

## *The Case for the Personhood of Gorillas\**

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We present this individual for your consideration: She communicates in sign language, using a vocabulary of over 1,000 words. She also understands spoken English, and often carries on 'bilingual' conversations, responding in sign to questions asked in English. She is learning the letters of the alphabet, and can read some printed words, including her own name. She has achieved scores between 85 and 95 on the Stanford-Binet Intelligence Test.

She demonstrates a clear self-awareness by engaging in self-directed behaviours in front of a mirror, such as making faces or examining her teeth, and by her appropriate use of self-descriptive language. She lies to avoid the consequences of her own misbehaviour, and anticipates others' responses to her actions. She engages in imaginary play, both alone and with others. She has produced paintings and drawings which are representational. She remembers and can talk about past events in her life. She understands and has used appropriately time-related words like 'before', 'after', 'later', and 'yesterday'.

She laughs at her own jokes and those of others. She cries when hurt or left alone, screams when frightened or angered. She talks about her feelings, using words like 'happy', 'sad', 'afraid', 'enjoy', 'eager', 'frustrate', 'mad' and, quite frequently, 'love'. She grieves for those she has lost - a favourite cat who has died, a friend who has gone away. She can talk about what happens when one dies, but she becomes fidgety and uncomfortable when asked to discuss her own death or the death of her companions. She displays a wonderful gentleness with kittens and other small animals. She has even expressed empathy for others seen only in pictures.

Does this individual have a claim to basic moral rights? It is hard to imagine any reasonable argument that would deny her these rights based on the description above. She is self-aware, intelligent, emotional, communicative, has memories and purposes of her own, and is certainly able to suffer deeply. There is no reason to change our assessment of her moral status if I add one more piece of information: namely that she is not a member of the human species. The person I have described - and she is nothing less than a person to those who are acquainted with her - is Koko, a twenty-year-old lowland gorilla.

For almost twenty years, Koko has been living and learning in a language environment that includes American Sign Language (ASL) and spoken English.<sup>1</sup> Koko combines her working vocabulary of over 500 signs into statements averaging three to six signs in length. Her emitted vocabulary - those signs she has used correctly on one or more occasions - is about 1,000. Her receptive vocabulary in English is several times that number of words.

Koko is not alone in her linguistic accomplishments. Her multi-species 'family' includes Michael, an eighteen-year-old male gorilla. Although he was not introduced to sign language until the age of three and a half, he has used over 400 different signs. Both gorillas initiate the majority of their conversations with humans and combine their vocabularies in creative and original sign utterances to describe their environment, feelings, desires and even what may be their past histories. They also sign to themselves and to each other, using human language to supplement their own natural communicative gestures and vocalisations.

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\* In PAOLA CAVALIERI & PETER SINGER (eds.), *The Great Ape Project* (New York: St. Martin's Griffin, 1993), pp. 58-77.

<sup>1</sup> Additional information about the work of the Gorilla Foundation with Koko and Michael can be found in: F. G. Patterson, 'The gestures of a gorilla: language acquisition in another pongid', *Brain and Language*, vol. 5 (1978) pp. 72-97; F. Patterson, 'Conversations with a gorilla', *National Geographic*, vol. 154, no. 4 (1978) pp. 438-65; F. Patterson and E. Linden, *The Education of Koko* (Holt, Rinehart and Winston, New York, 1981); F. Patterson, C. H. Patterson, and D. K. Brentari, 'Language in child, chimp, and gorilla', *American Psychologist*, vol. 42, no. 3 (1987) pp. 270-2; F. Patterson, J. Tanner, and N. Mayer, 'Pragmatic analysis of gorilla utterances: early communicative development in the gorilla Koko', *Journal of Pragmatics*, vol. 12, no.1 (1988) pp. 35-55.

**Table 1** Koko's performance on the Assessment of Children's Language Comprehension (ACLIC) test

Number of critical elements	Per cent correct				
	Chance	Sign + voice	Sign only	Voice only	Overall per cent
One - vocabulary (50 items)	20	72			
Two (e.g. HAPPY LADY)	20	70	50	50	56.7
Three (e.g. HAPPY LADY SLEEPING)	25	50	30	50	43.3
Four (e.g. HAPPY LITTLE GIRL JUMPING)	20	50	50	30	43.3
Overall per cent correct (two, three and four elements)		56.7	43.3	43.3	47.7

The results of  $\chi^2$  tests (1 df) indicate that Koko's performance on the ACLIC in all modes and at all levels of difficulty was significantly better than chance, and that there was no significant difference in her comprehension whether the instructions were given in sign, English or sign plus English.

Sign language has become such an integral part of their daily lives that Koko and Michael are more familiar with the language than are some of their human companions. Both gorillas have been known to sign slowly and repeat signs when conversing with a human who has limited signing skills. They also attempt to teach as they have been taught. For example, one day Michael had been repeatedly signing 'CHASE' (hitting two fistful hands together) but was getting no response from his companion, who did not know this sign. He finally took her hands and hit them together and then gave her a push to get her moving. Similarly, Koko has often been observed moulding the hands of her dolls into signs.

