



## *The Alex Foundation Newsletter*

September/October 2006

[www.alexfoundation.org](http://www.alexfoundation.org)

Issue 6, Volume I

### What's Happening in Research

#### **Color by Numbers and Numbers by Color!**

By Elaine Hutchison

Alex is known for showing the world just how smart African Grey parrots are...and he's known for breaking barrier after barrier in the world of animal intelligence. But now he's achieved a feat that no other animal has ever achieved, a feat that we believe will wow the world—and it's a feat he accomplished all by himself!

Dr. Pepperberg's newest paper, "Ordinality and Inferential Abilities of a Grey Parrot (*Psittacus erithacus*)," has just been published in this month's *Journal of Comparative Psychology*. This paper outlines Alex's newest achievement in number comprehension. We think it will amaze you as much as it amazes us.

Alex now knows that the number of objects on a tray, six sticks for example, can be represented by the vocal label "six," and that the written numeral "6" represents those objects as well as the vocal label. This may not sound too astonishing, but what he does with this knowledge is quite amazing--as is the story of how he reached his current level of understanding.

#### **It's as easy as 1-2-3**

For some time, Alex has been able to name the color of an item and he's been able to count the number of objects presented to him. Alex's math education also included being taught the vocal label of written number symbols, such as spoken label "five" for "5."

When learning these verbal labels for the written number symbols, Alex learned them differently than we humans do. Human children are generally taught to count in an order of numbers, such as 1, 2, 3, 4, 5 and so on. Learning numbers in this manner automatically infers the order or numerical value of the numbers (their ordinality) by their placement. However, children may demonstrate that they can determine which number is bigger than the other simply by the number's position in the order of the counting sequence, but they may not have a true understanding of the number's value.

Alex learned his written numerals in an "out of order" sequence, learning 3 and 4 first, then 2, 5, 6 and lastly, 1. Using refrigerator magnet numerals, Alex learned the names of number symbols using his knowledge of color. Dr. Pepperberg would ask (using the Model/Rival technique), "What number green?" when holding a green "4." Or she would ask, "What color 5?" when holding a red number "5."

Prior to this, Alex had learned how to label the number of the objects in a set and even to perform this behavior for similar objects interspersed with different objects. For instance, when 4 red objects were placed among 6 blue objects, Alex was asked "how many red?" and he could correctly answer "four." Consequently, Alex knew that the number of objects was represented by a vocal label that described that number.

When Dr. Pepperberg combined all these skills into a number comprehension test for Alex, an amazing thing occurred.

### **"Which bigger?"**

Out of Alex's sight, a tray was prepared with either two refrigerator magnet numbers of different colors or a set of objects combined with one refrigerator magnet number, with the set of objects being one color and the number symbol being another color.

For example, Alex was presented with three red objects and the number symbol "5." Alex was then asked,

"What color number is bigger (or smaller)?" And he answered correctly. This indicated that Alex understood that the single number symbol "5" represented a larger object set than the three objects sitting in front of him.

This type of problem was alternated with other types of number comprehension tests. Also out of Alex's sight, another type of tray was prepared, one with two different number symbols, each with a different color. These were presented to Alex, and he was again asked, "What color number is bigger (or smaller)?" And he would again answer correctly.

### **An Unbelievable Understanding**

The last type of number comprehension challenge was especially revealing. Once again, out of Alex's sight, a tray was prepared for his test. But this time, the two number symbols of different

numerical value (and two different colors) had a different physical size. For instance, a larger "2" symbol would be placed next to a significantly smaller-sized number "5." Alex would be asked the same question, "what color number is smaller (or bigger)?" He answered correctly with respect to the value of the symbol, not its physical size.



His responses in this test were nothing short of stupendous. Years prior to this, Alex had been taught to recognize physical mass as a qualifier for bigger or smaller. In past learning sessions, he had been asked to determine which key was bigger or smaller when presented with two keys of varying sizes.

In this number comprehension test, rather than paying attention to the physical mass of the number symbol, Alex recognized the number as a symbol of numerical value. This proved that he has a true comprehension of the numerical value of a number symbol AND how that number value compared to the other—in short, he recognized ordinality.

### **Alex's Singular Accomplishment**

Why is this so amazing?

