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# STANDARDS OF PROOF IN APE LANGUAGE STUDIES: THE CASE OF BOW AND LITERACY

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**Abstract:** Objective evidence of spontaneous, contextual use of language in ape language studies requires replicable results, significant samples, statistical analysis and double blind testing. If the results are replicable and predictable, then the accusation of rote training can be leveled. If the evidence arises spontaneously in context, then it may be merely anecdotal. The requirements create insurmountable difficulties where proof is concerned. This paper offers evidence that Bow, a male common chimpanzee, is the author of his own messages through the following circumstances: (1) Bow spells out information not known to his interlocutor; (2) Bow spells out in Hebrew with an interlocutor who is not a Hebrew speaker when there is no Hebrew speaker present. A new test for substantiating evidence of language use is suggested: namely, that if no other reasonable explanation for language output by a non-human is available, then the use of language is established.

**Keywords:** ape language studies, chimpanzees, Hebrew, English, apes and literacy, standards of proof, bilingualism in non-humans, bilingualism as a method of double-blind testing.

**Languages:** Chinese, English, Hebrew.

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## 1. ANIMAL COMMUNICATION STUDIES.

1.1. HISTORY OF THE FIELD. The scientific community has not agreed on a standard, that if met, would definitively prove that an ape has acquired language. “[I]f at the end of extensive experimental research, a reputable research team proposes a definitive answer [to one of the key questions in ape language research] ... there are no agreed methods by which the scientific community can determine whether that conclusion is or is not well-founded” (Savage-Rumbaugh, Shanker & Taylor 1998:142). While the history of inquiry into the language potential of non-humans is dominated by the idea of there being a sharp dividing line between humans and other animals (Sutcliffe 2009), ape language researchers are expected to show objective proof. The obstacles they face are in some ways similar to the difficulties of proving the language abilities of an inarticulate human child.

The problem of proving that an ape has acquired language is not essentially different in theory from the problem of proving that a human being has acquired language. Some human beings face a similar fight for the recognition of their own independent communi-

cation. As long as they use their articulatory apparatus to speak out loud, most people enjoy the benefit of the presumption that they are in fact speaking and not just making noises that sound like speech. People with normal speech are not required to prove anything. But for those with neural damage that prevents them from having normal control over their movements, the path to recognition that they do understand language and are able to use it is a difficult one. The controversy surrounding facilitated communication has not yet been resolved (Biklen & Cardinal 1997).

In the 1960s and 1970s, research into teaching non-humans a human language was considered a legitimate field of endeavor, and there were many such experiments, conducted with apes (Fouts & Rigby 1977, Gardner et al. 1989, Patterson & Linden 1989), as well as with other animals, such as parrots (Patterson & Pepperberg 1994; Pepperberg 1999, 2009) and dolphins (Herman 2009).

One of the most successful projects of this period was the work of Beatrix and Allen Gardner with a female chimpanzee by the name of Washoe. Washoe was brought up in a human home, using a method called cross-fostering. She was taught American Sign Language and acquired an impressive vocabulary that she could use in context to express her wishes, desires and opinions. (Gardner et al. 1989, Fouts & Mills 1997)<sup>1</sup>

Herbert Terrace attempted a similar experiment with a male chimpanzee whom he named Nim Chimpsky, after Noam Chomsky. Like the Gardners, it was Terrace's intention to raise Nim in a human home and to teach him sign language. However, Nim's early experiences were very different from Washoe's. Terrace did not volunteer to adopt Nim himself. He was an unmarried man, and he did not feel up to the challenge of raising a baby chimpanzee by himself. Instead, he asked a former research assistant of his to adopt Nim into her home. However, conflicts concerning parenting methodology and other matters arose, and Nim was abandoned by his adoptive mother at an early age and brought up by a sequence of different assistants, none of whom served as the central figure in Nim's life. Deprived of a stable family life, Nim experienced attachment issues very similar to those that human children deal with when they are denied a strong relationship with a reliable parent. (Hess 2008)

After failing to secure continued funding, Terrace ended the project and began to review the tapes of Nim signing. He came to the conclusion that Nim was not using language spontaneously to express himself. It seemed to him that Nim was signing to please his trainers. Soon thereafter, researchers working in animal communication were invited to a conference which retrospectively is known as The Clever Hans Conference. There, not only were Terrace's conclusions about Nim Chimpsky made public, but it was suggested that Washoe, and all other animals engaged in language experiments, were also not actually using language. They were all compared to Clever Hans, a German horse who had used cues from humans in order to answer math questions correctly. In 1907 it had been

