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The Kof, Reverse Evolution, & the Adnei Ha-Sadeh

As noted in Chagigah (16a), human beings have three characteristics in common with, and three other characteristics distinguishing them from, animals. The similarities include eating and drinking, elimination of wastes, and reproduction. Human beings are distinct from animals in that human beings have understanding, communicate verbally, and walk erect.

According to kabalistic thought, kofim (or, primates) are the connecting link between animals and human beings. The Arizal taught that in between every two levels of reality there is always an intermediate level. The kof is the intermediate level between animals and human beings. As every intermediate has two sides, one aspect of the kof relates to its animalistic tendencies and the other aspect relates to its similarities to human beings.¹ This idea was elaborated upon by Rabbi Solomon Ibn Verga (1460-1554) in *Shevet Yehudah*, a compilation of accounts of the persecutions undergone by the Jews from the destruction of the Second Temple until his own day. Interspersed within the historical accounts was a brief discussion of the natural sciences, in which he described

the hierarchical sequence of life as follows: Coral is the connecting link between inanimate matter and plants. The aquatic sponge, which has senses and feeling, is the connecting link between plants and animals. The kof is the connecting link between animals and human beings. This article discusses the kof in midrashic and talmudic literature.

Although kof is translated as "monkey," "primate" may be a more appropriate term. The biological order of Primates includes about 180 mammalian species. Primates are characterized as having opposable thumbs, or thumbs that can touch each of the other fingers and thereby can function in grasping objects. In addition, primates have shortened snouts, with eyes on the front, rather than on the side, of the head, thereby allowing

for stereoscopic (or, three-dimensional) vision. Primate gestation is lengthy, with one birth at a time and with an extended juvenile period of dependency, during which there is an emphasis on learned behavior and complex social interactions. The order Primate contains two suborders, Prosimii and Anthropoidea. Prosimians, or the pre-monkeys, include the squirrel-like lemur and the mouse-sized tarsier, and anthropoids include monkeys, apes, and human beings.² Monkeys are subdivided into two categories: the Old World monkeys, which include those indigenous to Africa and Asia, and the New World monkeys, those of the Americas. These two types of monkeys differ in appearance. The New World monkeys have grasping tails and flattened noses, with round nostrils that face to the side. Two of the better known New World monkeys are the spider monkey and the capuchin, or the organ grinder's monkey. Old World monkeys lack grasping tails, have protruding nostrils, are diurnal, and generally are larger than their New World counterparts. Two of the better known Old World monkeys are the baboon and rhesus monkey.³

Apes differ from monkeys in several ways. Apes have no tails and

generally have a larger body weight than most other primates. They have a more upright body posture and a broad chest, rely more on vision than on smell, and have a broad nose rather than a snout. Apes have a larger brain relative to their body size than do other primates. Gorillas, orangutans, and chimpanzees are categorized as apes.³ It is doubtful that primates were indigenous to Eretz Israel. The first mention of kof is in Melachim I (10:22). Hiram's ships acquired exotic animals from Tarshish (Tunisia, according to the Abarbanel; Spain, according to the Malbim) and returned once every three years to King Solomon with "ivory, kofim, and peacocks." The acquisition and transport of kofim to Eretz Israel by sailors is also cited in Divrei HaYamim II (9:21) and

animals that defile anyone who touches their carcasses. "And everyone that walks on "ka'paav," among all the animals that go on four legs, they are unclean to you; whoever touches their carcasses shall be unclean until the evening" (Yayikra 11:27). Rashi translated "ka'paav" as "its paws" and included such species as a dog, bear, and cat. The Sifra, however, translated "ka'paav" as "its hands, like an ape" and "all that go" was interpreted to encompass the long tailed monkeys.