Tests have shown that the gorillas understand spoken English as well as they understand sign. In one standardised test called the Assessment of Children's Language Comprehension, novel phrases corresponding to sets of pictures were given to the gorillas under conditions in which the tester did not know the correct answers. Koko's performance (see Table 1) was twice as good as might have been expected by chance, and there was no significant difference in her performance whether the instructions were given in sign only or in English only.<sup>2</sup>

**Table 2** Koko's tested IQ 1975-6

Date	Test	CA <sup>+</sup>	MA <sup>+</sup>	IQ <sup>†</sup>
Dec 1976	Khulman—Anderson	65	56	84.8
July 1976	Peabody Picture Vocabulary Test	60	49	81.6
Jan 1976	Stanford—Binet Intelligence Scale	54	46	85.2
Nov 1975	Wechsler Preschool and Primary Scale of Intelligence	51	37	71.0
July 1975	Stanford—Binet	48	44	91.7

<sup>2</sup> F. G. Patterson, 'Linguistic capabilities of a young lowland gorilla', in F. C. Peng (ed.), *Sign Language and Language Acquisition in Man and Ape: New Dimensions in Comparative Pedolinguistics* (Westview Press, Boulder, CO, 1978), pp. 161-201.

Apr 1975	McCarthy Scales of Children's	45	32	73.0
Feb 1975	Stanford--Binet	43	37	86.0

\* Chronological age in months.

+ Mental age in months

‡ The McCarthy GCI stands for General Cognitive Index and is a scaled score, not a quotient.

Because the gorillas understand linguistic instructions and questions, we have been able to use standardised intelligence tests to further assess their abilities.<sup>3</sup> Koko's scores on different tests administered between 1972 and 1977 yielded an average IQ of 80.3 (see Table 2). More significant than the actual scores is the steady growth of Koko's mental age. This increase shows that she is capable of understanding a number of the principles that are the foundation of what we call abstract thought.

Many of those who would defend the traditional barrier between *Homo sapiens* and all other species cling to language as the primary difference between humans and other animals. As apes have threatened this last claim to human uniqueness, it has become more apparent that there is no clear agreement as to the definition of language. Many human beings - including all infants, severely mentally impaired people and some educationally deprived deaf adults of normal intelligence - fail to meet the criteria for 'having language' according to any definition. The ability to use language may not be a valid test for determining whether an individual has rights. But the existence of even basic language skills does provide further evidence of a consciousness which deserves consideration.

Conversations with gorillas resemble those with young children and in many cases need interpretation based on context and past use of the signs in question. Alternative interpretations of gorilla utterances are often possible. And even if the gorillas' use of signs does not meet a particular definition of language, studying that use can give us a unique perspective from which to understand more directly their physical and psychological requirements. By agreeing on a common vocabulary of signs we establish two-way communication between humans and gorillas. We can learn as much from what they say as we can by evaluating how they say it.

Some of what they tell us can be anticipated: 'What do gorillas like to do most?' 'GORILLA LOVE EAT GOOD'. Or, 'What makes you happy?' 'GORILLA TREE'. 'What makes you angry?' 'WORK'. 'What do gorillas do when it's dark?' 'GORILLA LISTEN [pause], SLEEP'. Some responses, on the other hand, are quite unexpected: 'How did you sleep last night?' (expecting 'FINE' 'BAD' or some related response). 'FLOOR BLANKET' (Koko sleeps on the floor with blankets). 'How do you like your blankets to feel?' 'HOT KOKO-LOVE'. 'What happened?' (after an earthquake). 'DARN DARN FLOOR BAD BITE. TROUBLE TROUBLE'.

Gorillas have suffered from a reputation for aloofness, low level of motivation and a contrary nature. Such gorilla stubbornness and negativism have been encountered and documented in our work with Koko and Michael, but certain findings indicate that this is evidence of intelligence and independence rather than of stupidity. And it is just this ornery independence that seems to spark episodes of humour and verbal playfulness. A characteristic incident involved Koko and assistant Barbara Hiller. Koko was nesting with a number of white towels and signed, 'THAT RED', indicating one of the towels. Barbara corrected Koko, telling her that it was white. Koko repeated her statement with additional emphasis, 'THAT RED'. Again Barbara stated that the towel was white. After several more exchanges, Koko picked up a piece of red lint, held it out to Barbara and, grinning, signed, 'THAT RED'.

Our approach has been to give Koko and Michael vocabulary instruction but no direct teaching

<sup>3</sup> F. G. Patterson, 'Linguistic capabilities of a lowland gorilla' (Ph.D. dissertation, Stanford University, 1979. University Microfilms International no. 79-172-69, Abstract in *Dissertation Abstracts International*, August 1979, 40-B, 2).

of any other language skill. Most of the signs were learned either through the moulding of the gorillas' hands into signs or through imitation. But Koko and Michael have both created signs and used the language in diverse ways not explicitly taught. In a very real sense, the study has involved the mapping of skills, rather than the teaching of skills. This mapping is being done through observations in relatively unstructured and uncontrolled situations and through rigorous tests. The best possible linguistic and cognitive performances are likely to be given in the informal setting, with support coming from tests.