One aspect that astounds us is that Alex made the connection himself. As Dr. Pepperberg says, “Alex demonstrated that he inferred the ordinal relations among his number symbols without direct training of the one-to-one correspondence between these numbers and their corresponding object sets, and without having been trained to recite the numerals in order.”

Alex had first been taught the vocal label for set of objects, and had then been taught the vocal label for the number symbol. His agile avian brain made the leap of understanding that the same vocal label represented two very different concepts, a numerical value and the label of a symbol. But Alex made an even bigger leap when he understood that the vocal label for number symbol represented the numerical value of that same vocal label. Of equal importance is Alex's grasp of the relations of these numbers to each other. He realized their ordinality by their true numerical value.



Alex surpasses chimpanzees in this respect. Chimpanzees can be trained to realize that a written number corresponds to a certain number of objects in a set, but they must be trained in a direct manner, by identifying the written numeral with the object set. A chimp's understanding of ordinality was likewise based on a trained comprehension of the numeric symbol based on the number of objects in a set.

We humans somehow expect chimpanzees to outperform all other species in assessments of animal intelligence, perhaps because they are so much like us in appearance and social behaviors.

But the world must now take notice of this bird, this parrot named Alex—a creature so unlike us in appearance but so singular in his ability to assimilate information and draw his own conclusions. And most tellingly, the conclusions he draws prove that he has an intelligence that is comparable to and sometimes surpasses very young human children.

What lies ahead for Alex as he progresses in mathematical concepts? Addition? Subtraction? Only through time, donations and the endeavors of Dr. Pepperberg and her staff will we be able to know what Alex can fully accomplish.

But one thing is for sure. We're sure Alex has more amazing feats in store for the rest of the world, and that these feats will once again prove the incredible intelligence of African Grey parrots.

## What's Happening in the Lab

*American Federation of Aviculture Fellowship  
Award Winner  
Jessica Balter*

When I began working at the Pepperberg Lab, my adoration for animals was taken to a whole new and rather exciting level. Having experience fostering baby sparrows and with my own Blue-crowned Conure at home, I have always had an interest in birds. Now a senior at Brandeis University, I am preparing to apply to veterinary school. My time working with Dr. Pepperberg, Alex, Griffin and Wart has been personally rewarding and essential to supporting my choice of veterinary medicine.



This is my second year working at the lab. The delight I receive from watching Griffin eagerly solicit a nut or hearing Alex insist, "time to go eat dinner" as I am closing the lab for the night is still as strong as it was my first day.

Recently, Dr. Pepperberg awarded me with a fellowship from the American Federation

of Aviculture. In addition to allowing me to work more intimately with Alex, this honor has provided me the opportunity to explore the cognitive abilities of birds in relation to other, higher functioning mammals. The experience that I continue to gain in animal behavior will undoubtedly be of benefit to me when I matriculate into veterinary school. Not everyone has the opportunity to work with academics as cultured as Dr. Pepperberg or animals as advanced as Alex.

The research project I have begun with Dr. Pepperberg is aimed at exploring Alex's ability to perform addition. Past experiments have suggested that Alex does indeed have a fundamental understanding of basic math. Rather than using groups of individual objects, this project utilizes Arabic numerals. If Alex continues to answer with the amount of success seen in early trials, the results can be enlightening. Rather than estimating the relative size of each group as larger or smaller, here Alex must not only recognize the numeral to represent a specific quantity, but he must also have a relative understanding of the ordinal relation between the numbers. In conjunction with the results from previous studies, perhaps this project will further reveal just how similar Alex is to you and me.

## Dr. Pepperberg's Speaking Schedule

- 📅 October 5, 2006. Invited speaker, IgNobel Awards Ceremony, Harvard University, Cambridge, MA (Invitation only)
- 📅 October 21, 2006. Invited speaker, Bird Paradise, Burlington, NJ  
<http://www.birdparadise.biz/palooza.html>  
(open to the public)
- 📅 November 4, 2006. Invited speaker, Tree Top Bird Center, Dallas, TX (open to the public)
- 📅 November 15, 2006. Book signing and speaking engagement, ABC Pets and Humble Civic Center, Houston, TX (open to the public)
- 📅 Invited speaker, December 20, 2006, Department of Biology, UCSD (open to the University community)
- 📅 January 12-15, 2007. Invited speaker, Winter Bird Festival, Morro Bay, CA  
(open to public; please visit the Morro Bay website for more details.  
<http://www.morrobaybirdfestival.org/festlinks.htm>

