Beit Yosef* (*YD* 80) who cite various interpretations of this mishnah.
33. Because they are covered with skin it is possible that they would be considered bones and not horns. We have not found this discussed in any sources, but think it worthy of further consideration. It is important to note that even were it to be determined that the giraffe “horns” are not halakhic horns that is not an indication that they are not kosher. There are many kosher animals without “horns,” most notably the females of many deer species. It would simply be that their presence could not be used as a confirmation of the *kashrut* status of the giraffe.
34. This horn in the front of the head accords with the identification of the “keresh” as the giraffe. That is because this single horn is located more forward, and thus someone seeing the three-horned giraffe head twenty feet up could easily have seen only the single horn and thought the animal to be a unicorn, particularly if the person had heard about the existence of such an animal. See at length *Siḥat Hullin* p. 417.
35. This is accepted as the halakhah according to *Rambam Hil. Ma’akhalot Asurot*, 1:3 and *Shulḥan Arukh*, *YD* 79:1.
36. Rashi explains “under the bone of the fat-tail that is called ‘Hanche’ (O.F.) which is the “moten” (Heb.) (see M. Catane, *Ozar Loazei Rashi* [Jerusalem, 1988], number 2176) but this is not sufficient to clearly define this part of the animal. For other suggestions as to the specific location see I.M. Levinger, *Mazon Kasher Min ha-Ḥai* (Jerusalem 1985), 25, note 8. He suggests that it is the internal obturator. This is a thin sheet of muscle found

- only in carnivores and not in ruminants. However, it is a deep muscle and it is more likely that the sages were referring to larger, more obvious muscles, possibly in the gluteal group that is layered, but we don't know which ones.
37. In the standing position a giraffe requires an enormous blood pressure to get blood up to its brain. Mean aortic pressure in a 4.5 meter giraffe has been measured at 220 mm Hg (compared to about 90 for human and dog, 50 for a pig, and 130 for a cat) and left-ventricular systolic varied between 260 and 300 mm Hg (180 in dog and ox, 120 - 130 for human; note that in turkeys it is also close to 300) and end diastolic between 10 and 18 mm Hg (similar to human) (Malcolm S. Gordon, *Animal Physiology: Principles and Adaptations*, 3rd edition, page 284-286.) In familiar terms, normal human blood pressure is about 120/80, while in a giraffe it is about 300/200. Interestingly, while pressure at the base of the brain is about 200 mm Hg when the giraffe is upright, it surprisingly drops to 175 mm Hg when the head is lowered. Correlated with the high aortic pressure is left-ventricular hypertrophy. See Anne Innis Dagg and J. Bristol Foster, *The Giraffe: Its Biology, Behavior, and Ecology* (Malabar, FL, 1976).
 38. Indeed the major cause of anesthetic death in giraffes is regurgitation, with subsequent aspiration of the rumen contents, which causes rapidly fatal aspiration pneumonia. This often will occur when the animal falls, increasing intra-abdominal pressure. Because of this the animal is usually fasted for 72 hours and water withheld for 48 hours prior to anesthesia. (Mitchell Bush, "Anesthesia of High-Risk Animals: Giraffe," in *Zoo and Wild Animal Medicine, Current Therapy 3*, ed. Murray E. Fowler, [Iowa, 1993]).
 39. We were able to see these valves during the dissection.
 40. This is one of the five fundamental points of the laws of slaughtering (*Shulhan Arukh*, YD 23:1) and its laws are detailed *ibid*, 24:1-6.
 41. A schematic of this pen can be seen at <http://www.grandin.com/restrain/intro.schematic.html>.
 42. Sadly, it is also in books specifically written for children of the Orthodox community. See for example, R. Halperin, *Enzyklopedyah Le-Beit Yisroel*, 6 (Israel, 1996), 159, 'Giraffe'; *Olam U-melo'o: Encyclopedia for Ultra-Orthodox Youth*, A (Animals) (Jerusalem, 1998), 63. It was refuted by Dovid Tzvi Feldman, *Yalkut Kol H'ai* (Jerusalem, 1997), 640.
 43. *Hullin* 55a; Rambam *Hilkhos Shehitah* 1:5; *Shulhan Arukh*, YD 20:1,2.
 44. As defined by Rambam, *Hilkhos Shehitah*, 1:7 and *Shulhan Arukh* YD 20:1.
 45. Rambam *Hilkhos Shehitah* 1:5; *Shulhan Arukh* YD 20:2.
 46. *Simlah Hadashah* 20:1 does write that one should slaughter in the middle of the neck height-wise. But he too is clearly saying that one should avoid the extremes so as not to come to questions about whether they were actually on the border. No one requires a precise midpoint. *Matteh Asher* on that *Simlah Hadashah* quotes *Peri Magadim* as explaining that one should move towards the center rather than cut too low down near the body. However, he and *Mishbezet* (20:2) agree that one can slice much higher than "the middle" as long as it is below the "big ring," presumably because that is a clearly defined border.
 47. See *Matteh Asher* (on *Simlah Hadashah*; 20:3).
 48. See E.P. Walker, *Mammals of the World* (Baltimore, 1968), 1405. This information is also found in all the later editions edited by R.M. Nowak.
 49. Shakh (s.k. 12) notes that the *ayal* also lacks a gall bladder. In fact, all of the

deer in the Cervidae, except for the musk deer, lack a gall bladder. There seems to be some confusion in the sources with identifications of the words *ayil*, *ayal*, *zevi*, and *yael*. *Ayil* refers to a male sheep, a ram (*Ovidae*), while *ayal* refers to deer (*Cervidae*). At some point, European Jewry erroneously began to refer to deer as *zevi*. Rashi, *Hullin* 59a, explains that the *zevi* in his day was not the *zevi* in the time of the Talmud. Biblically *zevi* probably referred to gazelle (*Gazelle gazelle*) (e.g., found in Israel—Mountain, Arabian and Dorcas Gazelles). *Yael* refers to the ibex such as Nubian Ibex (*Capra ibex nubiana*) and Sinai Ibex (*C. ibex sinaitica*).

50. In all other regards it is immaterial that we examined a fetus. It was late term and anatomically identical to a living giraffe. Even its lungs were structurally identical. Its nature as a fetus simply made the task of examining the lungs more difficult.
51. C. Pasquini and T. Spurgeon, *Anatomy of the Domestic Animals*, 2nd ed. (La Porte, CO, 1988).
52. See S. Nakakuki, "The Bronchial Ramification and Lobular Division of the Giraffe Lung," *Anatomischer Anzeiger* 154, 4 (1983):313-17.
53. *Siḥat Hullin* (above footnote 1), 496. See also N.S. Maluf, "Kidney of Giraffes," *Anat. Rec.* 267, 2 (June 1, 2002): 94-111.
54. J. Kingdon, *Kingdon Field Guide to African Mammals* (London, 1997).
55. "Giraffe Restraint, Habituation, and Desensitization at the Cheyenne Mountain Zoo," Paul P. Calle and John C. Bornmann, II, *Zoo Biology* 7(1988):243-252. See also A. M. Kornak, "The Success of Performing Procedures Using Operant Conditioning with Giraffe in a Restraint Device," *Proceedings, 26th AAZK National Conference* (Binder Park Zoo, Michigan, 1999), 124-128.
56. The capture, care, and transportation of giraffes require careful planning and consideration. See for example *The Capture and Care Manual: Capture, Care, Accommodation and Transportation of Wild African Animals*, ed. Andrew A. McKenzie, (South Africa, 1993). (<http://www.wildlifedecisionsupport.com/captureandcare/>).