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DRAFT

BEHAVIOR ANALYSIS AND PARROT LEARNING

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Some parrots behave in friendly, sociable ways while others are flat-out unapproachable. Some parrots entertain themselves for hours in their cages while others scream incessantly. Observing this kind of behavioral variability leads many of us to ask some very important questions such as: Why do parrots behave the way they do? How should we expect them to behave? Can they learn to behave as pets? Knowing the answers to these questions can make the difference between life-long success and failure to thrive for parrots in captivity, particularly in our homes. However, to understand, predict, and change behavior we first need to know how it works.

Behavior Analysis

Learning and behavior have been studied as a natural science within the field of psychology for well over a century. This science has come to be known as behavior analysis. Pierce & Cheney (2004) provide the following contemporary definition:

> Behavior analysis is a comprehensive experimental approach to the study of the behavior of organisms. Its primary objectives are the discovery of principles and laws that govern behavior, the extension of these principles over species, and the development of an applied technology. (p. 420)

Behavior can be investigated at many different levels of analysis as with genetics, neurology, and pharmacology. The focus of behavior analysis is the environmental determinants of behavior, from which behavioral learning theory[1] has been formulated and continues to be refined.

Behavioral learning theory explains a second kind of selection by consequences first recognized in natural selection (Skinner, 1981). Whereas natural selection is the process of functional genomic adaptation of an entire species across generations, learning is the process of functional behavioral adaptation of a single individual within its lifetime. The two keystones of learning theory are: 1) learning is largely determined by external, environmental influences, and 2) the laws of learning are general in nature, transcending species and situations. In its simplest terms then, according to each individual’s experience interacting with its environment, behaviors that “work” are repeated and behaviors that don’t work are modified or suppressed.

Over the last 60 years, the applied branch of behavior analysis has matured into a highly effective technology to solve practical, real world behavior problems. Its widespread applicability continues to expand having already been demonstrated across seemingly diverse areas such as special education, industrial safety, and animal management. Other names such as operant conditioning, behavior modification, and behavior therapy refer to the same basic intervention strategies, however applied behavior analysis includes a more rigorous and comprehensive course of action involving the scientific procedures of hypothesis generating (functional assessment), testing (functional analysis), and evaluation (measurement). Intervening to change behavior in this systematic way allows us to solve behavior problems with a high degree of precision, replicability, and accountability. In this chapter the tools and techniques of applied behavior analysis are discussed in reference to the care and management of captive parrots, particularly those kept as pets.

The ABCs of Behavior

The fundamental unit of behavior analysis is the 3-term contingency, described by Skinner (as cited in, Chance, 1998, p.38):

> An adequate formulation of the interaction between an organism and its environment must always specify three things (1) the occasion upon which a response occurs, (2) the response itself, and (3) the ... consequences. (p. 7)

These three terms comprise the behavior ABCs – antecedent, behavior, and consequence. Behavior does not occur independently of the environmental events that surround it, therefore there is never just behavior. The smallest element of behavior that can be meaningfully analyzed is an ABC unit, described further below.

Antecedents

Antecedents are the stimuli, events and conditions that immediately precede a behavior. They are functionally related to the behavior that follows if the appearance of the behavior depends on the presence of the antecedent stimuli. Antecedents set the occasion for behavior rather than cause it. For example, an open hand presented to a parrot can be an antecedent for either stepping up or running away, depending on the consequences the parrot experienced for doing so in the past. Thus, we can increase the probability that a particular behavior will occur by carefully arranging antecedents but ultimately the animal makes a choice to behave as we have planned or in some other way. By definition, the term operant (i.e., voluntary) behavior acknowledges the individual's power to operate on its environment.

Behavior

In applied behavior analysis, behavior is what an organism *does* that can be measured. The main focus is overt behaviors that can be operationally defined and unambiguously observed. Birds *do* jump off perches, hang upside down, rouse their feathers, bite hands, ring bells, pin their eyes and flare their tails. These behaviors can be unambiguously observed and measured according to different dimensions of interest such as frequency, rate, duration and intensity. Covert behaviors, including thinking and feeling, are private events that can only be observed and measured by the individual engaging in it. This makes parrots' covert behaviors impractical, if not impossible, behavior-change targets, at this time.

