

The visual, tactile and acoustic signals of play in African savanna elephants

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Introduction

Elephants are intelligent, highly social animals whose complex behaviour has been the subject of intensive investigation for more than three decades. Surprisingly, however, the subject of play has received very little attention. Play behavior is most developed in species with complex nervous systems, sensory apparatus and behavioral mechanisms whose behavioral repertoire is not fully established at birth. Since elephants fulfill all these criteria, we should, therefore, expect to find play behaviour in elephants to be both well developed and highly varied.

Play among mammals may be defined as occurring when individual elements of behavior that are normally incorporated in adaptive and functionally directed activities such as feeding, hunting, socializing, mating, fleeing or fighting are executed in a way that appear self rewarding or, so to speak, "for the fun of it" (Van Hooff & Preuschoft, 2003). Postures associated with play can often appear aggressive and, therefore, communication of playful intent is not only essential, but also remarkable, in that it may imply "a cognitive appreciation of the distinction between reality and pretense" (Bekoff & Allen, 1998 p. 109). How are animals able to distinguish between reality and play? Many species exhibit particular "play faces," play vocalizations and vehement but supple, frolicsome and energetic body movements. The postures and movements of face and body, though similar to the model gesture or display, "lack the tension, rigidity and brusqueness that is characteristic of expressions of aggression, threat and fear" (Van Hooff & Preuschoft, 2003; p 267). Many mammals including bears, dogs, and primates use a relaxed jaw-gape or open-mouth display to indicate that the behavior accompanying it should be interpreted differently from what it appears to be, for example that aggressive displays should not be interpreted as real aggression.

Among some mammals including humans, many primates (Van Hooff & Preuschoft, 2003) and dogs (P. Simonet, pers. comm.), play is accompanied by vocalizations. Wolf and dog "laughter" has been described as breathy panting or as a "breathy, pronounced, forced exhalation." Macaques produce "rhythmical voiced breathing" (Preuschoft, 1992) and chimpanzees a staccato, throaty panting (van Hooff, 1972). Even rats have been found to give chirping form of laughter (Panksepp, 2000). Human laughter stands out from that of other primates in giving a series of loud staccato barking vocalizations in one exhalation rather than in a series of small breaths. Observations of play among primate conspecifics show that play-faces and voiced breathing laughter occur during rough-and-tumble play-wrestling and play-chasing (Preuschoft, 1995).

Very little research has been focused specifically on the play behavior of elephants and the little work that has been accomplished has been part of broader studies of calf development (Lee, 1986; Lee & Moss, in press). From this body of work we know that play is the major type of interaction between calves under seven years of age (Lee, 1986). While play behaviour is also observed among adult elephants, it is more commonly seen among calves and juveniles. Lee (1986) describes play among calves as consisting of chasing, mounting, rolling on one another and wrestling head to head with the trunk and tusks. While bouts of play take place between all ages and both sexes of immature elephants, males and females exhibit different patterns in play partners (Lee, 1986). As males become older they tend to play more frequently with peers of the same sex and, in particular, they seek novel same-sex partners from outside the family and bond-group. Immature females, on the other hand, continue to play with more familiar family and bond-group peers of both sexes. Lee (1986; Lee & Moss in press) suggests that males use play with non-familiar individuals as a means of gaining experience in fighting techniques, in developing assessment abilities, as well as to expand their knowledge of the strengths of individuals who may be future rivals. Females, on the other hand, continue to develop relationships within the family and bond group, interacting in a manner that develops friendly relationships, competitive abilities and care-giving skills. As in other highly social animals (eg. primates: Lee, 1983; hyenas: Drea & Frank, 2003), therefore, play among elephants serves in part, a socialization function: Learning the rules of the group into which an individual is born, facilitating integration into the extended family, establishing friendships and strengthening social bonds as well as enhancing motor skills.

This paper describes the different visual, tactile and acoustic signals associated with play in various contexts in African savanna elephants based on observations carried out over 28 years on a population of individually known elephants in Amboseli National Park, Kenya.

Equipment, field techniques & analysis

Acoustic signals

Acoustic recordings of elephant vocalizations were made at 44.1 kHz on an HHB PDR 1000 Portadat digital recorder (frequency response: from 5-20Hz: -0.77dB to -0.15 dB; 60-1,000Hz, no roll off) using an Earthworks QTC1 omni-directional microphone (frequency response: 4Hz-40kHz \pm 1dB). Still images were taken with a Canon Powershot 90IS.