## What's Happening in Fundraising

On October 21<sup>st</sup>, Dr. Pepperberg will once again be appearing at Bird Paradise for their 3<sup>rd</sup> Annual Parrot Palooza event in Burlington, NJ. Dr. Pepperberg will be doing a presentation and a demonstration on the "model/rival" technique that is used at her lab. Contact Bird Paradise, and you could have your parrot selected to do a demonstration with Dr. Pepperberg! We will also be selling our Alex Foundation gift shop items, and Dr. Pepperberg will be signing her books, "The Alex Studies" and also "Alex and Friends".

Nikki Moustaki, behaviorist and author, along with her Grey "Rocky" from The Tony Danza show will also be speaking at this event. Contests, raffles and auctions held throughout the day. Free food and beverages served all day.

This is a great event that can't be missed, so please plan to spend your day at Bird Paradise and help support *The Alex Foundation*. For more information on the 3<sup>rd</sup> Annual Parrot Palooza, please visit their website at <http://www.birdparadise.biz/palooza.html>

## Our Super Sponsor !



*The Alex Foundation* is proud to feature our sponsor for September and October, Harrison's Bird Foods! This caring company (website [www.harrisonsbirdfood.com](http://www.harrisonsbirdfood.com)) has been a longtime friend and supporter of Alex and the gang, and the birds have certainly benefited from their wonderful foods—especially Alex.

Years ago, Alex suffered from aspergillosis. Although crop surgery helped correct the problem, the healthy food provided Harrison's Bird Foods put him "on the mend" in a big way. Alex bounced back from his surgery, grew some new feathers and is still on Harrison's Bird Food to this day.

Griffin and Wart also enjoy the benefits of this wonderful, organic avian food, and they love it! Harrison's Bird Food is as tasty to birds as it is healthy for them. Organic food is a terrifically important factor in the avian diet, and the birds' eager appetite for these delicious pellets is another added benefit.

In his practice as an avian veterinarian, company founder Dr. Greg Harrison saw too many patients that exhibited signs of inadequate nutrition. He realized the need for a pre-packaged diet that provided all the essentials, and Harrison's Bird Food was the result.

Because companion birds vary so widely in species and age, Harrison's provides a large assortment of diets. Check out their website at [www.harrisonsbirdfood.com](http://www.harrisonsbirdfood.com) and see their amazing product line! In addition to the core food formulas, their product line also features foods that provide a variety of taste sensations, such as a "hot" pepper formula and a toasted pellet with palm fruit oil. Yum!

Best of all, Harrison's provides a lifetime formula that eases the worry of parrot-owned humans everywhere. These companion animals are family members and we want to do the best for them. But because avian nutrition is complex and because nutritional needs vary from species to species, it's often hard to know exactly what is the best diet.

Dr. Harrison and his development staff of veterinarians and avian nutritionists have helped solve the problem of what is nutritionally best for our birds. In fact, one of Harrison's slogans is "your bird deserves the best." We, both the humans and the birds at *The Alex Foundation*, couldn't agree more—all birds deserve the best—and Harrison's organic bird food is one way of providing just that!

---

If you are interested in becoming a "Sponsor of the Month" please e-mail [alex@alexfoundation.org](mailto:alex@alexfoundation.org) for more information. We will display your company logo and link on our home page.

## In the News



2007 Edition of The Old Farmer's Almanac

<http://www.almanac.com/extras/pets/index.php>

The Justice – Student Newspaper at Brandeis University, September 19, 2006

<http://tinyurl.com/phsyg>

Reader' Digest Magazine, November 2006 edition.

(Not on newsstands yet)

Boston Magazine, "The Best of Boston"

(Not on newsstands yet)

Contributions to *The Alex Foundation* can be made on Alex's website, [www.alexfoundation.org](http://www.alexfoundation.org), or by sending a check or money order to the address below:

*The Alex Foundation*  
Brandeis University  
Department of Psychology, MS-062  
415 South Street  
Waltham, MA 02454

Some firms offer a corporate-matching program. If you are employed by a company that matches employee donations, your contribution to *The Alex Foundation* can do twice as much good. All contributions to *The Alex Foundation*, a non-profit 501c.(3) organization, are tax deductible.