Psychological constructs, such as intelligence, neurosis, and confidence, are not behaviors. Gall, Gall & Borg (2003) define constructs in this way:

> A concept that is inferred from commonalities among observed phenomena that can be used to explain these phenomena. In theory development, a concept that refers to a structure or

process that is hypothesized to underlie particular observed phenomena. (p. 621)

Thus, constructs are what we think is occurring inside an organism that explains why it is acting in particular ways. We don't really perceive intelligence, neurosis, or confidence with our senses. What we perceive are overt behaviors such as talking in context, plucking feathers, and going to strangers without hesitation. Constructs are best thought of as place holders for internal processes as yet unknown involving nerves, brains, hormones and muscles (Manning and Stamp Dawkins, 1992). Unfortunately, constructs all too easily come to be thought of as real entities residing somewhere in the brain. This leads to what Gould (1981) calls the fallacy of reification and explanatory fictions. The fact remains that even when the underlying physiological processes that support behavior are understood, no account of behavior can be complete without the behavior-environment factor.

Vague labels, such as sweet, spoiled and jealous are also not behavior. Labels typically describe what people think a bird is rather than what it does. For example, the label "is sweet" tells us nothing about the behavior we want to train or maintain. We can't train a bird to *do* sweet but we can train a bird to step up for all family members. To improve our ability to understand, predict and change parrots' behavior, the focus should be on observable, measurable behaviors, not constructs or vague labels.

Consequences

Consequences are the stimuli, events and conditions that occur after a behavior and influence the probability that the behavior will occur again. There is a functional relation between a specific behavior and a consequence if the appearance of the consequence depends on the behavior occurring first. Social attention, items and activities, sensory feedback and escape from aversive events are all consequences that affect parrot behavior. Consequences are nature's feedback about the effectiveness of an individual's behavior. In this way, past consequences affect motivation for future behavior. This is the law of effect that states,

> In any given situation, the probability of a behavior occurring is a function of the consequences that behavior has had in that situation in the past (Chance, 2004, p. 99).

Thus, parrots, like all animals, don't just "suffer the consequences" – they learn from them how to behave in the future, given similar antecedent circumstances. Learning by consequences is a natural process that accounts for behavior in both the free range and captivity. Even innate behavior (elicited automatically, without prior learning) is flexible according to consequences. For example, although nest building tends to be stereotypical within many species, we expect that birds improve in their abilities to build them with experience.

Functional Assessment/Analysis

The ABCs form the basis of an important tool called functional assessment, the hypothesis generating phase of changing behavior. After carefully observing and operationally defining the target behavior (the one we want to understand, change, or both), functional assessment is the next step in any behavior change program. By hypothesizing the antecedents that set the occasion for a behavior and the consequences that give the behavior function, the chance of successfully changing behavior is greatly increased. For example, consider the following common scenario:

> Sam Parrot has started refusing to step onto Grace's hand from the top of his cage. Grace worries that Sam is trying to dominate her from his high perch, and she wonders if she should force him down with a towel to show him who's boss. It was suggested to her that she cut off the cage legs so as not to trigger this innate response again.

A functional assessment of Sam's prior step up behavior reveals a convincing alternative hypothesis to that posed by Grace: Sam refuses to step up to avoid being locked in his cage as indicated below.

> Setting: Sam Parrot is playing with his bell on top of his cage.

A: Grace offers her hand

B: Sam steps up

C: Grace returns Sam to cage.

Prediction: Sam will step up less often in the future.

The hypothesis that Sam no longer steps up from his cage top to avoid being locked in his cage can be tested by changing the antecedents, the consequences, or both, and observing any concomitant changes in the frequency of Sam's step up behavior. It is at this point that functional assessment turns into functional analysis. One possible antecedent solution is to allow Sam access to the cage top only when there is sufficient time for him to tire of being there. One possible consequence change is to offer a special treat as Sam steps up and to have a special item in the cage to be discovered once he's inside it.

The process of functional assessment allows us to generate highly specific and testable hypotheses about behavior-environment relations. The question addressed with functional assessment is not why does the bird behave this way, but rather what valued consequence does the bird get by behaving this way; in other words, what's the function of the behavior? It is through changing antecedents and consequences that behavior changes. Since the environment in which captive parrots live is largely controlled by their caregivers, changing parrot's behavior is usually the result of changing human behavior first.

The Problems with Dominance

With this foundation in place, we can better evaluate two common misconceptions about behavior that have caused particular problems for parrots and their owners. The first is that parrots are strongly motivated by an innate drive or character trait to dominate their human caregivers. The second is that caregivers must establish and enforce superior rank over parrots to control them. These two misconceptions, and many others like them, come to have a life of their own, independent of sound scientific information about behavior. They appeal to conventional wisdom and our penchant for quick fixes but in the long run they pose serious obstacles to appropriate learning solutions and the behavioral health of captive parrots. The important implications of these two fallacies are discussed separately below.