The gorillas have taken the basic building block of conversation (signs) and, on their own, added new meaning through modulation, a grammatical process similar to inflection in spoken language. A change in pitch or loudness of the voice, or the addition (or substitution) of sounds, can alter the meaning of a spoken word. In sign language this is accomplished through changes in motion, hand location, hand configuration, facial expression and body posture. The sign BAD, for instance, can be made to mean 'very bad' by enlarging the signing space, increasing the speed and tension of the hand, and exaggerating facial expression. Koko, like human signers, has exploited this feature of sign language to exaggerate a point, as when she signed THIRSTY from the top of her head to her stomach, instead of down her throat.

The gorillas have been observed to use these kinds of variations to mark relations of size (e.g. small versus large ALLIGATOR sign), number (BIRDS versus BIRD by repeating the sign), location (SCRATCH-ON-BACK), possession (KoKo's-BABY signed simultaneously), manner, degree, intensity or emphasis (TICKLE signed with two hands), agent or object of an action (YOU-SIP signed by moving the signing hand toward the intended agent), negation (negating the ATTENTION sign by changing its location), to express questions (through eye contact and facial expression) and as a form of word play akin to wit or humour (simultaneously signing SAD FROWN when asked to 'smile' for the camera).

A conversation with Koko that involved this kind of creativity with the sign ROTTEN has been documented on film. Koko demonstrated the standard form of the sign in an exchange of insults after her companion called her a STINKER. Koko then inflected the sign by using two hands (perhaps meaning 'really rotten') and in the same sequence, brought the sign off her nose toward her companion, conveying the idea 'you're really rotten'. Koko's use of ROTTEN in this conversation also demonstrates her grasp of the connotation of a word rather than its denotation or concrete or specific meaning.

The meaning of the gorillas' signs are not necessarily identical to the most common meanings, and in some cases they are entirely different. To interpret the gorillas' conversations correctly, one must discover what the signs mean to them. Word-association games provide some clues. The gorillas are asked, 'What do you think of when I say-----?'

Examples of stimulus-response pairs from sessions with Michael include: TEACHER-HAND, MICHAEL-FOOT, and similarly, AFRAID-HUG, ^AD-STINK and HUNGRY-EAT. The gorillas have also simply been asked <sup>to</sup> give definitions. Examples from data on Koko follow:

*12 February 1984*

Teacher: What's an insult?

Koko: THINK DEVIL DIRTY.

T: What's a stove?

K: COOK WITH

*12 July 1984*

T: What's an injury? [Voiced only.]

K: THERE BITE [to a cut on her hand].

*13 July 19 84*

T: What is crazy?

K: TROUBLE SURPRISE.

*8 February 1985*

T: When do people say darn?  
K: WORK OBNOXIOUS.  
*21 April 1983*  
T: What can you think of that's hard?  
K: ROCK . . . WORK.  
*9 February 1984*  
T: What's a smart gorilla?  
K: ME.

There are also words that Koko does not understand, and she sometimes corrects her companions when they apply them to her: on Christmas Eve in 1984 Koko picked up the telephone, listened to the dial tone, then signed 'RON' and handed the receiver to Barbara Hiller. When another companion commented, 'She's a goofball!' Koko responded, 'NO, GORILLA'. She has given similar responses when referred to as a 'juvenile' or a 'genius'.

Another way Koko and Michael have created novel meanings for basic vocabulary signs is through an unusual coining process in which they employ signs whose spoken equivalents match or approximate the sounds of English words for which no signs have been modelled. For example, Koko uses a modulated *knock* sign to mean 'obnoxious'. This indicates that she knows:

1. That the sign KNOCK is associated with the spoken word 'knock'.
2. That 'knock' sounds like the spoken word 'obnoxious'.
3. That the sign KNOCK can therefore be applied semantically to mean something or someone obnoxious.

Other examples include the substitution of the sign TICKLE for 'ticket', SKUNK for 'chunk', and LIP STINK for 'lipstick'. When Michael was asked to 'say bellybutton', he first signed 'BELLYBUTTON' (pointing to it), then signed 'BERRY BOTTOM'.

When signs have been repeatedly demonstrated that are difficult or impossible for Koko to form, her solution has often been to make restitutions based on the sound of the corresponding English word: NEE for 'need', RED for 'thread', LEMON for 'eleven', and BIRD for 'word'.

The gorillas also communicate new meanings by making up their own entirely new signs. The intended meanings of some of the gorillas' invented nouns have been obvious ('nailfile', 'eyemakeup', 'barrette') because of their iconic form. The meanings of more abstract words such as verbs and prepositions ('above', 'below', 'take-off'), have to be worked out over time from records of the situations in which they occurred.

