Jumpstarting Sentience: Promoting Higher Consciousness In African Grey Parrots Through Early Language Acquisition

Breeann Wright

Scientists do not know exactly what consciousness is or how it comes about. They know that some aspects of it are unique to human beings, but they do not know why. Psychologists, biologists, and philosophers cannot even seem to agree on how to define consciousness; nevertheless, it it a much-investigated and contested area of study, as any definition of consciousness could pertain to the studies of neurology, psychological disorders, linguistics, philosophy, behavioral analysis, and numerous other fields. Often it seems that the only constant, when speaking of sentience or consciousness, is that consciousness is what humans have, by and large, and what animals do not. Occasionally, however, even this seeming constant may be called into question, in particular when examining the theories of primary consciousness, neuronal group selection, and species-specific variation in age of language acquisition.

Gerald Edelman suggests a differentiation between primary consciousness and higher-order consciousness, wherein primary consciousness involves being able to form concepts and complex discriminations, and is not unique to human beings, and higher-order consciousness requires primary consciousness as a starting point, but also makes use of higher-order processes, especially language. Individuals possessing primary consciousness only are incapable of placing themselves as selves in a time stream consisting of past, present and future. Additionally, only individuals possessing higher consciousness are capable of self-reflection, such as thinking "I am I," or of thinking about thinking: metacognition is purely a function of higher consciousness and cannot be accessed via primary consciousness alone. Unfortunately, metacognition is also impossible to determine with simple tests, and can only be reliably verified by an individual's lingual self-report. In Edelman's model, individuals of many species may have innate access to primary consciousness, and therefore be able to discriminate between concepts such as color and size, or even have a limited sense of numbers, but still not have access to higher consciousness because possessing primary consciousness does not automatically engender higher consciousness. Rather, an individual possessing primary consciousness, given the right set of environmental and social stimulation, will undergo a process of neuronal group selection, or neural Darwinism, such that various sets of neuronal patterns are interlinked and cross-connected in increasingly complex ways, with the end result that higher consciousness is demonstrated to be a function of the exponential increase in complexity (Edelman, 1990).

Fundamental to Edelman's model is the concept of language. He notes that language does not occur without higher consciousness, and higher consciousness does not occur without language: the two are inextricably linked. If language is absent, then there is no potential for higher-order consciousness. Language, because of its own inherent complexity and networked symbols, functions as a catalyst for neuronal group selection and, therefore, also for higher consciousness. Remove language from an individual's development, it is hypothesized, and that individual has no chance for higher consciousness. However, directly testing this theory on human subjects is impossible due to ethical constraints, as with-holding language

from a developing child is not only highly illegal but also highly unethical.

With the concept of development comes the widespread theory of an age of primary language acquisition. This does not mean the period in time during which individuals can easily learn second languages; rather it refers to the period in time in which individuals learn a first language. An individual human must learn a first language, be it spoken, written, or signed, within this time frame; if no language whatsoever has been learned by the end of it, then it is generally assumed by linguists and psychologists that that individual will never be able to learn any language whatsoever. Referring back to Edelman's theory of neuronal evolution, this lack of language corresponds with a lack of neuronal group selection, so that such an individual would also never attain higher consciousness: the occurrence of higher consciousness would then require not only the stimulus of language, but also that the individual receive that stimulus within the right time frame, i.e., before the age of language acquisition has passed. This theory is, again, impossible to directly test on human subjects, but may be partially borne out by observations of feral children who were not exposed to language until they had passed the age of language acquisition, in humans about seven or eight years old. Most of these children never attain average levels of human awareness, and are animalistic in their behavior and cognitive processes (Newton, 2003).

The subject of nonhuman behavior is not a new one. Psychologists, biologists, and ecologists have paid considerable attention to quite a few species, creating catalogues of common behaviors and fine-tuning training methods. However, serious investigation into nonhuman cognition has been primarily limited to the great apes – particularly gorillas and chimpanzees – and dolphins, most frequently the bottlenose dolphin (*Tursiops truncatus*). These experiments have been problematic, partially because of some problematic initial assumptions and partially because the species involved do not have the means to report back in a medium easily interpreted (Blumberg & Wasserman, 1995). While it is possible to assess an individual's intelligence by measuring performance on certain tasks, the only sure means of measuring higher consciousness, or sentience, is by self-report; without that self-report there is no way to either prove or disprove consciousness on the part of any individual or species. Many psychologists believe this limitation rules out meaningful experiments that would deal with animal consciousness rather than with animal behavior.