Parrots and Dominance

Giving commands, following orders, and jockeying for position within linear social hierarchies are common activities for most humans. These behaviors are well supported by our educational, religious, sports, military, and corporate organizations throughout our lives. We are also prone to observe, or think we observe, in other species that which we most expect to see. This problem, known as observer-expectancy bias, is well documented even among those who watch birds (see for example, Balph, D. F., & Balph, 1983.) Perhaps this accounts for the widely held and persistent belief among parrot enthusiasts that parrots' dominant nature impels them to refuse to step off cage tops (height dominance), to chase and bite humans and other animals while on the floor (floor dominance), to scream when the telephone is in use (phone dominance) and to lunge at feed doors (cage dominance). In the companion parrot arena, the different supposed forms of dominance that parrots use to subjugate their caregivers goes on, ad infinitum.

In fact, even among scientists the term dominance is ambiguous and varies significantly from report to report (an inherent problem with constructs). In technical usage, dominance generally describes some aspect of an animal's priority access to resources such as food, location and mates, which is often achieved through agonistic control of another animal. However, in Barrow's *Animal Behavior Desk Reference* (2001) there are seven different definitions of social dominance including four sub-categories, one of which has 2 subtypes. As reported by Barrow, "Hand (1986, p. 202) indicates that there is no agreement regarding how to define, or measure, social dominance."

To further complicate matters, Barnett (1981) suggests that "Dominance should be distinguished from an animal's superiority resulting from its being in its own *territory*. Dominance should also be distinguished from being a *leader*" (p. 633). Moreover, a critical omission in many discussions of dominance is variables such as changing motivations, contexts, and prior learning history (see for example, Cloutier, Beaugrand, & Lague, 1995). This lack of scientific consensus about what dominance is, should call into to question its usefulness for understanding and managing companion parrot behavior (as is currently being done regarding the behavior of wolves and dogs, see Mech, 1999, 2000; and, van Kerkhove, 2004).

Although some people support the validity of the dominance model applied to pet parrots based on free-range behavior, social hierarchies among wild parrots have not been well documented. Other people support the validity of the dominance model based on the unnatural demands of the captive environment. No studies could be located on dominance relationships between parrots and humans. One study, of a flock of 12 group-housed cockatiels (*Nymphicus hollandicus*), lends support to the hypothesis that males tend to hold higher dominance ranks than females, based on well-operationalized definitions of aggression, submission, and rank (Seibert and Crowell-Davis, 2001). These findings are consistent with those reported by Weinhold with aviary-kept blue-fronted Amazon parrots (*Amazona aestiva*), (as cited in Seibert, et al., 2001). Seibert, et al., discussed several limitations of their study which restrict the extent to which these conclusions can be generalized to other flock-housed cockatiels: Only one flock of 12 cockatiels was investigated; the genetic relatedness of the birds was unknown; and the data were collected during mate selection and breeding season. Further research is needed to assess the extent to which these findings generalize to parrots kept as pets and to parrot-human interactions. The implications, if any, to companion parrot behavior management appear to be remote.

The ubiquitous dominance interpretation of companion-parrot behavior has other problems as well. First, the expectation that pet parrots are motivated to win superior rank over their caregivers in some pecking order can serve as a self-fulfilling prophecy. As mentioned previously, when people have expectations about another individual’s behavior, they act differently and tend to get what they expect. Second, since dominance is thought to be an invisible drive or character trait inside the bird, a dominance problem is a bad bird problem. This provides a convenient excuse for getting rid of the bird rather than taking responsibility for the circumstances (antecedents and consequences) under which these behaviors arise. Third, the dominance explanation predisposes many caregivers to use forceful management strategies in order to counter-dominate their bird and win the struggle for alpha organism. Fourth, the dominance explanation ends the search for proximal, environmental causes and solutions. The very process of labeling a problem provides a false sense of closure when in fact it has only provided a name.

Thus, the essential processes of functional assessment and solution building are prematurely terminated and the known and remediable relations between behavior and environment remain unexplored (Chance, 1998).

The Case for Empowerment

When the dominance construct is extended into parrot management practices it takes the form of "show them who's boss" and "never let them make any important decisions." These suggestions are ubiquitous in both popular magazines and professional veterinary literature. However, much to the contrary, scientific evidence indicates that animals tend to thrive in environments in which they are not subjugated but rather have control over significant life events (Schwartz, Wasserman, & Robbins, 2002). Given knowledge of how behavior works and sound training skills, parrots can be empowered instead of overpowered, without altering our standards for good companion behavior.