Observations of elephant behavior were made over a period of 28 years in Amboseli, Kenya. We recorded elephant vocalizations among the Amboseli elephants from 1984-1990 and from 1998-2003. Data noted in the field include location, date, time, channel settings, group size, group type, and individuals present. When a call was heard the elapsed time was noted as well as information on the call type and the sender. Call types were recorded with level of sureness (A: certain, B: fairly confident, C: educated guess; D: no idea) as well as whether the decision was based primarily on the quality of the sound or on its behavioral context. The sender was named with a level of sureness (A,

B, C & D as above). Also noted was the distance in meters between the microphone and the source. Finally any contextual or other comments about the situation or the behavior of the calling animal were included.

Using the sound analysis program from Engineering Design, RTSD 1.1, calls were acquired through a low pass filter onto a Gateway 2000 at appropriate sample rates (ranging from 2000Hz – 44.1kHz depending upon the call type) and saved to disk. Using the sound analysis programs SIGNAL 4.0 and Raven 1.0, basic measurements were taken of each call. Measurements included bandwidth (highest frequencies of a signal), duration (length of a signal in ms), time to peak amplitude (delta begin time and the first time in the selection at which a sample with amplitude equal to peak amplitude occurs), time to max amplitude (delta begin time and the first time in the signal at which a spectrogram point with power equal to max amplitude occurs), time to max power (delta begin time and the first time in the signal at which a sample with amplitude equal to max power occurs), max frequency (the lowest frequency at which max power occurs), fundamental frequency minimum and maximum, and fundamental frequency contour (definitions of acoustic measurements were adapted from the Raven 1.0 Manual)

Visual and tactile displays and gestures

Elephant displays described in this chapter are based on the visual and tactile displays database compiled by Poole and Granli (2003). Other authors have described some of these displays and full references are linked in the database. In 2002 and 2003 field trips to Amboseli focused on the still image documentation (approx. 1500) of elephant displays, including those associated with play (approx. 300). Display names start with a capital letter and two word names are hyphenated. For example, Mock-Charge; Spinning; Kick-Dust. Behaviors that refer to a particular display are written in this manner in the body of this paper. Detailed descriptions of these displays may be found on www.ElephantVoices.org.

Definitions of elephant play

Lee & Moss (in press) have divided elephant calf play into five categories: environmental exploration, object play, lone locomotor play, gentle contact play, and escalated contact play. We have adapted their definitions as follows:

1. *Environmental exploration*: Approaching, chasing, threatening, and vocalizing at other animals (eg. birds, monkeys, humans, and other species) in the environment. These actions are typically associated with exaggerated movements of the head, ears, trunk, tail and body and can appear to be aggressive and/or fearful and may be accompanied by trumpeting.
2. *Object play*: Exploring objects with trunk, mouth, tusks or feet in a slow and sensual or, alternatively, rapid and vigorous manner; throwing objects with the trunk, rolling objects under the feet, and general intense manipulation of objects. Object play can be either gentle or vigorous.
3. *Lone locomotor play*: Floppy-Running, swinging the head in Mock-Charge, Spinning, Kicking-Back. Often accompanied by trumpeting (see below). While individuals frequently play alone, lone locomotor play may also involve more than one individual typically playing independently, but sometimes interacting.
4. *Gentle contact play*: Climbing upon, leaning upon, rubbing against, rolling onto (collectively “Wiggling”), shoving gently, Trunk-Twining and gentle trunk wrestling.
5. *Escalated contact play*: Mounting, Chasing, vigorous Pushing, and Sparring.

These categories of play may be observed independently, concurrently or in rapid succession. For example, *lone locomotor play* may include *object play* or *environmental exploration play*, or it may lead to *escalated contact play*. *Gentle contact play* may lead to *escalated contact play*. Individual displays and gestures may be associated with several categories of play.