The previous theories indicate, however, that it may be possible to induce or facilitate self-awareness in a non-human species that possesses higher consciousness through early language acquisition. My goal is to identify a species appropriate to the research – that is, to select a species which demonstrably possesses primary consciousness, and which is easily accessible at infancy and for long periods of time thereafter so that researchers can apply language as a stimulus before the subject a) has passed any species-specific age of language acquisition, and b) has acquired the necessary physiological structures for self-report in order to confirm higher consciousness at the end of the experiment. The species selected should also have been the subject of study in the past, so that results from previous experiments could be compared to results from the new experiment. Dolphins and dogs, whether or not they have access to primary consciousness, do not meet the requirements for self-reporting, i.e., they cannot report through the medium of language because their physiological makeup prevents sign language and known human languages; gorillas and chimpanzees cannot report vocally, though there have been attempts to teach individual great apes sign language. Research indicates that experiments

with these species have reached a dead end. I propose to focus on a different species, specifically the Congo subspecies of the African grey parrot (*Psittacus erithacus*).

Dr. Irene Pepperberg is famous for her work with African grey parrots and language. In 1977 Pepperberg bought an African grey parrot which she named Alex, an acronym for Avian Learning EXperiment. In the decades since then, Pepperberg has conclusively demonstrated that African grey parrots have the ability to form concepts and discriminate between complex situations, and thus certainly have primary consciousness at the very least, but she has not yet determined how far their cognitive abilities may extend. Her primary bird, Alex, displayed comprehension of a number of concepts, but did not demonstrate complete facility with the English language, and therefore could not be a candidate for determining the presence of higher consciousness. This apparent lack of linguistic ability could be related to Alex's age when he was purchased; while Congo African greys do not usually begin vocalizing before they are a year old, they learn most of their vocal and social cues well before then (Hallander, 2003), and Alex was 12-13 months old at the time of purchase. It is entirely possible, even probable, that the age of language acquisition in Congo African grey parrots falls far before one year of age. Although without experimentation there is no way to determine exactly what that age might be, subject birds should optimally be as young as is feasibly possible.

African grey parrots seem, then, to be the ideal choice: first, individual birds have demonstrated the capacity for primary consciousness, and second, African greys can report back vocally, in the same medium that humans do. If, given the prerequisite of primary consciousness, language does indeed either encourage or induce neural Darwinism in order to form higher-order consciousness, then there is a possibility that the brain of any species possessing primary consciousness could re-order itself if it receives the proper stimuli from an early enough age. A new type of experiment is warranted: the proposed experiment will use African grey chicks to search for an answer to the question of nonhuman higher-order consciousness.

African grey chicks require certain types of stimulation at certain ages, much like human infants, but unlike human infants it is uncertain as to exactly when some of these earliest stages take place. It would be easy to misgauge a chick's developmental patterns and miss the critical window of language facilitation. So, under optimal circumstances, researchers would raise two chicks, from the time of their hatching, making every effort to mimic the chick’s natural environment, while another two chicks serving as the control group would be raised as one would normally raise them for a pet environment. The control birds would not interact with the researchers until they were weaned, as is normal for chicks intended to become pets. All four birds would be randomly chosen.

However, time, availability of researchers, and monetary constraints render using four birds impractical for my study. For this reason the study will be done with one bird and will use results from laboratory and pet birds as controls. Two researchers will work with the bird from a domestic environment, preferably a house or apartment, and refrain from changing the environment for at least the first eighteen months in order to avoid stress as a confounding variable.

For the first month, the researchers will attempt to mimic parent African greys when caring for the chick, except for replacing parrot vocalizations with human ones similar to those made by a human parent talking to an infant. The chick should be encouraged to vocalize using human phonemes and even simple words, such as names, food, water, and touch, but will most likely remain silent during this time period. Though it is clearly

impossible for humans to brood baby birds as the parents would, at least one researcher should be present at all times, maintaining a low-level stream of dialogue, interspersed with careful handling and feeding of the chick.

From five to seven weeks, the researchers should start transitioning the chick out into the main living area. The researchers should continue speaking to each other and the bird, but add basic language games similar to those played with young human children, such as identifying objects (toys, food) and object attributes (color, shape, size.) The bird should be encouraged to vocalize, but it is more important that the bird demonstrate understanding of whatever language is used by the researchers – being asked to touch a color, for instance, instead of vocally naming the color, or being asked to go to a specific person instead of vocalizing the person's name. This should be presented as an engaging and pleasant game for the bird, not as a frightening or harsh task. If the bird shows any signs of stress, of anxiety, or of disengaging from the activity, the researcher should immediately switch to a preferable activity, based on previous observations of the bird's behavior. Similarly, the researchers should involve the bird in common household activities, from vacuuming to folding laundry to eating dinner; the bird can be taught the names of different objects and activities, as well as performing simple activities such as using its beak and feet to sort silverware or place socks in one pile. At least one researcher should still be present at all times, and the bird should not be confined to a cage.

