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A Study in Vocal Mimicry of the African Grey

by Pamela Ayres

INTRODUCTION TO VOCAL BEHAVIOR

Although African grey parrots (*Psittacus erithacus*) have been kept in captivity for centuries, little has been written about their vocal behavior in the wild state or the aviary. Forshaw (1973) and Bannerman (1953) note that they call "loudly" while in flight. Mackworth-Praed and Grant (1962) observed this calling while the birds were feeding, and describes the calls as a combination of "chattering, screaming and whistling" notes.

THE GREY AS A VOCAL MIMIC

There are several reasons the grey parrot has obtained a reputation as an excellent talking bird. Greys often learn to mimic quickly. Mowrer (1950) describes a grey which was talking within two weeks of purchase. Todt (1975b) notes that most of his five grey parrots learned new words within three days. The grey's ability to indefinitely learn new words is suggested by Nottebohm (1970), whose grey, at 20 years of age uttered one hundred different words within a period of a year, and was still adding new words. From casual observations it is my belief a parrot retains most of what he learns for some time.

TRAINING PUCK THE PARROT

Developing a Training Method

When obtained, Puck was approximately six months of age. He was very quiet, compared to current behavior, uttering only a growl, a crunching sound, a squeal or a shriek several times a day. Within a few days he was willing to take

food from my fingers. I rewarded any sound I heard him make by rushing to his cage and handing him a sunflower seed. He was soon willing to make a crunching sound any time a sunflower seed was offered to him. I repeatedly said "Time to Eat" each time I handed him a sunflower seed, and made a repeating tape of this phrase which was played to him several hours a day. A repeating tape of "Preen" was later used. I continued these techniques for four months without noting any change in Puck's repertoire.

It was at this time, May 1977, that I read an article by Gramza (1970) which suggested that captive birds are encouraged to mimic in captivity when their environment is stimulus-poor. I put Puck in a closet where he got a minimal amount of light, and could stick his head out of the door. In that greys have been reported flying till late in the evening, and are "shy" as compared to other parrots (Mackworth-Praed and Grant, 1962), this darkened environment may have been more secure to Puck.

Regardless of cause, the effect was almost immediate. Within two days Puck was producing a number of different noises. These included the noises previously mentioned as well as a clicking sound, an och sound, a tch sound, an ah-ah sound, a yuk-yuk sound and a ya-ya-ya sound, as well as a one syllable whistle. Some of these sounds were repeated in long sequences, whereas others, such as the shriek, were always emitted singly. Sessions of vocalizing lasted up to 50 minutes. I found that by saying "Hello" when Puck said "ah-ah", this sound began to gradually approximate hello. Within a week he was saying "Hawow", and the L sound was soon appropriately added.

Teaching Puck Words

By this time I had completely given up on the tape recorder as a tool for teaching Puck to "talk". I found that Puck picked up a number of sounds on his own, and that these could be shaped into words, as I had shaped "ah-ah" into "hello". New sounds could also be introduced by repetition. I found that most words I made in the morning, if repeated over and over, and spoke them before I had any physical contact with Puck on a given day, would begin appearing in his repertoire within a week. Once a new sound appeared, I reacted to his uttering it without fail until he was producing it to my satisfaction. Being at the beck-and-call of a parrot can be tiring, so I adopted a strategy of going into another room where I couldn't "hear" Puck when I had had enough. After about a month Puck was moved from his closet to the main part of the room without any noticeable effect on his verbal behavior.

Teaching Puck Verbal Discriminations

The first association I taught Puck was the word "Eat", which he was to utter when a sunflower seed was presented. The seed was held just out of Puck's reach and the word "Eat" was said in an emphatic, drawn out, fashion. Puck will often attempt to join in and complete a word or phrase when it is drawn out. He was soon willing to say "Eat" without prompting. I repeated "Eat" each time he said it, to emphasize pronunciation. "Preen", "Come here", "Water", "Peanut", and "Toy" were subsequently taught by this same manner. As Puck was encouraged for some time to say "Eat" when he wanted to chew on a non-edible object, "Eat" is still often used where "Toy", his most recent acquisition, would be appropriate.