As noted by R' Ibn Verga, the kof is an intermediary creation, between animals and human beings. In Berachos (58b) it is stated that upon seeing a kof, an elephant, and a vulture, one is required to recite the blessing, "Blessed are You Who diversifies the creatures." Apparently, the

the life of a human being are described, a bent, old man is compared, in appearance and demeanor, to a kof. An interesting similarity between primates and human beings is menstruation of the females, as cited by R' Tobiyah ben Yirmiyahu Moses HaCohen (?-1729) in his sefer, Ma'ase Toviyyah (Olam HaKatan, chapter 11), written about 300 years ago, and by R' Phinchas Elijah Hurwitz (1765-1821) in Sefer HaBris. R' Hurwitz also mentioned other similarities between primates and human beings, including facial appearance, hands and feet subdivided into digits, and walking erect. In Sefer HaBris, R' Hurwitz also acknowledged differences amongst the primates, differentiating between tailed monkeys and tailless apes and further among chimpanzees, gorillas, and orangutans.

However, similarities between kofim and human beings extend beyond appearance. The intelligence of primates and their ability to perform specific tasks were recognized in the Talmud. Primates were trained to clean house (Bava Kama 80a; Tosefta, Bava Kama 8:17) and to dye wool, although the quality of their work left much to be desired (Tosfot, Bava Kama 101a). In Sefer HaBris R' Hurwitz noted that primates were taught to chop wood, gather firewood, eat from a plate with a fork and knife, and to drink from a glass. Although primates were trained to perform simple tasks and domestic duties, Chazal were still cognizant of the wild nature of these animals. Thus, Chazal questioned the suitability of raising kofim, as they frequently bite or wound their owners (Koheles Rabbah 6:11). The use of primates to perform work is, apparently, still news worthy, as noted in a recent Associated Press item, dateline Thailand. The article related the ingenuity of Tawee Phanthachange, an owner of orchards of tamarind, mango, and coconut. Concerned with the rising cost of hiring farm workers, he trained twenty macaque

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in Nedarim (50b).

Professor Y. Feliks⁴ suggested that most designations of kof in rabbinical literature refer to long tailed Old World monkeys, rather than to tailless apes. For example, in Berachos (57b) it is stated, "All kinds of beasts are a favorable sign when they are beheld in a dream, except for an elephant, kof, and kipod." Rashi suggested that as these animals have an exceedingly strange appearance, their appearance in a dream was a bad omen. The kipod was defined by Rashi as the marten [a type of weasel], an animal whose appearance resembles a kof, in that it has a long tail. Kofim were recognized as wild, not domesticated, animals (Kalyim 8:6) and were enumerated with those wild

Baraisa specified these three specific species because of their strange appearance. However, according to the Meiri, these specific creatures were noted as they have features in common with human beings; this is most obvious in comparisons between kofim and human beings. The genetic closeness between human beings and kofim has been confirmed through DNA analyses. Human beings and chimpanzees share in common 98.4% of their DNA, differing by only 1.6%. Gorillas differ somewhat more, by about 2.3% from human beings and orangutans by 3.6% of their DNA.⁵ Physical similarities between kofim and human beings were noted in midrashim and in the Talmud. In Koheles Rabbah (1:3), in which the seven stages in

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monkeys to pick fruit from his orchards. Tawee noted that the monkeys “are loyal ... and not afraid of heights. On top of it, they neither complain nor ask for a raise.”⁶ On a more serious note, Helping Hands, an organization devoted to aiding quadriplegics, provides capuchin monkeys trained to perform some of the simple tasks a quadriplegic can no longer perform.⁷

That kofim can be taught specific tasks (Rashi, Eruvin, 31b) prompted rabbinical discussions concerning whether a primate can be used to perform a mitzvah (e.g., see Yadayim 1:5, for a debate on the suitability of a kof for the pouring of water to cleanse one’s hands). A primate lacks the mental focus and purposeful intent (i.e., *kavanah*) for intellectually performing a mitzvah. In fact, the performance of a mitzvah in an inappropriate manner has been likened to it being performed by a kof (Menahos 7a, 100b; Yoma 29b). The phrase, “*ma’aseh kof*” is used to describe an act that does not have halachic significance, such as a circumcision performed incorrectly by irreligious mohallim (Chatam Sofer, Yora De’ah, 248). As a primate’s intelligence is not equivalent to that of a human being, a kof cannot be utilized to perform a mitzvah in its totality. Although a primate can carry an object from one location and deposit it at another specific location, the kof – by itself – cannot establish an *eruv techumin*, as it is incapable of formulating the purposeful intent needed to acquire the place as a dwelling. However, if the kof merely functioned as the transport vehicle and another person was instructed to receive the object from the kof and then to properly deposit it, the *eruv* is valid (Eruvin 31b).