Visual and tactile signals associated with play

Elephants may engage in play on their own or in the company of others. In Amboseli most instances of play include small groups of calves or juveniles, but on extraordinary occasions 50 or more elephants including adult males and females may play simultaneously. Spirited play, including *environmental exploration*, *vigorous object play*, *lone locomotor play*, and *escalated contact play*, is most often observed in the cooler hours of the day. Furthermore, bouts of vigorous play are more commonly observed during and following the wet season when elephants are in peak condition, than in the dry season when they are in poorer condition. *Gentle contact play* among calves and juveniles may be observed at any time of day but is more likely to take place while a group of elephants is sedentary, for instance when adults are feeding in one place, particularly in lush grass. *Gentle object play* may also be observed at any time of day but is often seen when an individual is waiting for other family members to change activity.

Soliciting Play

Elephants may solicit play with others via several different gestures including: Wagging of the head from side to side (Head-Wagging); stretching the head down and forward while gazing at a play partner (Solicit-Play); pausing or approaching a play partner with the trunk held up in an expectant periscope or S-shape position (Distant-Frontal-Attitude); or by lying or kneeling down (Kneel-Down). Elephants may also use these forms of play solicitation during playful interactions with researchers (personal observation).

Social Play

Many of the gestures observed in play include components of specific defensive, aggressive, affiliative or sexual displays and these forms of play may allow young elephants to gain social experience. Lee & Moss (in press) point out, for example, that *gentle contact play* may have a two-fold function. For very young calves, *gentle contact play* allows partners to gain knowledge of one another as individuals and to initiate assessments of relative size and strength in a physically unchallenging context. For older juvenile females, *gentle contact play* becomes a mechanism for connecting socially with young calves and offering them an opportunity to develop experience in calf interaction and allomothering skills. *Escalated contact play* consists of more vigorous contact allowing older juvenile males to begin assessment of the size and strengths of more novel (outside their natal family) partners in a relatively secure context as well as to begin to acquire the skill required for successful mounting. *Lone locomotor play* or vigorous non-contact play and *environmental exploration play*, too, allow young animals to practice skills and displays (eg. Mock-Charge, Standing-Tall, Kick-Back, Kick-Dust, see Poole & Granli, 2003) that will be used throughout life.

Similar to other animals, elephants exhibit wide-eyed, open-mouthed play faces and emit characteristic play vocalizations. Play postures though similar to those observed in aggressive or defensive situations are more boisterous and frolicsome, thus distinguishing them from more serious displays.

Defensive gestures in play

Defensive gestures incorporated into social and practice play include some of the displays seen in anti-predator, defensive or fearful contexts. For example, widening the eyes (Eye-Widening), raising the tail (Tail-Raising), and an overstated fearful display (Exaggerated-Fear) that consists of a medley of gestures including Chin-Raising, Tail-Raising, Eye-Widening and curving the trunk under (Curving-Trunk-Under) in an exaggerated manner while often looking back over the shoulder (Looking-Back). These displays may be observed during *environmental exploration play*, *object play*, *lone locomotor play*, and *escalated contact play*.

Figure 1. Emma displays Exaggerated-Fear in playful interaction with the authors; note her open, up-curved mouth.



Aggressive gestures in play

Some of the aggressive displays incorporated into play include mock charges (Mock-Charge), standing with the head held high while looking down over the tusks at an adversary (Standing-Tall), head and ear shaking (Head-Shake), kicking backwards and outwards with the hind legs (Kick-Back), kicking up dust with the front foot (Kick-Dust), swinging or tossing the trunk toward an adversary (Forward-Trunk-Swing) and pushing (Pushing), tusking (Tusking), or ramming into another (Ramming). These displays may be observed during *environmental exploration play* (chasing other species), *lone locomotor play* and *escalated contact play*. The latter three are observed during *escalated contact play* or Sparring (head to head or tusk to tusk contact with pushing or trunk shoves). Adults of both sexes engage in gentle sparring, though this is much more frequently observed among males than between females or between males and females. Young and fully adult males spar more forcefully and include whole-body pushing and shoving, but it is unusual for this behaviour to escalate into aggression and sparring is usually accompanied by non-aggressive ear and head postures. Sparring, therefore, might be considered a form of adult play or status (weight, size, dominance) assessment (Lee & Moss, 1996).