An analysis of the 876 signs emitted by Koko during the first ten years of the project<sup>4</sup> revealed that fifty-four signs, 6 per cent of her total emitted vocabulary, were her own inventions. Another 2 per cent (fifteen signs) were compounded by Koko from signs she was taught. Originally, only ten signs (1 per cent) were counted as natural gorilla gestures. New data from detailed observations of the gestures used by uninstructed gorillas indicates that these categories are fluid, and some of Koko's inventions are shared by other gorillas.

These invented signs indicate that the gorillas, like human children, take initiative with language by making up new words and by giving new meanings to old words. On the next level, there is evidence that Koko and Michael can generate novel names by combining two or more familiar words. For instance, Koko signed 'BOTTLE MATCH' to refer to a cigarette lighter, 'WHITE TIGER' for a zebra, and 'EYE HAT' for a mask. Michael has generated similar combinations, such as 'ORANGE FLOWER SAUCE' for nectarine yogurt and 'BEAN BALL' for peas. Other examples in the samples of the gorillas' signing are 'ELEPHANT BABY' for a Pinocchio doll and 'BOTTLE NECKLACE' for a six-pack

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<sup>4</sup> F. G. Patterson and R. H. Cohn, 'Language acquisition by a lowland gorilla: Koko's first ten years of vocabulary development', *Word*, vol. 41, no. 2 (1990) pp. 97-143.

soda can holder. Critics have commented that such phrases are merely the pairing of two separate aspects of what is present. Many of the above examples, however, cannot be explained in this way - when Koko signed 'BOTTLE MATCH', neither a bottle nor a match was present.

The gorillas have applied such new descriptive terms to themselves as well as to novel objects. When angered, Koko has labelled herself a 'RED MAD GORILLA'. Once, when she had been drinking water through a thick rubber straw from a pan on the floor after repeatedly asking her companion for drinks of juice which were not forthcoming, she referred to herself as a 'SAD ELEPHANT'.

Intrigued by examples of language use such as these, we went on to obtain more empirical evidence of the gorillas' metaphoric capacity. Koko was given a test devised by Howard Gardner<sup>5</sup> in which she was asked to assign various descriptive words to pairs of colours. The adjective pairs used were 'light-dark', 'happy-sad', 'loud-quiet', 'hard-soft', and 'warm-cold'. In videotaped sessions administered under conditions in which Koko could see only the stimulus and not the experimenter, she had no difficulty identifying literal dark versus light (two shades of green), red (versus blue) as warm, brown (versus blue-grey) as hard, violet-blue (versus yellow-orange) as sad, and lemon yellow (versus spring green) as loud. Koko indicated her answers either by pointing or by verbal descriptions (e.g. 'ORANGE THAT FINE', when asked which colour was happy). Ninety per cent of her responses were metaphoric matches as determined by Gardner and by three project research assistants who took the same test. Preschoolers in Gardner's study made only 57 per cent metaphoric matches; seven-year-olds, 82 per cent.<sup>6</sup>

Another creative aspect of the gorillas' language behaviour is humour. Humour, like metaphor, requires a capacity to depart from what is strictly correct, normal or expected. For example, when asked to demonstrate her invented sign for STETHOSCOPE for the camera, Koko did it on her eyes instead of on her ears. Asked to feed her chimp doll, she put the nipple to the doll's eye and signed 'EYE'. Appreciation of this kind of wit is sometimes dependent on recognising the sign behind the distortion. A sceptic might see this as a simple error, but in the case of signs that the gorillas themselves invent, such as STETHOSCOPE, this is not likely, and there are consistencies that run across the gorillas' humorous use of signs.

We have often noticed Koko giving an audible chuckling sound at the result of her own and her companions' discrepant statements or actions. She discovered that when she blew bugs on her companions, a predictable shrieking and jumping response could be elicited. Originally, she laughed at this outcome, but now she chuckles in anticipation of the prank as well. Accidents and unexpected actions by others can also cause Koko to laugh. Chuckles were evoked, for instance, by a research assistant accidentally sitting down on a sandwich and by another playfully pretending to feed sweets to a toy alligator. Developmental psychologists have found that the earliest form of humour in young children, incongruity-based humour, relies on similar principles of discrepancy applied to objects, actions and verbal statements.

Koko has also made verbal 'jokes'. On 30 October 1982, Barbara Hiller showed Koko a picture of a bird feeding her young.

K: THAT ME [to the adult bird].  
B: Is that really you?  
K: KOKO GOOD BIRD.  
B: I thought you were a gorilla.  
K: KOKO BIRD.

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<sup>5</sup> H. Gardner, 'Metaphors and modalities: how children project polar adjectives onto diverse domains', *Child Development*, vol. 45 (1974) pp. 84-91.

<sup>6</sup> F G Patterson, 'Innovative uses of language by a gorilla: a case study', in K Nelson (ed.), *Children's Language*, vol. 2 (Gardner, New York, 1980), pp. 497-561.

...  
B: Can you fly?  
K: GOOD. [GOOD can mean yes.]  
B: Show me.  
K: FAKE BIRD, CLOWN. [Koko laughs.]  
B: You're teasing me. [Koko laughs.]  
B: What are you really?  
Koko laughs again, and after a minute signs  
K: GORILLA KOKO.