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<sup>1</sup> For instance, when she found herself in a barren cage after the end of the experiment, Washoe signed "ROGER ME OUT. ROGER YOU ME OUT." (Fouts & Mills 1997:122). The language experiment was over. She was signing not for a reward or to please, but as a way of conveying what she wanted.

discovered that Clever Hans could answer questions correctly only when the human with him knew the answer and Hans could see the human. According to Savage-Rumbaugh and Levin:

For some time during the mid-1970s, Thomas Sebeok, a linguist at Indiana University, had been expressing strongly negative views on ape language research. And in May 1980 he organized a conference under the auspices of the New York Academy of Sciences, which made his position brutally clear. The conference was called “The Clever Hans Phenomenon: Communications with Horses, Whales, Apes and People” [...] There was even a move, fortunately thwarted, to have the conference vote for a ban on the research. At a press conference at the end of the meeting, Sebeok expressed his views most stridently of all: “In my opinion, the alleged language experiments with apes divide into three groups: one, outright fraud; two, self-deception; three, those conducted by Terrace.”<sup>2</sup> (1994:50–51)

The Clever Hans conference set a new set of standards for animal language experiments, and in particular those involving apes. Evidence of language competency in a conversational context became suspect, because of possible cuing. Tests had to be objective, double blind, infinitely replicable, and involve predictable results. The Clever Hans demonstrations of arithmetic skill had in fact been objective (only one correct answer), infinitely replicable (you can always find one more question to ask), and predictable (if the horse knew his arithmetic, he could always get it right.) The problem was that the tests were not double blind. The humans with the horse knew both the questions and the answers. From this point on, to prove that a non-human had acquired language, a researcher had to present the subject with questions whose answers could be verified independently, distinct questions that would allow for a potentially unlimited number of trials, and that neither the tester nor the subject knew the answers to in advance.

1.2. THE ADVANTAGES OF AUDIBLE SPEECH FOR COUNTERING THE ACCUSATION OF CUING. Experimenters who work with parrots operate under different constraints from those that apply in the case of apes, because the articulatory apparatus of parrots, while quite different from that of humans, is capable of producing comprehensible speech. (Patterson & Pepperberg 1994, Pepperberg 2009). The other great apes,<sup>3</sup> the gorilla, the orangutan, the common chimpanzee, and the pygmy chimpanzee (AKA bonobo), are not able to produce speech that humans can comprehend. That is why alternative methods of communication, such as sign language or lexigrams, have to be used. The moment it is not

<sup>2</sup> Terrace’s study with Nim was considered neither fraud nor self-deception because Terrace, after terminating the project for lack of funding, retrospectively decided that it had been a failure.

<sup>3</sup> The great apes are members of the family *Hominidae* (hominids). Surviving members of this family are humans (*homo sapiens*), common chimpanzees (*pan troglodytes*), bonobos (*pan paniscus*), gorillas (*gorilla gorilla*), and orangutans (*pongo pygmaeus*). All other hominids have long since gone extinct.

Trial	Objects in Set	Question	Response
1	Purple key, yellow wood, green hide, blue paper, orange clothes pin, grey box, red truck	What object is grey?	Box
14	Purple paper, yellow clothes pin, green box, blue truck, orange key grey wood, red hide	What color is truck	Blue

**Table 1.** Representative sets of objects, questions, and responses from Alex, and African Grey parrot. (Reproduced from Pepperberg 1999:137.)

audible speech, the researcher opens himself up to the accusation that not just the answer itself, but also its linguistic form, is being cued.

Why is audible speech less open to the accusation of cuing? Because the researcher cannot see into the parrot's throat and determine what articulatory gesture the parrot is about to make. Speech is rapid and the means of articulation are usually not visible. Because of this, when a parrot utters a word, the researcher is not likely to have cued the parrot as to which phones or phonemes to use. But when an ape spells out a word, letter by letter, it is more likely that cuing as to individual phonological elements of the word might have taken place. This is the same problem that practitioners of facilitated communication face (Biklen & Cardinal 1997). For instance, consider the representative samples of sets of objects, questions, and responses from Alex, an African Grey parrot, as reproduced in **Table 1**.