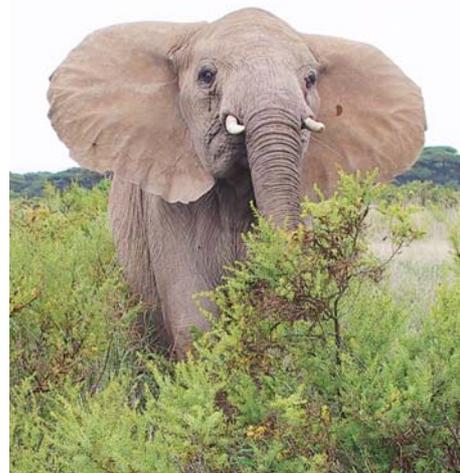


Figure 2. A female Standing-Tall in play. Note Eye-Widening in excitement

Several displays that are almost exclusively observed during escalated contests between highly aggressive musth males (Poole, 1987) are also frequently included in play. These are kneeling on the front legs (Kneel-Down) and/or tusking the ground (Tusk-Ground), beating vegetation with the head, tusks or hind legs (Bush-Bashing) and the throwing of vegetation or other debris (Throw-Debris). In addition, in play an elephant may raise its trunk and allow it to flop on its head while opening its mouth (Flop-Trunk-on-Head), a display reminiscent of the Trunk-to-Head display of musth males (Poole, 1987). The Kneel-Down, Tusk-Ground and Flop-Trunk-On-Head displays may be observed in *gentle contact play* and all are components of *lone locomotor play*.

Much of the aggression exhibited in play includes inappropriate responses to the wrong object. For example, mock charging (Mock-Charge), tossing the trunk (Forward-Trunk-Swing), kicking dust (Kick-Dust) or throwing debris (Throw-Debris) at a cattle egret, monkey, wildebeest or other innocent bystander. Mock charges are often accompanied by trumpeting. *Lone locomotor play* is perhaps the most entertaining elephant spectacle to watch. In Amboseli, a favored *lone locomotor play* arena is the long “elephant grass,” *Sporobolus consimilis*. Juveniles in particular (though at the height of the wet season even adults of both sexes) charge through the long grass throwing debris, standing tall, kicking back and spinning from side to side facing off imaginary enemies. These bouts of exuberant play are also often associated with trumpeting.

Affiliative gestures in play

During *gentle contact play* between calves many of the gestures observed are affiliative or care taking in nature. For example, the inter-twining of trunks (Trunk-Twining), the rubbing of bodies against one another (Social-Rubbing), reaching of trunks into one another’s mouths (Test-Mouth) and the sniffing of one another’s genitals (Test-Genitals) and temporal glands (Test-Temporal-Gland) and the gentle touching of another with a hind foot (Foot-Touch) are all behaviors that are often observed in greeting, affiliative or care-taking contexts. Calves particularly enjoy Wiggling, climbing upon, leaning upon, rubbing against, and rolling onto one another. Very often an older female calf or juvenile will purposefully kneel or lie down, inviting youngsters to play.



Figure 3. Wiggling in Gentle Contact Play

Sexual gestures in play

Running after (Chase or Run-After), grasping the tail of (Grasp-Tail), reaching over the back of (Reach-Over) or mounting (Mount) another elephant are behaviors often observed in *escalated contact play* between young elephants and these are behaviors that are used later in life during courtship. Almost inevitably the mounting individual is male, though the mounted individual may be of either sex. During *gentle contact play* calves may climb upon one another, males often exhibiting erections.



Figure 4. Reach-Over in play

Object-Play

An elephant’s trunk is an extremely sensitive and dexterous appendage. Both the tip of the trunk and the soles of the feet contain some of the most densely packed sensory cells, *pacinian corpuscles*, found in the animal kingdom (Rasmussen & Munger, 1996). It is perhaps for this reason that elephants engage in significantly more object play than the majority of other mammals. Elephants may manipulate objects with their trunk (Toying) or kick or roll objects with their hind feet (Kick-Back). Almost any object can make a good plaything for a wild elephant. Natural objects include elephant grass, palm fronds, branches, sticks, bones, and water. Novel man-made objects such as shoes, film canisters, cement bags, plastic bags, clothes, string, wire, research equipment, jerry cans, tin cans, trashcans, appear to hold even more fascination for elephants. While two or more may play together, elephants tend to guard their “toys” rather jealously from access by another. Other youngsters may “Queue-Up” and wait quietly for their turn with the plaything.