R’ Ibn Verga’s statement that kofim serve as the connecting link between animals and human beings undoubtedly included similarities in social organization and interactions. Over two centuries ago, R’ Hurwitz in Sefer HaBris wrote about the

food gathering behavior exhibited by a colony of kofim. Groups of monkeys enter a field containing produce. Sentry monkeys are placed at each corner of the field; should a predator approach, the sentries scream thereby alerting the group to flee. The gathered food was passed from one to another and finally placed in a storehouse for community use. R’ Hurwitz also noted that the female monkeys menstruated and carried their offspring on their chest (rather than clinging on their backs). Male monkeys showed an interest in the offspring and would take the offspring from the females, carry the offspring in their arms, and eventually return them to the females. Male-female conflicts were also noted. R’ Hurwitz’s descriptions of social interactions among primates were similar to those of Jane Goodall, in her studies of chimpanzees in the wild. As summarized by D.R. Schwartz,⁴ Goodall’s chimpanzees exhibited craft at tool making, cherished their loved ones, experienced family disputes, were depressed at the loss of their loved ones, hunted meat, gathered flora, and engaged in war over territory, females, and offspring.

Human speech is recognized as the dividing line between us and the rest of the animal world. Targum Onkeles translated “and man became a living being” as “and man became a speaking being” (Bereshis, 2:7; see also R’ Sorotzkin’s commentary⁹ on this verse). While monkeys are noisy creatures, chattering and shrieking to one another using different alarm cries to signal different types of dangers, the apes, for the most part, are fairly quiet and do not depend as much on calls and cries to keep their group acting in harmony. The slow-paced life of gorillas does not need cries to coordinate the action of the band and the fairly solitary life of the orangutan also does not require such calls. The chimpanzee is the noisiest of the tailless apes, yet still only uses about a dozen different

noises, such as grunts, hoots, screeches, and whimpers compared to the hundreds of sounds the human vocal organs can produce. Although calls and cries are effective, they are not a true form of communication, whereby an animal deliberately sends a message to another member of its group rather than just giving voice to an emotion. In the 1960s and 1970s, the discovery that apes could use hand gestures and symbols to communicate resulted in many primate learning research facilities. In one such facility, Koko, a gorilla, was trained to use American Sign Language (ASL) to express her feelings and desires. Washoe, a chimpanzee, was taught ASL and learned 132 different words, which she used in her daily interactions with her human companions. The vocabulary and sentences of ASL-taught apes are comparable to that of a two-year old human.^{10, 11} Perhaps, such gestured communication was a criterion recognized in kabalistic thought and contributed to the kof’s classification as an intermediate between human beings and animals.

Many linguists, however, still believe that apes have no real grasp of human language, but are merely imitating their human companions.¹⁰ In Sefer HaBris, R’ Hurwitz told of an interesting incident regarding a kof that fatally mimicked human behavior. Apparently, a kof was accustomed to enter a specific house of a human being and therein to cause much damage. The human being, unable to trap the animal, thought of an ingenious plan. While the

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kof was watching, the human being took a knife and passed it by his throat several times. When the human being placed the knife down, the kof grabbed it, repeated the gestures performed by the human being, and in the process the kof slaughtered itself.

Current biblical commentaries have coined the term, reverse evolution, to explain the various midrashic and talmudic references of mammalian anthropoids arising from human beings. R' Elie Munk,¹² a chief proponent of this concept, noted that according to tradition, Abel, Cain, and Seth were not the only progeny of Adam (Eruvin 18b). Based on Bereishis 5:4, R' Munk quoted Rav Sherira Gaon (as cited in the Radak) and the Rambam (Guide to the Perplexed 1:7), who suggested that some of these progeny were anthropoid mammals, half-human and half-animal. According to the Zohar (1:54), other degenerate human-like creatures were begotten by acts of bestiality committed by Cain. Furthermore, during the generation of Enosh, the human appearance degenerated, becoming more primate-like (Bereshis Rabbah 23:6). According to these sources, human beings and various other primitive, mammalian anthropoids simultaneously existed in a common environment. Interestingly, this is in accord with current thought. For example, four different species of hominoids – *Paranthropus boisei*, *Homo rudolfensis*, *Homo habilis*, and *Homo ergaster* – presumably lived in what is now part of northern Kenya. Although paleoanthropologists have no idea how these different species interacted, they all foraged in the same area around Lake Turkana.¹³ R' Munk also cited Sanhedrin (109a), in which are noted the varied punishments meted out to the generation of the Tower of Babel. One group of the Generation of Dispersion was flung into the forests; these people degenerated to kofim (Margaliyos HaYam). The M'la'chas Shlomo (Kilayim 8:6), ques-