Requesting versus Identifying Stimuli

A regular routine developed where Puck would initiate a conversation with "Hello", follow by answering hello with "Come here", and request food, water, or attention when I went to his cage. He had me well trained. It is impossible to measure, however, whether he requested food because he wanted to eat, because he liked being handed food, because he enjoyed hearing me echo his "word" or any of a number of other possibilities. When presented with something he did not presumably want, such as water after his thirst had been satisfied, he ignored the stimuli and elicited other inap-

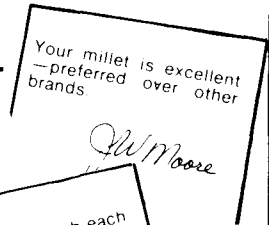
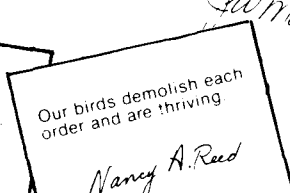
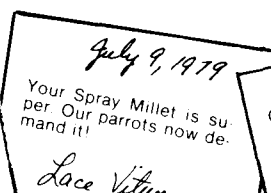
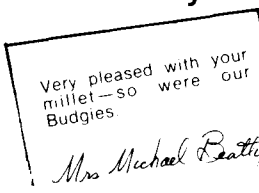
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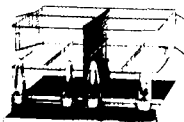


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appropriate "words". It could be logically said that since he did not want the water, why should he ask for it, and why not request something he did want? However looking inside a parrot's head for motivations is even less valid than making assumptions about what people are thinking.

To get around this problem, Puck was transferred to a schedule where he could only receive objects when a) they had first been presented to him and b) this was followed by his eliciting the appropriate vocal response. By alternating stimuli so that in a given session all possible stimuli (water, food, peanut, head scratching and toys) would eventually be presented, Puck adjusted to this training method. It may be that he was willing to give up making requests as he realized that eventually the stimuli he wanted would appear.

PUCK'S PRESENT REPERTOIRE

Size and Composition

At about 21 months of age, Puck had been talking for about ten months. Nine hours of taping, over a 24 hour period, were made to determine something about Puck's repertoire. This was a normal day, with the normal background noises of radio and television. Two people live in the apartment with Puck, so vocalizations were measured along five variables: 1) what Puck said when I was in direct physical or verbal contact with Puck, 2) what Puck said when Alex, the other person in the apartment, was in contact with Puck, 3) Puck's sounds when we were both in contact with Puck, 4) Puck's noises when neither of us were in contact with Puck, but I was in the apartment and therefore in hearing range, 5) Puck's noises when I was out of the apartment. Alex does not pet or play with Puck, although sometimes they "talk" to each other. One of Puck's vocalizations, "Lo", is said in Alex's voice, all others are said in my voice. The vocalizations that Puck made were divided into six classes. The first class was *parrot noises*, which were those noises which both a) had been emitted before Puck learned his first word and b) did not approximate any identifiable human sound. The second class was *words Puck has learned which were no longer reinforced* (that is were ignored when he said them), the third was *human sounds Puck had learned* (such as "clearing his throat") which were no longer reinforced. The fourth category, *words which were presently reinforced*, in the order order they were learned, consisted of 1) hello,

1) preen, 3) eat, 4) water, 5) come here, 6) peanut, 7) hi, and 8) toy. The fifth category was *nonsense words, which were not reinforced*, and ranged from simply combining two known words, to long sequences of repeated sounds. The final class was a special type of nonsense word — the *shortened word*. Most of these were real words, such as nut, come, and thank, however they were abbreviated forms of the original verbalizations peanut, come here, and thank you. In all but one case they were the accented syllable of the longer phrase.

Contained in the nine hours of taping were 1869 sounds or phrases. Of these, 77 different sounds were distinguishable.

Table I lists the number of different words or sounds within a given class (the Types), as well as the total number of emissions falling into each class (the Token). Table II ranks the most commonly produced sounds.