Figure 5. Toying with a discarded cement bag in Object-Play

Floppy-Running

Perhaps the most quintessentially joyful elephantine play behavior is the Floppy-Run (Moss, 1988), a loose, floppy gait, accompanied by shaking a lowered head from side-to-side, allowing the ears to flap against the neck and curling the tail up high. Floppy-Running is primarily associated with *lone locomotor play* but may also be observed during *escalated contact play* and *environmental exploration play*.

Figure 6. Floppy-Running. Note the supple, frolicsome and boisterous body movements



Acoustic signals associated with play

In the context of play, calves, juveniles and adults of both sexes produce a variety of trumpets that vary in quality. Some are rather clear harmonic sounds; others are distinctly nasal, while still others are pulsed. We refer to these broad structural varieties as Harmonic-Play-Trumpets (HPT), Nasal-Play-Trumpets (NPT) and Pulsated-Play-Trumpets (PPT), respectively. Across these categories, however, wide variation exists. The plasticity of these calls is probably related to the flexibility of the elephants' sound production source (larynx) and resonator (nasal cavity). The varying speed and volume of air moving over the vocal cords and its passage through the elephant's large (2.8 meters in an adults female; McComb et al 2003) and highly mobile nasal cavity both affect the production of sound.

Harmonic-Play-Trumpets are typically associated with *lone locomotor play* including displays such as Floppy-Running, Throw-Debris, and Bush-Bash. It is an abrupt sound as if it is first rising and then falling in pitch, though in fact this rising/falling quality has more to do with a rise and fall in amplitude (Figure 7). Some Harmonic-Play-Trumpets have a flatter reverberating sound almost like a loud nose-blow and spectrographically these show more noise. Harmonic-Play-Trumpets are generally short, high-pitched, high intensity and slightly modulated in frequency contour. Elephants of both sexes and all ages also produce a shortened form of play trumpet that we refer to as a Trump, which sounds like a very short ascending "brpp" sound.

Similar to the Harmonic-Play-Trumpet, but sounding shriller in quality is a trumpet associated with Mock-Charging. Cavorting elephants often chase other species in their environment (such as rabbits, hyenas, wildebeests, monkeys) during which they trumpet loudly. We term this the Mock-Charge-Play-Trumpet (MCPT; Figure 7). The Mock-Charge-Play-Trumpet is longer in duration than the Harmonic-Play-Trumpet (MCPT median=0.868 seconds, n=10; HPT median=0.584 seconds, n=45; U=123.5; z=-2.21, p<0.027). Other measures showed no significant differences though this may be due to the measurements selected and the small sample size of Mock-Charge-Play-Trumpets.

Pulsated-Play-Trumpets are given in similar contexts to Harmonic-Play-Trumpets, namely lone locomotor play, but they tend to be associated with more exuberant play especially more spirited Floppy-Running and Bush-Bashing. The Pulsated-Play-Trumpet is similar to the Harmonic-Play-Trumpet and the Mock-Charge-Trumpet in that they are all harmonic in quality, but as their name expresses, and unlike either the HPT or the MCPT, they are expelled in breathy pulses, usually as the animal is moving at a fast gait (Figure 7). In structure they are similar to the Harmonic-Play-Trumpet in fundamental frequency, max amplitude and max power. They are, however, longer in duration than the Harmonic-Play-Trumpet (PPT median=1.35 seconds, n=23; HPT median=0.584 seconds, n=45; U=295.0; Z=-2.88; p<0.04) and they also portray longer times to reach Peak Amplitude (PPT median=0.632 seconds, n=23; HPT median=0.269 seconds, n=46; U=345.0; z=-2.34; p<0.02), Max Power (PPT median=0.519 seconds, n=23; HPT median=0.303 seconds, n=45; U=339.0; z=-2.3, p=0.02) and Max Amplitude (PPT median=0.442 seconds, n=23; HPT median=0.262 seconds, n=45; U=377.0; z=-1.93; p=0.05).