tioned why the b'racha, "Who diversifies the creations," is specifically recited upon seeing a kof (and two other animal species) but not upon viewing the myriad of other strange creatures, and presented an interesting answer. Literally, this b'racha can be translated as, "...Who changes the creations," i.e., the kofim were changed from humans into primates. The gradual, but progressive, degradation of the human appearance was elaborated in Bava Basra (58a): Compared with Sarah, all other people are like a kof to a human being; compared with Chava, Sarah was like a kof to a human being; compared with Adam, Chava was like a kof to a human being; and compared with HaShem, Adam was like a kof to a human being. R' Munk concluded that "the Sages of the Talmud and Midrash stand opposed to Darwinian theories, which have human beings descending from the ape. For the Rabbis, the ape is, on the contrary, a malformation of man."

Whereas the majority of primates undoubtedly were distinct creations at Ma'aseh Bereshis, a specific species of non-human primate may have evolved from the Generation of Dispersion. It is interesting to speculate on the possible identification of this specific species of primate. Based solely on size and physical appearance, gorillas and orangutans would be the logical choices. As noted, there is much similarity in the DNA composition between apes and human beings.⁵ Although the gorilla is the larger hominoid and its DNA composition is more similar to that of human beings, of the two apes, orangutans are the closest – at least in reproductive behavioral patterns and physiology – to human beings. Most mammals, including most primates, can mate only when the female is in estrous. At any other time of the menstrual cycle, mating for the female is physiologically and physically impossible – even if the opportunity to copulate were to present itself. The peri-

od of estrous is timed to the menstrual cycle: a female comes into estrous at the peak of her fertility, which is during ovulation. At estrous there are also external physical signs, such as the ballooning of the female genital region that coincides with peak fertility, which is ovulation. Such external signals alert males to the female's sexual receptivity and, thus, to the opportunity to produce offspring. Female orangutans are unique among the apes in that they do not have an estrous cycle, with its behavioral constraints and external physical signs, imposed upon their menstrual cycle. Given the chance, female orangutans copulate throughout the menstrual cycle. For gorillas, however, copulation is restricted to the period around ovulation. Female orangutans have not been found to show any external physical changes in the genital region at ovulation or any other phase of the menstrual cycle. Female gorillas, however, have some physical signs of estrus. Copulatory bouts between orangutans are quite long, in contrast to the seconds it takes gorillas. Orangutans and human beings have the longest gestation period of any primate. A chimpanzee usually gives birth after 245 days, a gorilla after about 260 days, and an orangutan and a human being after about 270 days. When the female orangutan is ready to mate (they do so infrequently, there being up to 7 years between offspring), she forms a partnership with an adult male. This partnership is for many weeks, not for just a brief period around the time of ovulation. Bouts of "lovemaking" are quite long, no quick thrusts of intromission as characterize most mammals, including chimpanzees. Rather than mounting the female from behind, as, for example, a male monkey does, the male orangutan frequently mates in a face-to-face position with the reclining female. It appears that the same orangutan male pairs with the female when she enters the next birthing phase of her life. Thus, there are obvious

positive comparisons in the sexual and reproductive behavior of orangutans and human beings. Furthermore, orangutans and human beings share several anatomical similarities. Neither walks on knuckles (as do chimpanzees and gorillas) nor is normally ambidextrous; both have heavy molar enamel, widely separated pectoral breasts, and a steady secretion of estradiol. Most mammals display some asymmetry between the right and left sides of the brain in size and morphology. Among mammals, human beings have the most extreme of cerebral asymmetries. Next to human beings, the orangutan has the greatest amount of right-left cerebral asymmetry, the chimpanzee noticeably less, and the gorilla the least.¹⁴ The orangutan appears to be an excellent candidate for the nonhuman-primate that arose by reverse evolution from the Generation of Dispersion. Interestingly, the orangutan may also be the modern identification, at least according to the Tifereth Yisroel and possibly also to R' Pinchas Kahati, of the adnei ha-sadeh.