One important demonstration of the emotional gain that comes from having control over one's environment is experiments conducted by Watson with two groups of human babies only three months old (as cited in Schwartz, Wasserman, & Robbins, 2002). Under the pillows of the first group was a switch that operated a mobile whenever the infants turned their heads. The babies in the second group had no control over their mobiles although their mobiles automatically moved as much as the first groups' did. As expected according to the law of effect, the frequency of head movements in only the first group increased since doing so was reinforced by the mobiles' movement (i.e., the mobiles' movement depended on what the babies did). However, other differences were observed in the two groups of babies that were very surprising. Initially, both groups of babies responded to the moving mobiles by cooing and smiling, a reasonable measure of well-being. These happy responses continued throughout the experiment for those babies who controlled their mobiles but for the babies who did not control their mobiles, the cooing and smiling quickly stopped. Apparently, controlling one's consequences explains, at least in part, what makes them reinforcing.

Another relevant line of research is the free food phenomenon, also known as contrafreeloading. With contrafreeloading, animals choose to perform a learned response to obtain reinforcers even when the same reinforcers are freely available. For example, given a choice between working for food and obtaining food for free, animals tend to choose to work, often quite hard, with a bowl of free food placed right next to them. This phenomenon has been replicated with rats, mice, chickens, pigeons, crows, cats, gerbils, Siamese fighting fish, and humans (Osborne, 1977); starlings (Inglis & Ferguson, 1986); Abyssinian ground hornbills and bare-faced curassows (Gilbert-Norton, 2003); and captive parrots (Colton, Warren, & Young, 1997). There are several interesting hypotheses explaining why this phenomenon occurs. Contrafreeloading behavior may be motivated by innate foraging behaviors that are otherwise frustrated in captivity; animals may be engaging in information seeking behaviors as they work to predict the location of optimal food sources; or they may be responding to the additional reinforcement provided by stimulus changes when one works for food such as the sound of a hopper. Nonetheless, animals' preference to behave in ways that impact their environment is demonstrated once again. Animals are built to behave, not to be passive.

A third area of scientific inquiry called learned helplessness adds additional support to the theory that personal control over significant environmental events is necessary for animals to behave healthfully. This phenomenon further demonstrates that a lack of control can have pathological effects including depression, learning disabilities, emotional problems (Maier & Seligman, 1976), and suppressed immune system activity (Laudenslager, Ryan, Drugan, & Maier, 1983). Learned helplessness occurs when an animal with no prior escape history is prevented from escaping severe, aversive stimuli. Under this condition, the animal eventually gives up attempting to escape and remains passive. Later when escape is made blatantly possible the animal does not make the expected escape response, as if helpless. This research has been replicated with cockroaches (Brown, Hughs & Jones, 1988), dogs, cats, monkeys, children and adults (Overmier & Seligman, 1967). Further, Seligman's (1990) research suggests that we can "immunize" learners from the effects of lack of control by providing them with experiences in which their behavior is effective, that is, in which they control their own outcomes. In this way, the effects of exposure to uncontrollable aversive stimuli, which is inevitable in all our lives to some degree, can be minimized.

Based on these three related research areas, it is very possible that a lack of control explains some, if not many, of the pathological behaviors we see in parrots such as self-mutilation, mate killing, and phobias. To the greatest extent possible, parrots should be empowered to make important decisions, such as when to exit or enter their cages or go on and off their caregiver's hands. Parrots so empowered will likely experience greater behavioral and emotional health in captivity.

Tools and Techniques for Behavior Change

Although parrots' biological history often takes center stage, much of the time behavior problems are the result of their learning history in captivity, which is composed of all the environmental events that have affected the parrot's behavior up to the present. When one stops to think about it, behavior problems can be reduced to two simple categories, not doing something enough (e.g. stepping up, staying put and eating pellets) and doing something too much (e.g. screaming, biting, and chewing woodwork). Our responsibility is to successfully increase desirable behavior and decrease problem behavior using the most positive, least intrusive methods possible. Table 1 below describes this simple behavior support model, after which the major strategies that compose the teaching technology of behavior analysis are discussed.

Table 1

A Simple Model of Behavioral Support

	NOT ENOUGH BEHAVIOR	TOO MUCH BEHAVIOR
GOAL	Increase/maintain current frequency	Decrease/suppress current frequency
ANTECEDENT CHANGES	Setting events Establishing operations Adding a cue	Setting events Establishing operations Removing a cue
CONSEQUENCE CHANGES	Reinforcement	Punishment

<u>Changing Behavior with Antecedent Strategies</u>

There are three general categories of antecedents that precede behavior - discriminative stimuli, setting events, and establishing operations. A discriminative stimulus (S^D, pronounced ess-dee), or “cue”, belongs to a special class of antecedents that signal that a certain response will be reinforced (among all possible responses). A stimulus or event becomes an S^D by being repeatedly present when a response is reinforced. For example, when the door bell rings, we open the door rather than pick up the phone, hurry to the exits, or gather up our school books. We do so because in the past, the doorbell has been consistently paired with reinforcement for opening the door and not for those other behaviors. The strength of a stimulus to cue a behavior is related to the strength of the reinforcer that follows the behavior. For some birds a perching stick comes to signal that stepping up will be reinforced with activities outside the cage. A ringing phone signals that saying “hello” will be reinforced with gales of laughter; and a person approaching a cage with a bowl in hand signals that coming to the feed door will be reinforced with food.