Hello, Hi, and Come Here

The four words produced most frequently were "Hello", "Toy", "Hi", and "Come here". As "toy" was still being shaped, the day of the taping was the first day I did not answer Puck's "Toy" with my pronunciation of "Toy". "Hello" and "hi" were likewise uniformly answered, as this was the means by

TABLE I

Class	Number of Distinguishable Sounds	Frequency	% of Sounds Produced
Reinforced Words	8	1032	55.2
Parrot Noises	10	532	28.5
Non-reinforced Sounds	6	133	7.1
Non-reinforced Words	8	78	4.2
Nonsense Words	36	49	2.6
Non-reinforced Shortened Words	7	45	2.4
Total	75	1869	100.0

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TABLE II

Sound	Class	Frequency
<i>Hello</i>	Reinforced Word	403
<i>Squeal</i>	Parrot Noise	234
<i>Toy</i>	Reinforced Word	226
<i>Hi</i>	Reinforced Word	154
<i>Och</i>	Parrot Noise	134
<i>Growl</i>	Parrot Noise	103
<i>Come Here</i>	Reinforced Word	94
<i>Preen</i>	Reinforced Word	63
<i>Peanut</i>	Reinforced Word	42
<i>Whistle</i>	Non-reinforced Sound	42
<i>Click</i>	Parrot Noise	40
<i>'Lo</i>	Non-reinforced Shortened Word	30
<i>Burp</i>	Non-reinforced Sound	30
<i>Eat</i>	Reinforced Sound	27
<i>Bye bye</i>	Non-reinforced Word	24
<i>Clear Throat</i>	Non-reinforced Sound	24
<i>No</i>	Non-reinforced Word	24
<i>Water</i>	Reinforced Word	23
<i>Kiss Sound</i>	Non-reinforced Sound	22
<i>Other Non-reinforced Words</i>		30
<i>Other Non-reinforced Shortened Words</i>		12
<i>Other Non-reinforced Sounds</i>		15
<i>Nonsense Words</i>		49
<i>Other Parrot Noises</i>		21
Total		1869

which Puck was encouraged to initiate verbal contact. "Come here" was the phrase that, if proceeded by "hello" or "hi", drew me to Puck's cage. "Hello" was produced on the tapes 403 times, which was almost twice as much as the next most commonly produced sound. "Hello" and "hi" combined amounted to 30% of all vocalizations, 42% of all learned vocalizations, and 54% of the reinforced vocalizations.

Several authors have suggested that a parrot used his vocalizations to remain in contact with an individual (Mowrer, 1950). This has been likened, by Todt (1975b) to duetting between a mated pair of birds in the wild state — a pair in captivity consisting of the parrot and its trainer. Antiphonal duetting has been recorded in two species of parrots, the orange-chinned parakeet (*Brotogeris jugularis*) by Power (1966) and the orange-winged Amazon (*Amazona amazonica*) by Nottebohm (unpublished). Nottebohm refers to his studies of the vocal behavior of the orange-winged Amazon in two other papers (Nottebohm, 1970)(Nottebohm, 1976). If Puck was trying to maintain verbal contact with me, it would be expected that the majority of his sounds would be made when I was in the apartment but not in direct contact with him. 60% of all vocalizations were made at this time (see Table III). This suggests a significant motivation for Puck's vocalizing is to obtain a vocal or non-vocal response from me. A final behavior of Puck's which is suggestive of a type of duetting is his tendency to complete a drawn out phrase. A common example is:

Me: Heeelllooooo
Puck: 'Looooo

Nonsense Words

Nonsense words were a broad class of vocalizations which included long phrases such as "Hankybabbbabba" as well as simple variations on known words such as "Hinut". Puck had just learned the word "toy" and was experimenting with the T sound. "Tello", "Tokay" and "Tochere" all appeared on the tape. This tendency of Puck to take a sound and vary it can be used to shape one basic sound into a number of different words. For example, from the sound "baba" Puck learned to say "Baby", "Boy", "Bye-Bye" and "Why". Thirty-six distinguishable nonsense sounds occurred on the tapes, but few were repeated (Table I). The longer phrases of babbling which Puck makes may be attempts to imitate the sound of human conversa-

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TABLE III

		Parrot Noises	Reinforced Words	Non- reinforced Sounds	Babbling	Total # Under Condition	% of All Sounds
Direct contact with trainer	Frequency % class under condition	100 23.1	304 70.0	23 5.3	7 1.6	434	23.2
Direct contact with Alex	Frequency %	12 36.4	16 48.5	5 15.1		33	1.8
Direct contact both	Frequency %		5 1000			5	.2
Trainer in apart- ment, no contact	Frequency %	339 30.4	587 52.6	158 14.2	31 2.8	1115	59.7
Trainer out	Frequency %	81 28.7	120 42.6	70 24.8	11 3.9	282	15.1
Total emissions of		532	1032	256	49	1869	class
Class' % of All Sounds		28.5	55.1	13.8	2.6		100

tion, as this is what it sounds like from a distance.