Nasal-Play-Trumpets sound as if air is being forced slowly through the upper part of the trunk and echoing down the length of the trunk. Somewhat similar to the flatter more reverberating version of the Harmonic-Play-Trumpet, the Nasal-Play-Trumpet also sounds like a very large man blowing his nose. Though similar in duration to the relatively short Harmonic-Play-Trumpets, Nasal-Play-Trumpets are, however, quite distinct in that they are less harmonic and more noisy in structure and considerably lower in frequency (Figure 7). The fundamental frequency, bandwidth and Max Frequency measures are all significantly lower in Nasal-Play-Trumpets than in Harmonic-Play-Trumpets (fundamental frequency: NPT median=50.55 Hz, n=12; HPT median=231.9 Hz, n=44; U=23.0; z=-4.8; p<001; bandwidth: NPT median=3729 Hz, n=13; HPT median=9304 Hz, n=44; U=48.0; z=4.3; p<0.001; Max Frequency: NPT median=246.8, n=13; HPT median=416.9, n=44; U=121.0; z=3.1; p<0.002). These measures are similarly lower than in either Mock-Charge-Play-Trumpets or Pulsated-Play-Trumpets.

Typically a bout of play may start with Harmonic-Play-Trumpets after which Nasal-Play-Trumpets will be incorporated into the repertoire. As play continues and becomes more exuberant Pulsated-Play-Trumpets may be heard. It is our impression that elephants may imitate the type of trumpet (HPT, PPT, NPT) made by nearby play mates as there seems to be a tendency for Nasal-Play-Trumpets to be temporally associated with other Nasal-Play-Trumpets and Pulsated-Play-Trumpets to be associated with Pulsated-Play-Trumpets. Additional data will be required, however, to determine whether elephants are using vocal imitation in play.

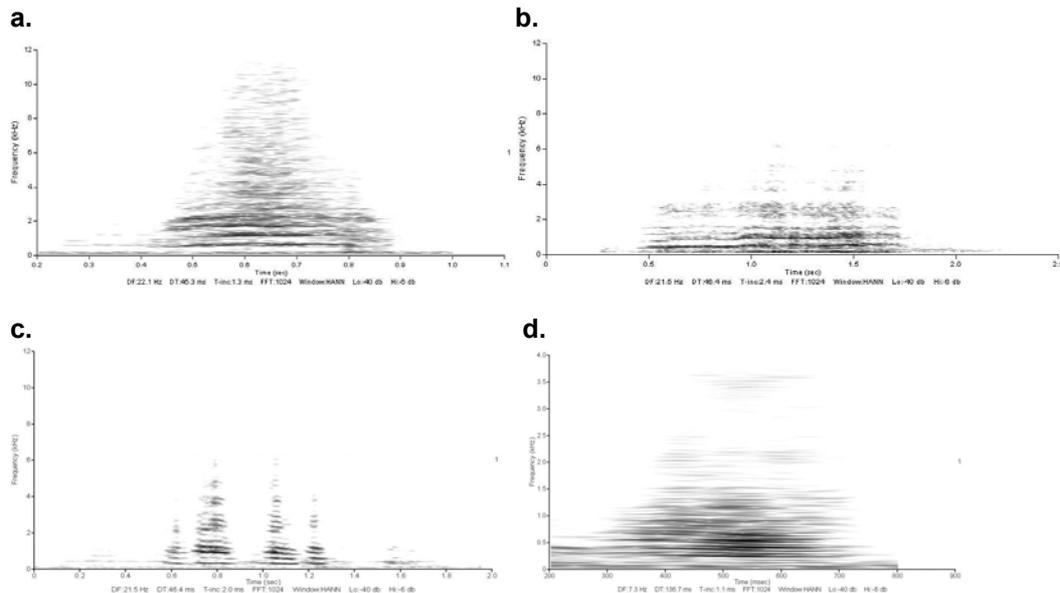


Figure 7. Note the differences in time scale and for d. the difference in frequency scale. a. Harmonic-Play-Trumpet, A0503001; b. Mock-Charge-Play-Trumpet while chasing rabbits B1101310; c. Pulsated-Play-Trumpet B1101702; Pulsated-Play-Trumpets are breathy-pulses in one exhalation; d. Nasal-Play-Trumpets, A050303.