Once a bird demonstrates comprehension of simple language, or once it is seven to eight weeks old and investigating its environment on its own, the researchers can begin demonstrating the model/rival method, wherein one researcher gives instructions and a second demonstrates correct and incorrect responses. The researchers should involve the bird in this activity as a game, where the respondent is rewarded for correct answers, such as being given a grape after successfully identifying the object as a grape, as round, or as purple. The bird may vocalize requests for water, food, treats or games; but researchers should offer an alternative, e.g., of touching a symbol or performing a variable action, if the bird does not vocalize – the researchers would need at least five variables and thirty possible combinations to draw from. The variables could include color, shape, size, material, number, or any other category; the bird should learn to distinguish between the variables relatively quickly, at which point the researchers can proceed from using one variable to two, and then three. At this point in time, the bird should also be acclimated to a flight suit or harness so that later in the experiment it can be taken outside safely and without stress.

From about twelve weeks on, researchers should still be present for most of the day and preferably at night, but the bird can be acclimated to short absences. The bird may be taken outside in the car, on walks, to bird-friendly stores, to parks, and to campuses. Researchers should name the things encountered and work to make the activities engaging. If the bird is disinterested or frightened, the researchers should withdraw the bird from the environment and try again later. During this time period the researchers should continue to work with the model-rival method and language games.

The bird should wean between 14-16 weeks. Data can be collated on its apparent understanding of human language at any point after this, regardless of whether or not it is vocalizing. This could be done by selection tests, such as giving multiple criteria for a set of objects, or directed performances in exchange for rewards such as play, food, or attention. As an example, the bird might be asked to find the largest blue square on a tray with twenty objects of different shapes, sizes,

and colors; alternately, the bird might be given a series of commands on which each subsequent command depends on the bird having acted out the prior command. Testing sessions may be run once a week to evaluate progress with these “games”.

Further data on the bird's usage and understanding of language should be collected whenever it begins to vocalize using actual phonemes and/or words. Once the bird has been vocalizing for four months, researchers should run modified IQ tests, such as varying levels of Wechsler Intelligence Scales adjusted for non-human physiology and spatial coordinates, and compare the bird's results to the results of variously aged humans. Additionally, the bird's demonstrated cognitive abilities could be compared with the results from the ALEX project. Other tests could then be added under advice or at the researchers' discretion.

The primary anticipated limitations to the implementation of this experiment are time and people. Due to the time constraints of raising the chick, and the necessary social interaction, a minimum of two people will be necessary. In addition, this project will need to run for an absolute minimum of 18 months, preferably two years, and the researchers in question will need to be familiar with the intricacies of hand-raising African grey parrots. Facilities will probably not constitute a problem, as the goal is for the bird to live in a home environment; otherwise the bird could become neurotic due to lack of social interaction and stimulation, as is typical for this species when kept without adequate companionship.

What should researchers expect to see from this project? It is possible that there will be no dramatically different results from any of Dr. Pepperberg's results working with Alex, Wart, and Griffin. The hypotheses on which the experiment is based may themselves be flawed. However, such a long-term and carefully monitored experiment, whatever the outcome, would be cause for re-evaluating the theories of higher consciousness and its interlink with language, and might mark off one possible avenue of investigation. In the case of negative results, more studies with other species might be indicated, and under other circumstances, in order to further examine the limits of the hypotheses themselves.

If results demonstrate a higher level of cognition than that achieved in the Alex experiments, but fail to conclusively demonstrate higher consciousness, they would pose an interesting question: could the neural evolution have progressed further under different circumstances, with perhaps a different method and a different subject? Such a result might validate the hypotheses but prove that African greys do not make adequate subjects; further experimentation would, again, be warranted.

There is also the remote potential for results to indicate a higher consciousness which meets every level of tests, housed in an avian brain. If this were to be the result, then firstly it would very strongly confirm the hypotheses of higher consciousness as neural evolution facilitated by language; second, it would give rise to numerous questions for psychologists, linguists, neurologists, ethicists, and cognitive scientists. Exactly which neural capacities are necessary for the neural evolution of higher consciousness? Could other species replicate the results? What would be the implications for human cognition – could this demonstrate a fundamental misconception in the way that we, as a species, view ourselves and our thoughts? Any result, essentially, will be of interest, as it is likely to close down some avenues of exploration and open up others. But certainly one of the latter two results would be the most fascinating of all, with far-ranging implications that cannot be entirely glimpsed by investigators at this point in time.

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