Todt (1975a) found that over a period of two years grey parrots spent an increasing percentage of time saying phrases in an order other than the order they were taught. As the phrases his parrots were taught are in German, the type of rearrangement is not clear to me. Todt (1975a) found that after two months these recombinations did not occur more than random, however by ten months 4% of the phrases were occurring in different arrangements more than would be expected by random vocalizations. By 24 months, this amounted to 16% of the times the phrases were said. This experimentation with learned vocalizations occurred "in the absence of social partners". As can be seen from Table III, Puck's percentage of emissions of nonsense words among the vocalizations under a given condition increased the less contact I had with Puck.

DISCRIMINATION TESTS

Five testing sessions were used to see 1) if Puck could choose the appropriate word from his repertoire to respond correctly to one of six stimuli and 2) to test how Puck would use his vocabulary to identify semi-familiar and unfamiliar objects.

Tests I – III

Puck sat on his stand or his perch,

both of which were in the same room and familiar to him during these tests. In all cases there was background noise, either a radio or the television. For casual observation I believe Puck does not learn new words from these stimuli. The order of stimuli to be presented were recorded ahead of time. Each stimulus was presented, and a vocal response was awaited from Puck. When he responded he received the object, regardless of the correctness of his response. Occasionally his response was so quiet I had doubts it would be recorded. The object was withheld until a louder response was emitted. The stimuli were 1) Hello, said by me, to which he was to reply "Come here", 2) a red plastic object to which he was to say "Toy", 3) my fingers rubbing his beak or head to which he was to say "Preen", 4) a sunflower seed to which he was to say "Eat", 5) a peanut to which he was to say "Peanut", and 6) a cup of water to which he was to say "Water". The stimuli were presented as follows:

- Test I : 4,3,6,4,2
- Test II : 3,2,5,6,3
- Test III : 1,6,5,3,2

The tests were recorded on a tape cassette which was listened to by three different people, each recording the responses they heard Puck say. Previous to the experiment one person had heard Puck often, the second occasionally, and the third had only heard Puck say "Hello". None of the judges were involved in training Puck.

Test IV and V

These tests were performed under the same conditions as Tests I through III. The purpose of these tests was to learn something about what the different words might correspond to for Puck. Puck regularly responds to the faucet running by saying "Water". It was also noted that subsequent to these tapings, Puck responded to a spoonful of peanut butter on two occasions (both times it was offered) by saying "Peanut", which he was taught to say in response to a whole unshelled peanut. These instances suggest that Puck does associate the words he is taught with characteristics of the corresponding stimuli.

In Test IV a number of objects which should generally fall under what Puck calls either eat or toy were presented to Puck. Some were familiar, such as a sunflower seed, an ear of corn on the cob, a peanut, and his red plastic toy. The others were not. The objects and the expected responses are listed below:

- 1) pencil toy
- 2) pen toy
- 3) sunflower seed eat
- 4) red toy toy
- 5) red eraser toy
- 6) corn on cob eat
- 7) matchbook toy
- 8) apple slice eat
- 9) dry corn eat
- 10) peanut butter on cracker eat
- 11) zipper toy



This interesting photo of a pair of African Greys was taken by Manuel Iglesias, Jacksonville, Florida. It was one of the several outstanding photos that were entered in the 1979 AFA photo contest.

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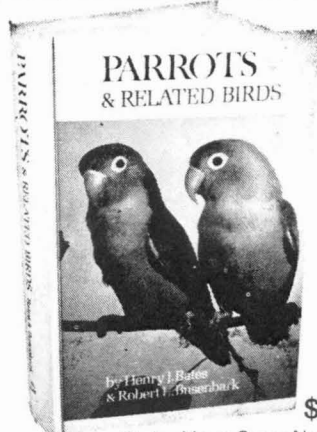
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- 16) peanut eat or peanut

Puck's responses to each object were recorded and analyzed as in Tests I through III.

In order to avoid the confusion between similarities of "eat" and "toy" - both being objects Puck took in his mouth and chewed, presumably swallowing only eat objects - a number of "eat" objects were presented and alternated with two other familiar stimuli - "water" and "preen". The objects and expected responses are listed below:

- 1) sunflower seed eat
- 2) fingers rubbing beak preen
- 3) corn on cob eat
- 4) slice of apple eat
- 5) water water
- 6) sunflower seed eat
- 7) peanut eat or peanut
- 8) fingers rubbing beak preen
- 9) peanut butter on cracker eat
- 10) dry corn kernals eat
- 11) corn on cob eat

These were recorded and analyzed in the same manner as other tests.