Problem behaviors are cued by discriminative stimuli as well. The very same cues described above can just as easily signal that biting will be reinforced if we remove the perching stick, return the phone to its base, or hastily install the food bowl and retreat fast. Cues don’t only come from people. The setting sun, cage covers, and microwaves can function as cues for particular behavior too. The approach of one of the author’s

(Friedman) Shih Tzu pups cues (antecedent) her umbrella cockatoo to call raucously (behavior), which is then reinforced by the Shih Tzu's howling (consequence); thus, the frequency of the bird's raucous calling increased. (Turning the raucous parrot call into a cue for the dog to return to its owner for a biscuit took care of the problem.)

Setting events also influence behavior. They are the context, conditions or situational influences that affect the contingencies that follow. Hands held too low, noisy environments, cage arrangements, and the number of people in the room are all potential setting events that can affect the way in which a bird responds to an offered hand. The relation between setting events and problem behavior should be considered carefully as the setting is often one of the easiest things to change.

Establishing operations (Michael, 1982) temporarily alter the effectiveness of consequences. As further explained by Kazdin (2001), "Motivational states, emotions, and environmental events are establishing operations because they momentarily alter the effectiveness of the consequence that may follow behavior and influence the frequency of the behavior" (p. 454). The effectiveness of a consequence to increase the frequency of a behavior is often related to its availability (i.e., excess or deficit). For example, hunger and satiation alter the reinforcing strength of food treats in opposite ways: A few sunflower seeds may be a highly motivating consequence to a bird that rarely has access to them but not motivating at all to a bird that has unlimited access to them every day.

Establishing operations can be used to alter the strength of other non-food reinforcers as well. For example, a bird may be more motivated to stay on a play gym after some quality time with a favorite caregiver. Chasing the family cat may be less reinforcing after an energetic training session; and stepping onto a hand may be more reinforcing when the bird is on the floor. Table 2 below lists additional examples of the many ways antecedents can be carefully arranged to decrease the occurrence of problem behaviors and increase desirable behaviors.

Table 2

Examples of Antecedent Behavior Change Strategies

Type of Antecedent Event	Antecedent Technique	Problem Behavior	Application
Discriminative Stimulus	Add a cue for the right behavior.	Lunges when cage is serviced.	Cue bird to go to a far perch before servicing cage.
	Remove a cue for the problem behavior.	Bites shirt buttons.	Don T-shirt before handling bird.
Setting Events	Decrease the response effort for the right behavior.	Refuses to go to others from preferred person's	Set bird on counter before offering

		shoulder.	non-preferred hand.
	Increase the response effort for the problem behavior.	Chews door frame.	Move play tree to center of room.
Establishing Operations	Increase reinforcer strength for the right behavior.	Resists returning to cage.	Remove treat from diet except when bird enters cage.
	Decrease reinforcer strength for the problem behavior.	Jumps off T-stand.	Offer undivided attention for 10 minutes before T-stand.

Changing Behavior with Consequence Strategies

At the heart of good training is two-way communication that results from the planned arrangement of contingencies. Contingencies are the if/then dependencies between behavior and its consequences. For example, to increase the frequency of quiet vocalizations we can offer the following contingencies: *if* the parrot vocalizes quietly, *then* a preferred person approaches but *if* the parrot vocalizes loudly, *then* no attention follows. Unfortunately, the opposite contingencies are often provided (i.e., if the parrot vocalizes loudly, then a preferred person approaches), inadvertently giving function to problem behaviors like excessive screaming.

Contingencies empower learners to choose how to operate on their environment. When a person offers a hand to a parrot, it chooses to step up or not depending on past consequences. If the parrot runs away, it communicates clearly that past consequences for stepping up are not sufficiently motivating at that moment to repeat the behavior. Rather than force the bird to comply, this is the time to consider ways to alter the antecedents and consequences to change the behavior. The question to ask before making any request of a parrot is, "Why should he?", and the answer lies in the consequences we consistently provide.