An added dimension to kofim in midrashic and Talmudic literature is the identity of the "adnei ha-sadeh" (Kilayim 8:5) (also termed, avnei ha-sadeh (Iyov 5:23)). In the mishnah there is a discussion whether the laws of ritual uncleanness, which apply to a human corpse, also apply to the creature termed the adnei ha-sadeh. The following is from the Artscroll Mishnah edition of Kilayim, which provides an extensive discussion of this creature. Rav described the adnei ha-sadeh as a dangerous creature, which lived in the jungle, had an overall human-like appearance, but was attached to the soil by a cord extending from its navel. Its movements were limited to the radius of the cord. This creature was unapproachable and killed anything that entered its domain. Its life depended on the cord remaining intact and severing this lifeline was the only mode to kill it. Hunters, standing just out-

side the creature's domain, would shoot arrows at the cord. When this cord was severed, the creature emitted a loud groan and died. The Yerushalmi translated adnei ha-sadeh as a large kof that has the form of a wild human. Aruch offered two explanations of the adnei ha-sadeh: either they are feral humans who grew up in the jungle or they are creatures that resemble human beings. The Rambam identified the adnei ha-sadeh as "al-nasnas," a creature which was reputed to speak incessantly without interruption (chimpanzee)¹⁵ and whose speech was like that of a human being. In modern Egyptian Arabic, al-nasnas is a monkey. The Artscroll Mishnah concluded the discussion by citing the Tifereth Yisroel who identified the adnei

human-like, ferocious creature connected to the ground by a cord with its current designation as a large primate, possibly, the orangutan? Note, no commentaries employ shinuy hatevah as an explanation, i.e., that the adnei ha-sadeh evolved into an ape. A fuller description of the orangutan might clarify this discrepancy. Orangutans are large, strong creatures, with fully-grown males weighing 198 to 242 pounds and about 4 feet tall. At maturity, males have big cheek pads and facial hair that can be identified as a beard and a mustache. The strength of the orangutan is legendary. A male orangutan's strength is more than four times as great as his human counterpart. It has been claimed that an orangutan can kill a

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ha-sadeh as an organutan. The Tifereth Yisroel (see Boaz) appeared bothered with the classical description of the adnei ha-sadeh as a human-like creature attached by a cord to the ground. The lack of its discovery was attributed to the adnei ha-sadeh now being extinct. However, questions remained. For example, if the cord functioned as an umbilical cord allowing the creature to receive nourishment from the ground, he questioned the purpose of the adnei ha-sadeh possessing a mouth, eyes, and a gastrointestinal system. Lastly, R' Pinchas Kahati noted that many commentaries now concur that the adnei ha-sadeh is a large kof.

How can one reconcile the classical description of the adnei ha-sadeh as a

crocodile "by main strength, by standing upon it, pulling open its jaws and ripping up its throat." Males are not sociable; they stake out areas which they defend as their own home and fight other males if necessary. The diet of the orangutan is varied. Aside from the staples – fruit, leaves, buds, young shoots, and small animals – orangutans also seek dietary supplements, including epiphytes (e.g., orchids that grown on other plants), lianas (probably best known as what Tarzan used for swinging through the trees) and the pith of wood.^{14, 16} It is doubtful whether the original compilers of the Mishnah actually saw the adnei ha-sadeh. Rather, descriptions of this creature, probably, were transmitted through unsubstantiated stories of explor-