It's one thing to be able to determine that a box is grey. It's quite another to know how to say "box" in response to a question like "what object is grey?" Even if Alex could somehow tell that the researcher thought the box was the object that was grey (maybe by the way she was looking at it), she can hardly be accused by her body language to have caused Alex to move his vocal tract in such a way as to produce the word "box."<sup>4</sup> Also, she cannot have cued him into the fact that "blue" was a color in the second question, involving the truck. Maybe the researcher was looking at the truck. But how could that cause the parrot to articulate the syllable of the English word "blue"? Clearly Alex the parrot knew what the word "blue" stood for, and he knew what the word "color" stood for, and he knew that the question "which color?" required an answer that is a color. All of this is quite significant in and of itself. In a study about linguistic ability, the parrot's choice of correct phonemes for pronouncing the correct word cannot be cued by the researcher's inadvertent body language.

1.3. MINIMIZING CONTEXTUAL CUES IN APE LANGUAGE STUDIES. With apes who use lexigrams, the process of testing is considered more suspect, because if the researcher inad-

<sup>4</sup> Alex had no training on what to do with his articulatory apparatus, which is very different from our own. He had to discover by himself how to go about making a noise that Pepperberg would identify as sounding like the word "box". (Without lips, he had to find a way to make a bilabial). Finding the articulatory to acoustic correspondences was Alex's doing. Pepperberg's explicit instruction to Alex was on semantics.

vertently looks at the right lexigram for the answer, this might be a cue for the subject, not just for picking out the right answer, but also for picking out the right *word* to stand for the answer. Because of this, researchers in ape language studies are expected to conduct double blind tests, where neither the researcher nor the subject know the question or the answer. Many ingenious methods have to be found to minimize potential cuing.

In one set of experiments, Sue Savage-Rumbaugh hid behind a one-way mirror to minimize cues to Kanzi, an eight year old male bonobo, about what she expected him to do as she gave him novel requests to comply with. An example of such a request is "Can you put the apple in the hat?" In all, 660 such requests were made over a nine month period. Kanzi had never heard these sentences before, and he was requested to perform actions that served no practical purpose. This was evidence of comprehension of English syntax with minimal context. (Savage-Rumbaugh et al. 1993)

Both Sue Savage-Rumbaugh and Kanzi had to exercise extreme patience in order to go through the entire list of novel sentences for purposes of proof. Kanzi performed the actions as he was requested. However, he was not engaged by the tasks. There was no contextual motivation for complying with the requests. This was an artificial set of tasks that Kanzi participated in for purposes of proof. This sort of testing is possible only when the subject is extremely cooperative. Even small human children are not often that compliant. To ask this of a bonobo requires amazing patience on the part of the ape. To require it of a common chimpanzee is daunting. The problem is not one of cognition. It is a matter of impulse control, deferred gratification and interpersonal motivation.

Impulse control means that when a desire, urge or whim occurs to the subject, no promise of future reward or punishment is of use in curbing it. Deferred gratification is the willingness to put off present enjoyment in the hope of gain in the future. Humans are known for their willingness to defer gratification. Most chimpanzees are not. Common chimpanzees, even when they recognize the authority of a dominant conspecific, do all that is in their power to resist having their immediate desires thwarted. They never stop scheming. This is how, after years of being the dominant male, an Alpha is overthrown at the first sign of weakness.

Bow, the male common chimpanzee who is the subject of the current paper, is not cooperative. He spells out words when he wishes to communicate, but he refuses to answer questions that appear to him to be for purposes of testing his knowledge as opposed to genuine requests for information by someone who doesn't know, and he will not comply with a request when he has no immediate desire to do so. This presents considerable difficulties in implementing objective, context free,<sup>5</sup> and replicable tests.

2. DIFFICULTIES CONDUCTION DOUBLE-BLIND AND CONTEXT-FREE TESTS WITH BOW. BOW STARTED SPELLING OUT WORDS IN THE SUMMER OF 2007 at the age of five and a half years. Up to that point, we he was using lexigrams in the standard orthography

<sup>5</sup> Criticism of Nim Chimpsky included the idea that he was cued as to what to say by conversational context: if he was asked what he would like to play or do, answers were often suggested by the question.

of Hebrew and English, but little progress was made, because Bow pointed faster than researchers were able to see. The breakthrough came when Bow started taking the researchers' hands and using them as pointing devices, making sure the humans perceived what he was pointing at before proceeding further (Katz 2009).<sup>6</sup> From pointing at words in standard spelling, Bow went on to spell out words by pointing at letters. His achievement is remarkable, but there is a very real problem with eliciting objective proof.