Results of Tests I - V

A difficulty arose in analyzing the tapes in that the people listening to the tapes could not always hear what Puck was saying. Puck, in human fashion, speaks at a lower volume when in close contact with a person. Several of the responses from sessions IV and V were inaudible. As these sessions were longer and varied in procedure from the training sessions usually used with Puck, it is possible his responses were quieter due to confusion. It was decided that if two of the three evaluators heard a response and were in agreement, their analysis would be used. Only one stimulus-response sequence was therefore excluded, number ten of Test V, as only one person heard Puck's response. In only two cases out of 41 did the evaluators disagree. The person who had had the least exposure to Puck reported two answers, number six of Test V and number four of Test III differently than the other two evaluators.

Tests I - III

Of 15 stimulus-response sequences the records of two people matched the master copy. One person recorded "toy" where the correct answer was "preen". This would suggest that Puck is capable of discriminating between different visual and in one case auditory stimuli and choosing the appropriate corresponding word from his repertoire.

Tests IV and V

On Test IV, which tested discrimination between eat and toy objects, Puck had 11 out of 16 responses correct. This is better than chance. It should be pointed out that Puck had many words in his repertoire which would have been inappropriate, could have been used, but were not. All the 'mistakes' Puck made were saying "eat" when "toy" would have been more appropriate. The stimuli Puck 'got wrong' were unfamiliar stimuli and it is possible Puck did not know whether or not the objects were edible. In Test V, although one person thought Puck said "water" where the correct response was "eat", the other two people gave Puck perfect scores. The test was similar to Test IV, but avoided the confusion of eat and toy. These two tests show that Puck is able to identify other edible objects as "eat" besides the one he was taught. The first suggests Puck is able to likewise identify unfamiliar toy objects as "toy". It is therefore probably that "eat" does not mean "sunflower seed" to Puck, but "something to put in my mouth, chew and (maybe) swallow" - both the action and the object to do the action to. These tests show Puck's ability to adapt his vocabulary to new stimuli.

LANGUAGE

Although Puck has successfully learned to make certain verbal discriminations and has suggested an ability to generalize, it does not follow that Puck is capable of learning a sophisticated "language". It is also a mistake to assume that a parrot's perception of the universe coincides with human perceptions; 180 million years of separate evolution and a fundamentally different brain structure cannot be ignored.

On the other hand, it is clear that a parrot is not limited to "parroting" speech. There is an intelligent alien living at my house, and "words" are the tools it uses to communicate some of its

simpler desires. What Puck wants beyond "eat", "water", "toy" and "preen" can only be guessed at, but would certainly be interesting to know.

The magic of talking to the animals and the animals talking back is basic to many mythologies. In modern times man has made some scientific efforts to teach spoken language to animals. First he tried the chimpanzees, and then he tried the dolphins. Neither had the necessary vocal equipment, but both were mammals. Man looked for intelligence in that which was man-like.

And all the while the parrots were talking.

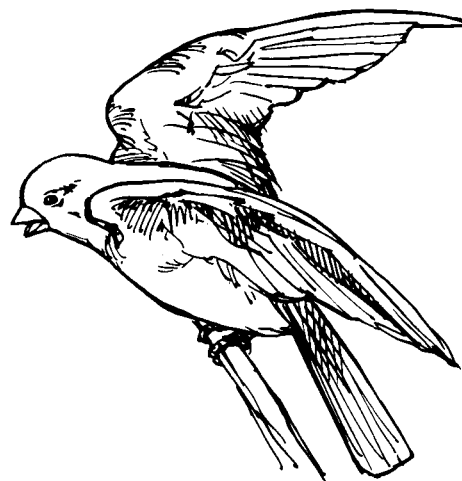
FOOTNOTE

Since these experiments were completed over a year ago, I have not had as much time to work with Puck. None the less he has made some advances.

He now calls me by name "Pam", as well as calling "Alex" for my husband. He says "Puck want eat" to request food and "Puck want toy" to request a toy. Whenever he bites fiercely at an object (or person) he shouts "No!". He is learning "Puck want preen".

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