ers and travelers. And, apparently, there were sufficient numbers of these reports for Chazal to consider the halakhic ramifications of the potential existence of the adnei ha-sadeh. [A similar suggestion (see the Artscroll Mishnah edition of Chulin, 9:6) was presented to explain the existence of the mouse that arose from soil by spontaneous generation (Chulin, 126b)]. Traveler's reports of chimpanzees, gorillas, and orangutans only began to emerge in the written literature in the early 1700s,¹⁴ including in the Torah literature (i.e., in Sefer HaBris). Suppose, an explorer traveling through the jungles or forests of a foreign, exotic land suddenly came upon a fully mature male orangutan that was munching on a long vine (liana). Male orangutans exhibit territoriality and fiercely defend their area. Upon seeing the human being, the startled animal, still

holding its long liana, might stand erect and emit a loud screech. The initial fright of the explorer would preclude careful scrutiny of the creature; the long trailing vine held by the orangutan possibly could appear as an umbilical cord linking the creature to the soil. The explorer, perhaps, would shoot arrows and throw spears, hoping to sever the "umbilical cord" and thus to kill the creature. As the cord is much narrower than the animal's huge chest, the majority of the arrows and spears would undoubtedly miss the intended target (i.e., the cord), but hit the animal. The orangutan would eventually fall, mortally wounded.

Perhaps, by telling us that kofim are the connection between animals and human beings, the Arizal has indicated that kofim are an excellent animal model system to study and to better understand

human beings. The human genome has been sequenced, as well as the genomes of other vertebrates, such as mice and rats. Attention will soon be focusing on deciphering the genetic code of other vertebrates; the chimpanzee is a prime candidate. As noted, the genome of the chimpanzee is about 98% identical to that of the human being. "By finding those few critical genetic differences between humans and chimpanzees, geneticists hope to solve the mystery of what makes humans unique. Specifically, they want to find the genes that underlie the striking differences between humans and chimpanzees in cognition, reproductive biology, and behavior."¹⁷

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A C K N O W L E D G E M E N T S

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N O T E S

- Gal Einai Institute of Israel (2001) De-evolution of the Human – a Mystical View on Primates. <http://www.inner.org/responsa/leter1/RESP21.htm> (April 26th).
- Mader, S.S. (2000) *Inquiry into Life*, 9th edition. McGraw-Hill Corporation. New York, NY
- Wisconsin Regional Primate Research Center (2001) Primate Info Net. Ask Primate, Frequently Asked Questions. <http://www.primare.wisc.edu/pin/askfaq.html> (April 26th)
- Feliks, Y. (1985) *Plants and Animals of the Mishna*. Institute for Mishna Research. Old City of Jerusalem, Israel.
- Gibbons, A. (1998) Which of Our Genes Make Us Human? *Science* 281:1432-1434.
- Khaikaew, T. (2000). Why Pay Workers When You Can Use Trained Monkeys? Associated Press. http://www.foxnews.com:80/science/091700/monkeys_work.sml (September 17th).
- Helping Hands: Monkey Helpers for the Disabled (2001) <http://www.helpinghandsmonkeys.org> (April 26th).
- Schwartz, D.R. (2000) *Noah's Ark*. Jason Aronson Inc. Northvale, NJ
- Sorotzkin, Z. (1991) *Insights in the Torah*, Vol. 1, Mesorah Publ., Ltd. Brooklyn, NY
- Myers, D.G. (2001) *Psychology*, 6th edition. Worth Publishers. New York, NY.
- Stafford, A. (2001) Chimpanzee Communication: Insight into the Origin of Language. <http://emuseum.mankato.msus.edu/cultural/language/chimpanzee.html> (April 26th).
- Munk, E. (1994). *The Call of the Torah*, Vol. 1. Mesorah Publ. Ltd. Brooklyn, NY.
- Tattersall, I. (2000) Once We Were Not Alone. *Sci. Amer.* January, pp. 56-62.
- Schwartz, J.H. (1987) *The Red Ape*. Houghton Mifflin Co. Boston, MA.
- Toperoff, S.P. (1995) *The Animal Kingdom in Jewish Thought*. Jason Aronson, Inc. Northvale, NJ.
- Galdikas, B. (2001) British Columbia Society for the Prevention of Cruelty to Animals. Orangutans. <http://www.sPCA.bc.ca/orangutn.htm> (April 26th).
- Gibbons, A. (2000) Building a Case for Sequencing the Chimp. *Science* 289:1267.