What evidence is there that, with the physical contact between researchers and subject during the process of pointing at letters, the researchers are not inadvertently cuing Bow as to what to say and how to say it?

Bow will not spell when there is no one in the room. Bow will not talk to strangers. He refuses to answer questions that he thinks researchers already know the answer to. He uses language only to communicate, and he cannot be bribed or cajoled to use it for anything else.

However, there is one form of proof available to show that Bow is in fact the author of the words that he spells out and that cuing is not a factor. In the following sections we will discuss two clips<sup>7</sup> in which the words must have come from Bow, and not his human interlocutor, because the human did not know the information that Bow provided and there was no one else present.

3. PROOF THAT BOW IS THE AUTHOR OF HIS UTTERANCES.<sup>8</sup> FIGURE 1 IS A PHOTO OF DELIGHT WANG HOLDING BOW WHILE HIS HUMAN ADOPTIVE SISTER SWORD LOOKS ON. Delight and her mother, June Sun, stayed in Bow's home for a period of six months ending in December of 2003. At the time, Bow was not yet two years old. When the researchers spoke among themselves, they didn't call Delight by her English name. They used her Chinese given name, which is 忻之 [ʃɪnzɪ].

At the end of August 2007, Eden Michaelov, a summer volunteer with Project Bow, was shown the picture in **Figure 1**. Ms. Michaelov did not know Delight Wang, and she had never heard Delight's Chinese name. She took the sheets from the album containing the photo of Bow, Delight and Sword, and she asked Bow, at a time when no one else was present, what the name of the little girl in the photo was.

If Bow had thought this was a test for purposes of proof, he probably wouldn't have answered. But he took Ms. Michaelov at her word. He knew that she didn't know, and he

<sup>6</sup> For a complete background, read Katz (2009). Bow was cross-fostered along with a human child two and a half years his senior. Hebrew was the home language. English was spoken outside the home by all others. Lexigrams in the standard orthography of each language were used for Bow to communicate. A lexigram is any visual symbol that stands for a word. What makes it a lexigram is that it is recognized as an undivided whole.

<sup>7</sup> The two clips may be accessed on-line at the following locations: <http://www.youtube.com/watch?v=V9fvLyXVWAQ> for Video Clip 07082901-5 and <http://www.youtube.com/watch?v=fWeE3AgveUo&> for Video Clip 08090301-3

<sup>8</sup> The author wishes to thank June Sun, Delight Wang, Eden Michaelov and Katie Thurston for their help and assistance both in working with Bow and in helping to compile the data on which this article is based.





**Figure 1.** Photo of Bow, Delight and Sword that Eden Michaelov showed Bow.

Speaker	Hebrew	English Translation
Eden	אני רוצה לדעת משהו. ראיתי את התמונה הזאת. מי הילדה הזאת ? איך קוראים לה ? זה קשת, נכון ? מי מחזיק את קשת כאן ? מי מחזיקה אותו? זאת חרב. מי זאת ?	I want to know something. I saw this picture. Who is this girl? What is she called? That's Bow, right? Who is holding Bow here? Who is holding him? This is Sword. Who is this?
Bow		RH: ש נ (spells) shin nun
Eden	אני לא יודעת. אני לא מכירה אותה. מה השם שלה ? האם אתה מכיר אותה ? זאת חרב, מי זאת ? תגיד ? תגיד לי !	I don't know. I don't know her. What is her name? Do you know her? This is Sword; who is this? Tell me!
Bow		RH: ש נ ג (spells) shin nun gimmel.
Eden		tries to sound it out (Tries to sound it out.) Shanag?
Eden	מה אתה עושה ? תגיד לי ! מה השם שלה ?	What are you doing? Tell me! What is her name?
Bow		RH: ש נ (spells) shin nun.

**Figure 1.** Transcription and English translation of dialogue in clip 07082901-5

was willing to tell her. The transcription of Video Clip 07082901-5 (**Figure 1**) shows what happened.

There were three consonants in the Chinese name. In the normal orthography of Hebrew, it is common to specify only the consonants. Bow chose the three Hebrew consonants that most nearly conformed to the Chinese pronunciation (**Figure 2**, overleaf). Hebrew doesn't

IPA for Delight Wang's Chinese given name:
[ʃ i n z i]
Consonants in the Chinese name:
[ʃ n z]
IPA for consonants chosen by Bow:
[ʃ n g]

**Figure 2.** Bow chose the Hebrew consonants that most nearly conformed to the consonants in the Chinese name.

have a [z] sound, but the gimmel stands for [g] the closest available phoneme, and the one that native speakers normally use to render a [z] in a borrowed word.