There are two broad categories of consequence techniques: Reinforcement strengthens behavior and punishment weakens it. Although the terms mean many different things in common usage, they have specific, technical meaning in the science of behavior that maximizes their usefulness. Behavioral strength can refer to different response dimensions such as frequency, rate, duration, intensity, topography (form, e.g., a foot barely lifted off a perch versus a foot raised high in the air), and latency (the time lag between the cue and the onset of the behavior). To simplify the discussion, frequency of behavior, the most often used measure of behavioral strength, is discussed throughout this section.

Reinforcement

When a behavior doesn’t occur often enough we can increase its frequency with reinforcement. Reinforcement is the procedure of contingently providing consequences for a behavior that increase or maintain the frequency of that behavior. Positive reinforcement, sometimes called reward training, is a reinforcement procedure in which a behavior is followed by the *presentation* of a stimulus. Negative reinforcement, sometimes called escape training, is a reinforcement procedure in which a behavior is followed by the *removal* of a stimulus. Technically, the terms positive and negative refer only to the operation of presenting (+) or removing (-) a stimulus that, in the case of reinforcement, functions to increase or maintain the behavior it follows. However, it is generally accurate and often easier to address, that positive reinforcers have “positive” value to the learner (something it works to get) and negative reinforcers have “negative” value (something it works to escape). Examples of positive and negative reinforcement follow in the Table 3 below.

Table 3

Examples of Positive and Negative Reinforcement

	Antecedent	Behavior	Consequence	Future Behavior
Positive Reinforcement (Reward)	Grace asks Sam to go to the back perch	Sam hops onto perch	Grace adds food bowl through feed door	Sam goes to perch more
	Grace is working on	Sam nips her hand	Grace scratches	Sam nips hand more

	her computer		Sam's head	
Negative Reinforcement (Escape)	Grace offers left hand with towel in right hand	Sam steps up	Grace puts down towel	Sam steps up more
	Grace offers perch while holding Sam's toes with her thumb	Sam pulls back foot to step on perch	Grace removes thumb as Sam steps down	Sam steps on perch more

Although both positive and negative reinforcement increase or maintain behavior, they can affect the manner in which a learner engages in training quite differently: To get positive reinforcers, learners often enthusiastically exceed the minimum effort necessary to gain them. Alternatively, to escape negative reinforcers, learners tend to offer only the minimum behavior necessary to avoid the aversive stimuli. Moreover, the use of aversive procedures has been repeatedly demonstrated to increase learners' escape behaviors, aggression, apathy, and generalized fear (Azrin & Holtz, 1966). These side effects are detrimental and are discussed further in the section on punishment. As a result, positive reinforcement is the gold standard of behavior-change procedures. It is powerful, effective and is not associated with aversive fallout (Sulzer-Azaroff & Mayer, 1991).

Factors Affecting Reinforcement. Several important factors affect reinforcement. The first is contingency, the degree to which delivery of the reinforcer depends on the behavior occurring first. Consistent pairing of the behavior and the reinforcer clearly communicates the contingency between a behavior and a reinforcer. Without consistency, it’s difficult for a parrot to make the connection between the two events, which slows down learning and produces inconsistent behavior.

Contiguity refers to the temporal closeness of the behavior and the reinforcer. Reinforcers that are delivered immediately after the behavior communicate the contingency most clearly. Lattal (1995) demonstrated the importance of timing to effective reinforcement with pigeons learning to peck a disk. With just a 10 second delay before delivering the food reinforcer, the pigeons never learned to peck the disk after 40 days of one-hour training sessions. When the delay was reduced to one second, the pigeons learned to peck the disk in less than 20 minutes.

Certain characteristics of the reinforcers also affect reinforcement such as type and magnitude. Simmons (1924) found that rats reinforced at the end of the maze with bread and milk ran significantly faster than those reinforced with sunflower seeds. In two studies comparing frequency and magnitude, Schneider (1973) and Todorov, Hanna, & Bittencourt de Sa’ (1973) found that small, frequent reinforcers tended to be more effective than large, occasional ones. Research continues on the many other factors that affect reinforcement such as task characteristics, task difficulty, relative availability and learning history.

Amid these general factors, individual differences should be carefully considered when arranging contingencies for desirable behavior. A consequence that is reinforcing to one parrot may be neutral or aversive to another. Regardless of the teacher's intentions, the proof of reinforcement is in the strength of the resulting behavior. Only by watching the data, the parrot's behavior, can we know the extent to which it has been reinforced. To determine an individual parrot's reinforcers, one can observe the bird's favorite items, foods, activities, people, sounds and locations. Establishing new reinforcers, a process discussed below, keeps the list growing throughout a learner's lifetime.