Discussion

Elephant play behaviour is complex and varied and a wide range of model displays normally used in aggressive, defensive, affiliative or sexual contexts are incorporated into play via frolicsome and energetic body movements and play trumpets. Play behaviour can be categorized as *gentle contact play*, *object play*, *environmental exploration play*, *escalated contact play* and *lone locomotor play* (Lee & Moss, in press). Individuals of all ages and both sexes engage in play, though play is more commonly observed among calves and juveniles than among adults. Occasionally, adults will engage in *object play*, *environmental exploration play*, *escalated contact play* or in *lone locomotor play*, while emitting loud harmonic, nasal or pulsated trumpets. Among calves and juveniles, Lee (1986 & Lee & Moss in press) found that forms of play change with age and sex. The most conspicuous difference is that of play partners. Older females tend to focus their attention on gentle play with younger calves of both sexes from within the family, while older males tend to play more within their age-sex class actively seeking novel play partners from outside the family.

As with many other mammals, play appears to serve a variety of functions, and the value of the play behaviour shifts over the course of development. *Lone locomotor* and *object play* may particularly benefit the development and training element of motor skills for the younger age groups, while *gentle contact play* may have a two-fold function, allowing physically undemanding social contact for the youngest calves and allowing older partners to gain knowledge of each other as individuals and to initiate assessments of relative size and strength. As males become older this second factor is pursued with more vigorous contact, as assessment priorities shift to novel individuals and more information about self and other is obtained. For older juvenile females, gentle play offers a means of interacting with young calves, and building experience in calf care-taking skills (Lee, 1986 and Lee & Moss in press.).

We distinguished four types of play vocalizations: Harmonic-Play-Trumpets, Nasal-Play-Trumpets, Mock-Charge-Play-Trumpets and Pulsated-Play-Trumpets. We suggest that the pulsated voiced exhalations heard in the Pulsated-Play-Trumpet may be a form of elephant “laughter” analogous to the breathy vocal exhalations that have been found to be associated with play in other species (for example human laughter, the staccato throaty panting of chimpanzees, the rhythmical voiced breathing of macaques, the high-pitched breathy panting of dogs and the chirping of rats). Among primates play faces and “voiced breathing laughter” occur primarily during rough-and-tumble play wrestling and play-chasing (Preuschoft, 1995). The Pulsated-Play-Trumpet, occurs during play-chasing, but even more frequently during *lone locomotor play* when an elephant appears to be engaged in play in which he or she appears to be his or her own audience.

One peculiar aspect of elephant play is how often they engage in what can only be termed absurd, even preposterous solitary play. An individual elephant can entertain him or herself for long periods running back and forth, mouth-agape, beating up bushes, spinning around, walking backwards, kicking out with the hind legs and attacking “imaginary enemies” while emitting Pulsated-Play and other trumpets (Moss, 1988; Poole, 1996). The play of most mammals is clearly directed at a partner and play displays are undoubtedly meant to signal to an audience a playful attitude (Van Hoof & Preuschoft, 2003). And yet chimpanzees, though apparently not monkeys, sometimes engage in ridiculous solitary play (“funny” movements, such as pirouetting, walking backwards, looking through their hind legs up-side-down) during which time they show full-fledged laughing faces without directing them at anyone in particular. Van Hoof & Preuschoft (2003 p. 284) conclude that these are instances of “pure expressions of joy, of fun in “clowning around” with its unusual experiential consequences”. They call attention to the possible significance of such [lone] performances, where one is one’s own audience, for the existence of self-reflection, and thus of self-

awareness. It is interesting to note here that in many hours of watching macaque play behavior they never observed a monkey "privately laughing to itself" during solitary play. Does the absurd solitary play behavior of an elephant, where he or she appears to be his own audience, indicate the existence of self-reflection and a "private laughing to himself"? It may.

Acknowledgements

For permission to carry out research in Amboseli National Park, Kenya we thank the Ministry of Education, the Kenya Wildlife Service and the Amboseli wardens. The Amboseli Elephant Research Project provided access to long-term data and logistical support and we thank in particular Cynthia Moss. The description of displays presented here are drawn from our website, ElephantVoices, and its Visual and Tactile Signals Database. The database was developed with input from many elephant biologists and we thank in particular Phil Kahl, Billie Armstrong and Cynthia Moss. We are grateful to Sarah Benson-Amram for her assistance in spectrographic measurement and to Phyllis Lee for her generous contribution of knowledge. This paper is part of a larger project funded by National Geographic Society, African Elephant Conservation Fund of the United States Fish and Wildlife Service, Winnick Family Foundation, Care for the Wild and individual donors.

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