The odds that someone selecting three letters out of the twenty-two letter Hebrew alphabet would have chosen this sequence are 1 in 10,648. Since the researcher with Bow did not know the name of the girl in the picture, and nobody else was in the room, the only logical explanation is that the answer came from Bow.

The next example is from the following year. The Project Bow intern in the summer of 2008 was Katie Thurston. She stayed with Bow until the beginning of September 2008. Katie is English, and she had been a student at the University of Edinburgh. Not only did she not speak Hebrew, something that Bow held against her, but her pronunciation of English was not American, and hence unfamiliar. At first Bow mistrusted her. Eventually, though, Bow came to respect and like the new intern, and he began to spell with her. Ms. Thurston even tried to learn a little Hebrew from him, but Bow refused to teach her, claiming that she was “stupid”, because she did not know Hebrew.

Instead of helping the new researcher learn Hebrew, Bow, on one occasion at least, tried to mystify her by telling her in Hebrew what she could understand only when spelled out in English. In the clip from September 3, 2008 (see Clip 08090301–3) transcribed in **Figure 3**, Bow told Katie Thurston that he was full in three ways:

1. He used the number 7, which when spelled out makes the word for “sated”: שבע
2. He spelled out the word for “full”: מלא
3. When she didn’t understand the above, he spelled out in English: “I am full.”

Ms. Thurston had picked up a little Hebrew in her three months with Project Bow. She knew the words for “Mommy,” “Auntie,” and “no.” But this did not make her a speaker of Hebrew, and she did not understand what Bow was telling her.

The intern did not know that, if spelled out in letters, the Hebrew word for seven was identical in spelling with the word for “sated”. She did not know the Hebrew word for “full”. There were no others present, besides Katie Thurston and Bow. Is there any better explanation than that Bow was the one who pointed at the letters?

KATIE: Okay, come on.

BOW: 7-7-1-7-8-7-8-7-8  
7-7

KATIE: What's seven go to do with anything? Mommy's not Auntie. Seven. That doesn't make sense.

BOW: 7-1-7  
8-7-8

KATIE: 8!8!8! Bow would you like to ask for something more to eat? Boy you've only had an apple and I've put out all this food for you and I don't know why you don't want any. Why don't you want any food Bow? Hmm? Why don't you want any food? Come one, tell me!

BOW: B-E-C-A-U-S-E-E-A-T-I-N-G-A-P-A-P-P <drops Katie's hand>

KATIE: Do you want to say what you want to say properly? Do you want to concentrate and do it? Come on, come on, come on!

BOW: B-E-C-A-U-S-E-I-A-M-F-U-L-L

KATIE: After one apple you're full?

BOW: Y-E-S

KATIE: Are you sure?

BOW: Y-E-S

KATIE: So shall I clear the food?

BOW: Y-E-S

**Figure 3.** Transcription of clip 08090301-3.

4. CONCLUSION. Language use in reality does not consist of answering questions that everybody already knows the answers to, as in the case of most double blind, replicable experiments approved by the scientific community. Real instances of language in action involve the production of spontaneous utterances that convey new information that an interlocutor does not know. Each such event is unique and not replicable. The evidence presented in this paper was of serendipitous occurrences that were in fact double blind – the interlocutor did not know the answer and Bow did not know what he would be asked. The only problem is: each event was unique and non-repeatable.

The following suggested standard might help resolve the problem of proof in ape language studies, as well as in the case of humans using facilitated communication:

THE BUT FOR TEST: If a conventional association between form and meaning is statistically unlikely to be made randomly, then the association by the subject of

this form and meaning can be viewed as evidence in favor of spontaneous language use by the subject, when those present with the subject did not know of the conventional association in question.

This test can be used in cases of lack of shared context between the researcher and the subject. It can also be used where the subject is bilingual and the researcher is not, or when the subject is fluent in a language that the researcher does not know. Bilingualism on the part of research subjects, both human and non-human, is a seldom utilized but effective method of reducing contextual cuing without diminishing spontaneity. In this case, the results need not be replicable. They need only be something that could never have happened by chance.

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