In stark contrast to the gorillas' ability to express humour is their ability to communicate their thoughts and feelings about death. When Koko was seven, one of her teachers asked, 'When do gorillas die?' and she signed, 'TROUBLE, OLD.' The teacher also asked, 'Where do gorillas go when they die?' and Koko replied, 'COMFORTABLE HOLE BYE.' When asked 'How do gorillas feel when they die - happy, sad, afraid?' she signed, 'SLEEP'. Koko's reference to holes in the context of death has been consistent and is puzzling since no one has ever talked to her about burial, nor demonstrated the activity. That there may be an instinctive basis for this is indicated by an observation at the Woodland Park Zoo in Seattle, Washington. The gorillas there came upon a dead crow in their new outdoor enclosure, and one dug a hole, flicked the crow in, and covered it with dirt.<sup>7</sup>

In December of 1984 a tragic accident indicated the extent to which gorillas may grieve over the death of their loved ones. Koko's favourite kitten, All Ball, slipped out of the door and was killed by a speeding car. Koko cried shortly after she was told of his death. Three days later, when asked, 'Do you want to talk about your kitty?' Koko signed, 'CRY'. 'What happened to your kitty?' Koko answered, 'SLEEP CAT'. When she saw a picture of a cat who looked very much like All Ball, Koko pointed to the picture and signed, 'CRY, SAD, FROWN'. Her grief was not soon forgotten.

*17 March 1985, with Francine Patterson*

F: How did you feel when you lost Ball?  
K: WANT.  
F: How did you feel when you lost him?  
K: OPEN TROUBLE VISIT SORRY.  
F: When he died, remember when Ball died, how did you feel?  
K: RED RED RED BAD SORRY KOKO-LOVE GOOD.

Arthur Caplan argues that animal interests and human interests could not be counted equally, claiming that nonhuman animals lack traits that make a moral difference. He uses the following sample to illustrate his point:

If you kill the baby of a baboon the mother may spend many weeks looking for her baby. This behaviour soon passes and the baboon will go on to resume her normal life. But if you kill the baby of a human being the mother will spend the rest of her life grieving over the loss of her baby. Hardly a day will go by when the mother does not think about and grieve over the loss of her baby.<sup>8</sup>

But in this example the comparison is between outward behaviour in the case of the baboon mother, and a private mental state in the case of the human mother. In most such cases, the human mother also resumes her normal life: returning to her workplace, caring for her other children, going about her daily activities as before. Her grief is not necessarily apparent to the casual observer. Because the baboon mother cannot (or chooses not to) communicate *to us* her internal feelings about the death of her baby, it is assumed that it does not matter to her.

<sup>7</sup> D Hancocks, 'Gorillas go natural', *Animal Kingdom*, vol. 86, no.1 (1983) pp. 10-16.

<sup>8</sup> A. Caplan, 'Moral community and the responsibility of scientists', *Ada Physiologica Scandinavica*, vol. 128 (1986) p. 554.

While we cannot make any claims here about the emotional life of baboons, we have considerable evidence that Koko continues to mourn the loss of her adopted 'baby', All Ball, even years after his death.

*19 March 1990*

Koko comes across a picture of herself and All Ball in a photo album.

K: THAT BAD FROWN SORRY [emphatic] UNATTENTION.

Through conversations such as these the gorillas show not only that they are capable of experiencing emotions, but that they are aware of their emotions and can use language to describe them. Koko, at age six, was given a test that parallels a study with human children five to thirteen years old by Wolman, Lewis and King.<sup>9</sup> Koko was asked a series of questions with these frames:

(1) *Do you ever feel\_\_\_\_\_?*

(2) *When do you feel.*

The target feeling states were anger, fear, happiness, sadness, hunger, thirst, sleepiness and nervousness. Like the younger human subjects, Koko most frequently reported external events as conditions of emotional arousal; for example, when asked, 'When do you feel hungry?' she answered, 'FEEL TIME'. A possible explanation of this reply is that when it is time (to eat), she feels hungry. Koko regularly uses an emphatic TIME sign to tell her companion to bring out the next scheduled meal. Her replies to questions about anger seem to be related to events of the months preceding the test. Her responses to 'When do you feel mad?' included 'KOKO LOVE MARJIE BYE' and 'KOKO MAD GIRL'- At the time this test was given Koko had been having a difficult time with a new assistant named Marjie.

Koko has displayed a capacity for empathy in her comments about the emotional states of others:

*24 September 1977*

Koko is shown a picture of the albino gorilla Snowflake struggling against being bathed.

Koko signs 'ME CRY THERE', indicating the picture.

*3 November 1977, with companion Cindy Duggan*

Koko looks at a picture of a horse with a bit in his mouth.

K: HORSE SAD.

CD: Why?

K: TEETH.

*27 December 1977*

Michael has been crying because he wants to be let out of his room. Koko, in the next room, is asked how Michael feels.

K: FEEL SORRY OUT.