Establishing New Reinforcers. The enormous degree of behavioral flexibility inherent in many species is related to the capriciousness of the environments in which they live. Indeed, if the environment remained constant, and therefore predictable, all the behavior we would ever need to survive could be genetically transmitted and elicited reflexively by particular triggering stimuli. Instead, for parrots, as with humans, learning is the rapid-adaptation system that allows them to meet the demands of an unpredictable environment in constant change. This extraordinary behavioral flexibility includes the process by which neutral stimuli become reinforcers, called secondary or conditioned reinforcers.

Secondary reinforcers, such as praise, favorite perches, and the sound of a clicker or whistle are previously neutral stimuli that acquire their reinforcing value by repeated pairing with existing reinforcers. Primary, or unconditioned reinforcers, such as food, water and relief from heat or cold, are automatically reinforcing, that is, they require no prior pairing or experience to function as behavior increasing consequences. Primary reinforcers are related to basic survival functions, which makes them a good starting point for conditioning secondary reinforcers.

Primary and secondary reinforcers have different advantages and disadvantages in the context of training (Chance, 2003). On one hand, primary reinforcers are generally quite powerful and they are not dependent on their association with other reinforcers; but, they are few in number and more susceptible to a temporary loss of effectiveness due to satiation. For most parrots, the first few sunflower seeds will be more motivating (a stronger reinforcer) than the last few. On the other hand, secondary reinforcers tend to hold their value longer (satiate slower) and they can be delivered with less disruption, better contiguity, at a greater distance, and in a wider variety of situations. However, secondary reinforcers tend to be somewhat weaker than primary reinforcers and their effectiveness relies on being paired with other reinforcers, at least some of the time. Both kinds of reinforcers, in the greatest possible number, add power to a trainer’s toolbox and increase the quality of life for companion parrots.

Schedules of Reinforcement. Schedules of reinforcement are the rules that determine which particular instance of behavior will be reinforced. Although it can be a complicated topic beyond the scope of this chapter, the three simple schedules that are most important to understanding and managing parrot behavior are discussed briefly here. They are continuous, intermittent and extinction schedules.

A continuous reinforcement schedule (CRF) is one in which each and every instance of the behavior is reinforced (1:1) Given this perfect consistency, CRF provides the clearest communication to the learner about what behavior is being reinforced. As a result, the CRF schedule produces rapid learning and is recommended for stabilizing and increasing existing behaviors, and teaching new behaviors (Sulzer-Azaroff Mayer, 1991).

At the other end of the spectrum is extinction (EXT) in which no instances of the behavior are reinforced (1:0). As the name suggests, when the reinforcer that previously maintained a behavior is withheld, the rate of that behavior predictably decreases to pre-reinforcement levels (not necessarily total suppression).

Another category of simple schedules of reinforcement is intermittent schedules. With intermittent schedules only some instances of the behavior are reinforced, as opposed to all (CRF) or none (EXT). Once a behavior is learned, an intermittent schedule produces persistent behavior in the sense that it takes longer to extinguish than behaviors maintained on a continuous reinforcement schedule. Perhaps the clearest example of this partial reinforcement effect is the different patterns of responding that occurs at vending machines versus slot machines. Given a continuous reinforcement history interacting with vending machines, most people stop dropping coins into the slot after the first or second instance that nothing comes out. But, given an intermittent reinforcement history with slot machines, most people continue dropping coins into slot persistently although rarely does anything ever come out.

The partial reinforcement effect explains many of the persistent misbehaviors we see in companion parrots. The occasional time a lunge to the feed door results in an escape to the top of the cage or a top decibel scream produces an expletive from a caregiver is often enough to produce enduring problem behaviors, due to the intermittent reinforcement schedule on which these behaviors are maintained. The solution to each of these problems is not to ignore the behaviors better but to consider antecedent and consequence changes to prevent them from happening in the first place and to reward alternative positive behaviors instead.

All things considered, our birds benefit most from our ability to catch them being good with the highest possible rate of reinforcement. One important benefit of this approach is that the people who deliver dense schedules of reinforcement are more likely to become valued secondary reinforcers themselves. A common axiom is, “You get what you reinforce.” Where problem behaviors are concerned, what you get when you reinforce intermittently is persistent problems.

Implementing reinforcement effectively. Sulzer-Azaroff and Mayer (1991) present several guidelines for maximizing the effectiveness of reinforcement procedures that, when overlooked, account for ineffective behavior change programs with children. As these guidelines apply to all learners and situations they should be accounted for carefully in our work with parrots. An adapted list of guidelines follows below.

- Reinforce immediately until the behavior is occurring at a high steady rate, then gradually introduce delay.
- Reinforce every response initially until the behavior is well established, and then gradually introduce intermittent reinforcement.