*7 April 1986*

Mitzi Phillips tells Koko about a problem that is making her feel sad.

MP: What could I do to feel better?

K: CLOSE DRAPES . . . TUG-OF-WAR.

As Mitzi writes in the diary, Koko quietly comes up to her.

K: SAD? [Making the sign a question by raising her eyebrows and leaning forward, a standard ASL question form.]

MP: I feel better now.

Koko smiles.

The gorillas have also been asked to represent feeling states such as love, hate, happiness and

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<sup>9</sup> R. W. Wolman, W. C. Lewis and M. King, The development of the language of emotions: conditions of emotional arousal', *Child Development*, vol. 42 (1971) pp. 1288-93.



anger with paints on canvas. Given free choice of ten or more colours, the gorillas produced works of contrasting colour and form. Asking them to paint emotions seemed a reasonable request because they had earlier demonstrated some primitive representational ability in their drawings and paintings done from models or from memory. Both Koko and Michael titled these works appropriately. One example of Michael's representational art is a work he called 'APPLE CHASE', for which he used our black and white dog named Apple as a model. The black and white painting bears a resemblance to Apple's head. (It is interesting to note that Michael and Apple have a special relationship. They frequently play 'chase' together, and Michael often initiates the game by signing CHASE to Apple.)

Michael frequently expresses himself creatively through sound play. He uses various objects and parts of his body to produce a wide variety of sounds and intricate rhythms. In creating his 'sound tools' he experiments with different materials in his environment. In addition to rhythmic drumming and tapping, for example, he sometimes strums a rope or fabric strip held taut between his feet and his mouth. He made a rattle by filling a PVC pipe end with hard nutshells and shaking it vigorously with his hand covering the open end. Then he filled his mouth with the nutshells and shook them around, making a contrasting 'wet' rattling sound.

Koko regularly expresses her creativity through fantasy play, alone or with her companions. Often this play involves her plastic reptile toys and centres on their tendency to 'bite'.

*13 October 1988, with Mitzi Phillips*

Koko is lying down with one of her toy alligators. She looks at it and signs 'TEETH'. She examines its mouth. She kisses it, puts two alligators together as if to make them kiss each other, then gives them a three-way kiss. She puts her hand into the toy's mouth, then pulls it out and shakes her hand.

MP: Oh, did it bite you?

K: BITE.

MP: Oh, no! Does it hurt?

Koko kisses her finger.

MP: May I see that bad alligator?

Koko gives it to Mitzi. Mitzi 'asks' the alligator why it bit Koko and pretends to listen to its answer, then hands it back to Koko.

Koko kisses the toy again and again.

K: ALLIGATOR. GORILLA. BITE. GORILLA NUT NUT NUT. STOMACH TOILET.

They are intelligent and emotional, they express themselves creatively through language, art, music and fantasy play; but are gorillas self-aware? Once considered unique to human beings, self-awareness is an elusive concept. Its many definitions are both varied and vague, although almost everyone has some notion of what it means. Through their signing, Koko and Michael have shown a number of generally accepted cognitive correlates of self-awareness, including the use of personal pronouns, references to their own internal and emotional states, humour, deception and embarrassment.

While self-awareness is probably best determined through the use of language, self-recognition in mirrors is an accepted indicator of self-awareness in human infants and other nonverbal individuals. In formal mirror-marking tests, the subjects are first exposed to a mirror and observed for any self-directed behaviour. Then their appearance is altered in such a way that they can only detect the change with the aid of mirror. Nonhuman primates undergoing these tests are normally anaesthetised and marked on the face with red dye. Human children are marked surreptitiously with a spot of rouge while they are distracted. Once marked, subjects are again exposed to a mirror. Touching the mark while looking in the mirror is considered confirming evidence of self-recognition. Chimpanzees, orang-utans and humans have demonstrated a capacity for self-recognition in mirror tests, but the six gorillas previously tested failed to do so. It was concluded that gorillas lacked the cognitive capacity for self-

awareness, in spite of informal reports to the contrary.

We gave a comparable mirror test to Koko<sup>10</sup> in which she demonstrated for the first time that gorillas, too, are capable of mirror self-recognition. For Koko, we used a modified procedure so that she would not have to be anaesthetised. During a series of ten-minute sessions videotaped over a three-day period, Koko's brow was wiped with a warm, damp, pink washcloth. During one of these sessions, the washcloth had been dipped in clown paint of the same pink colour. In the sessions in which she was unmarked, Koko touched the target area an average of only one time per session. During the fifth session when her brow was marked, she touched the target area forty-seven times, only after viewing it in the mirror. As she attempted to remove the paint, she also spent the most time viewing her reflection during the session in which she was marked. It is evident that Koko recognised the altered image as her own.

Koko had previously passed an informal 'mark test' when she attempted to rub away a dark spot of pigment on her upper gum, a spot that she had precisely located by looking into her mouth with a mirror. Captured on videotape, this spontaneous experiment of nature eliminated any possibility that Koko sensed the presence of the mark before noticing it in the mirror.

Why did the other gorillas fail to pass the mirror test? There are a number of possible explanations, including their age, rearing histories and social situations, their individual sensitivity to anaesthesia, or lack of motivation. There may also have been methodological problems, as at least two of the subjects touched the mark before exposure to the mirror. However, a more likely explanation is that the gorillas were inhibited by the presence of unfamiliar observers. Primatologists who have worked closely with gorillas have long been aware that the presence of strangers can profoundly affect gorilla behaviour, and this has been our experience as well. In certain situations Koko and Michael show a sensitivity to being watched even by familiar companions. Ironically, it may have been the gorillas' very capacity for self-consciousness that prevented them from exhibiting behaviours indicative of self-recognition in the test situation.

Mirrors have been part of Koko's environment from her infancy. At the age of about three and a half, Koko began to exhibit self-directed behaviours in front of a mirror. She would groom her face and underarms, pick at her teeth and examine her tongue while studying her reflection. She would also comb her hair, make faces and adorn herself with hats, wigs and make-up. Michael has exhibited similar behaviours, which have been documented on videotape, even though his exposure to mirrors has been much more limited. These mirror-guided behaviours are normally exhibited by human children by the time they are two years old. Before that age children respond to their mirror image as they would to another child.

We took advantage of Koko's linguistic abilities to cross-validate the evidence of self-awareness provided by her response to mirrors. Two 'Who are you?' questions were asked during each of the first four test sessions while Koko was away from the mirror. After the fifth (marking) session Koko was asked this question once more while away from the mirror, and also 'Who is that?' of her mirror reflection. Although correct answers to these questions can simply be learned responses, the data argue otherwise in Koko's case. Her responses (listed in Table 3) were all different, multi-sign utterances, but had one consistent theme. Each reply to the questions contained one or more of the three signs: 'GORILLA', 'ME', 'KOKO'. Koko does not use these three words in response to all 'who' questions. When asked 'who' questions about her closest companions, her responses were different for each individual but consistent over repeated questions about each individual.

Human children begin by using personal pronouns and self-referents in their speech at about the same time that they begin to recognise themselves in mirrors. Similarly, at the same age

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<sup>10</sup> F Patterson and R. Cohn, 'Self-recognition and self-awareness in lowland gorillas', in S. T. Parker, M. L. Boccia and R. Mitchell (eds), *Self-awareness in Animals and Humans* (Cambridge University Press, Cambridge, in press).

that she began to exhibit self-directed behaviours in front of a mirror, Koko acquired the signs for 'me', 'mine', 'myself', 'you', and proper nouns, including 'Koko'. The gorillas have also demonstrated self-awareness in their ability to describe themselves as the same as or different from others. For example, research assistant Maureen Sheehan questioned Koko about the differences between gorillas and humans:

Table 3 Koko's responses to self-identity questions

Test session	First Response	Second Response
'Who are you?'		
1	ME GORILLA NIPPLES TICKLE	NIPPLES GORILLA
2	POLITE-KOKO KOKO NUT NUT POLITE	POLITE DEVIL HAIR HEAD JOJO SWEET BAD
3	KOKO POLITE ME THIRSTY	GORILLA ME
4	POLITE ME THIRSTY FEEL KOKO-LOVE	POLITE POLITE-KOKO KOKO FEEL THIRSTY SORRY
5	KOKO POLITE SORRY GOOD	KOKO; PLEASE GIMME BROW-WIPER
'who is that?' (to mirror)		
5	ME THERE KOKO GOOD TEETH GOOD	

MS: What's the difference between you and me?

K: HEAD.

MS: And how are our heads different?

Koko beats on her head with her open hands quite hard, harder than a human would ever do.

MS: What else is different between us?

Koko moves her hand up to her stomach, a gesture resembling BLANKET.

MS: Do you mean something about your stomach?

K: STOMACH GOOD THAT.

MS: Oh, but what were you saying about blanket, different?

Koko moves her hands up and down her torso, then pulls the hair on her belly. Maureen interprets these new gestures as meaning 'body hair'.

MS: Now can you name something the same?

K: EYE.

MS: Yes, that's right, we both have eyes.

K: LOVE.

Michael was once asked a related question: 'What makes you different from your cat?' He responded, 'GORILLA ME MIKE'.

Self-awareness is also shown by the gorillas when they talk about themselves in situations removed in space or time from the current one. This capacity for displacement is clearly and repeatedly demonstrated in conversations such as the following:

*10 July 1984, with Frandne Patterson, six days after Koko's birthday*

F: What happened on your birthday?

K: SLEEP EAT.

F: Didn't something special happen on your birthday?

K: OLD GORILLA.

F: Yes, you're thirteen years old and big.

Michael began at an early age to tell stories about past events. In 1979, when the project was still located on the Stanford University campus, the gorillas witnessed a violent, screaming argument between a red-haired woman and a research assistant at a nearby laboratory

building. The woman apparently hit the assistant and had to be subdued at gunpoint by the police. When Michael's companion Barbara Weller arrived, knowing nothing of the incident, she found him at the window.

M: GIRL.

Michael stares out of the window for a few more minutes.

M: KNOW HIT-IN-MOUTH.

B: Know hit-in-mouth?

M: HIT-IN-MOUTH RED BITE.

B: Why are you signing hit-in-mouth?

M: KNOW.

B: Who do you want to hit-in-mouth?

M: HAIR GIRL RED.

B: What? Red hair girl?

M: LIP [The gorillas use LIP to mean 'woman'.]

B: Lip?

M: LIP LIP LIP BIG-TROUBLE.

Michael Lewis<sup>11</sup> suggests that there are certain emotional states that only the self-aware can have. One such state is embarrassment. In order to be embarrassed animals must be capable of reflecting on their own behaviour and comparing it to standards set by society or themselves. Koko seems embarrassed when her companions notice that she is signing to herself, especially when the signing involves her dolls. One incident recorded when Koko was five years old provides an example. Her companion observed her creating what appeared to be an imaginary social situation between two gorilla dolls. She signed, 'BAD, BAD' while looking at one doll, and 'KISS' while looking at the other. Next, she signed, 'CHASE, TICKLE', hit the two dolls together, and then wrestled with them and signed, 'GOOD GORILLA, GOOD GOOD'. At this point she noticed that she was being watched and abruptly put the dolls down.

There is no reason to think that Koko and Michael are significantly different from other gorillas in their inherent linguistic capacities, self-awareness or other mental abilities. They are two individuals selected more or less at random from the total population of gorillas, and the circumstances of their first few years were very different. So it is fair to assume that they are representative of their species. Nor is there reason to consider them essentially different from other gorillas because of their experience with human language. Indeed, a few zoo gorillas who have been exposed informally to sign language have shown that they, too can learn signs, even later in life and without intensive teaching. By teaching sign language to Koko and Michael we have not imposed an artificial system on them, but rather have built upon their existing system to provide a jointly understood vocabulary for mutual exchange. Detailed observation and analysis of the communicative gestures used by 'uninstructed' gorillas in a zoo group indicate that their own gestural communication system is much more complex than previously thought,<sup>12</sup> This ongoing study involves analysing a videotape compilation of these gestures and classifying them according to context and apparent functions. The gorillas have been observed to use communicative gestures in the following contexts: play invitation, anticipatory play reaction, play inhibition, indication of play location and action, sexual activities, agonistic interaction, group movement, body positioning and solitary play. One type of gesture involves touching to position the body of another, usually in the context of sexual activity. Another significant type of gesture uses the hands for deception, for example to hide a 'playface' grin in order to alter the signal being received by another gorilla. So far, over forty apparently discrete and meaningful gestural types have been identified in one five-member population. Gorillas in this particular group have been observed using conversational strings of up to eight

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<sup>11</sup> M. Lewis, 'Origins of self-knowledge and individual differences in early self-recognition', in A. Greenwald and T. Suls (eds), *Psychological Perspective on the Self*, vol. 3 (1986) pp. 55-78.

<sup>12</sup> F. Patterson and J. Tanner, 'Gestural communication in captive gorillas', paper presented at the American Society of Primatologists meeting, University of California, Davis, July 1990.

gestures, and there seems to be an element of request and response in their dialogues.

While we are a long way from any comprehensive understanding of natural gorilla communication, it is clear that non-signing gorillas use gestures to communicate with one another. Field researchers may not have always recognised the significance of semantic gestures used by tree-living gorillas, because they were unfamiliar with the gorillas' communicative habits or with gestural communication in general, or because the presence of human observers inhibits the gorillas' normal behaviour. Recognition of semantically significant gestures and sounds becomes easier as we become more familiar with gorillas as communicators.

Perhaps our most interesting findings relate to how astonishingly like us gorillas are - or how like them we are. But the striking similarities between gorillas and humans are hardly surprising in light of the most recent studies of our genetic kinship. The scientific classification of living organisms is based on the apparent similarities between those organisms. Within the order Primates, human beings have always been set apart in a separate family. More recent studies involving comparisons of chromosomes and analysis of DNA leave little doubt that apes and humans should be classed together in the family *Hominidae*. Some researchers now propose that humans, gorillas and chimpanzees also belong in the same subfamily, though the arrangement within this subfamily is still to be determined.<sup>13</sup>

Through what they have taught us about gorillas, Koko and Michael are helping to change the way we view the world. They force us to re-examine the ways we think about other animals. With an emotional and expressive range far greater than previously believed, they have revealed a lively and sure awareness of themselves as individuals. Asked to categorise herself, Koko declared 'FINE ANIMAL GORILLA'. Indeed. Fine animal-persons, gorillas.

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<sup>13</sup> J. Yunis and O. Prakash, 'The origins of man: a chromosomal pictorial legacy', *Science*, vol. 215 (1982) pp. 1525-9; B. F. Koop, M. Goodman, P. Xu, K. Chan and J. L. Slightom, 'Primate (eta)-globin DNA sequences and man's place among the great apes', *Nature*, vol. 319 (1986) pp. 234-7.