- Specify the conditions under which reinforcers will be delivered (i.e., the cue and criterion for reinforcement) and incorporate other antecedent conditions (e.g. setting events and establishing operations).
- Deliver a quantity of reinforcers sufficient to maintain the behavior without causing rapid satiation.
- Select reinforcers appropriate to the individual.
- Use a variety of reinforcers and reinforcing situations.
- Provide opportunities to experience new reinforcers.
- Eliminate, reduce, or override competing contingencies.

Shaping New Behaviors. A behavior can't be reinforced until it occurs, which could present a problem when one needs to teach a new behavior to a parrot. Waiting for the behavior to occur by happenstance and capturing it with reinforcement might be an option but some behaviors occur too infrequently or not at all. The solution to this problem is a called shaping, technically called differential reinforcement of successive approximations. Shaping is the procedure of reinforcing a graduated sequence of subtle changes toward the final behavior, starting with the closest response the birds already does. Below are two examples of shaping plans for teaching independent toy play and bathing.

Shaping Plan 1 Playing with Toys

1. Final Behavior: Independent toy play.
2. Closest behavior bird already does: Looks at toy.

3. Reinforcer for each approximation that meets the criterion: Safflower seeds and praise.

4. Tentative approximations:

a. Look at toy

b. Move toward toy

c. Touch beak to toy

d. Pick up toy with beak

e. Touch foot to toy

f. Hold toy with foot while manipulated with beak

g. Repeat previous approximation for longer durations

Shaping Plan 2 Triggering the Bathing Response

1. Final behavior: Step into shallow water dish.

2. Initial behavior: Looks at water dish.

3. Reinforcers for each approximation that meets criterion: Applause and praise.

4. Tentative steps:

a. Look at dish

b. Face dish

c. Take a step toward dish

d. Take two steps toward dish

e. Walk up to dish

f. Look at water in dish

g. Lift foot next to dish

h. Touch water in dish with foot

i. Step into dish with one foot

j. Step into dish with both feet

k. Walk around in dish

Implementing a shaping procedure requires noticing the subtle, natural variation in the way behaviors are performed within a response class (called an operant class). For example, a parrot naturally lifts its foot a little differently every time (left or right; high or low; fast or slow, with toe movement or without, etc.). Typically this variation is unimportant and it is simply classified as one behavior, or operant class, called lifting a foot. However, this subtle variation is exactly what allows us to shape a parrot to “wave” with a foot lifted fast, held high and toes open and close.

Shaping starts by reinforcing the first approximation every time it is offered, until it is performed without hesitation. Next, an even closer approximation is reinforced, at which time reinforcement for the previous approximation is withheld. Once the second approximation is performed without hesitation, an even closer approximation is reinforced, and reinforcement is withheld for all previous approximations. In this way, the criterion for reinforcement is gradually shifted (graduated) closer and closer to the target behavior. Finally, every instance of the target behavior is reinforced.

If the learner experiences difficulty at any criterion, the trainer back ups and repeats the previous successful step, or reinforces smaller approximations. Once an approximation is performed without hesitation, more variability can be generated from which to select the next approximation by switching from continuous reinforcement to intermittent reinforcement (see the discussion of extinction bursts below). Ultimately, it is the parrot who determines the exact sequence and pace of the shaping plan. This is where sensitivity and experience is required on the part of the trainer to observe the nuances of behavior.

With shaping toy play and bathing, the toys and water dish are the antecedents that set the occasion for the respective behaviors. For other behaviors, a cue from the trainer (discriminative stimulus) can be added to signal the behavior. To add a cue, start by introducing it while the behavior is occurring. Next, gradually deliver the cue earlier and earlier until it is signaled *before* the behavior. Last, reinforce only cued instances of the behavior and ignore all others. This will establish the relationship between the cue and behavior, called stimulus control. When a behavior is said to be under stimulus control, it is emitted after the cue and rarely or not at all when the cue is absent.

With shaping we can theoretically train any behavior within the biological constraints of the learner. Husbandry, medical and enrichment behaviors can be shaped to reduce stress and increase physical and mental stimulation. Birds can learn such behaviors as raising each foot for nail trims, going in and out of crates, staying calm wrapped in towels, flying to designated perches, and playing basketball. Shaping can also be used to change different dimensions of existing behaviors such as duration, rate, intensity, topography, and response time.

Not surprisingly, problem behaviors are often unwittingly shaped as well. We inadvertently teach our birds to bite harder, scream louder and chase faster through the subtle mechanisms of shaping. For better and for worse then, shaping is endlessly applicable to teaching captive parrots, making it the sharpest of all training tools. Its uses are limited only by one's imagination and commitment to learning how to use it well.

Shaping Touch-to-Target. Regarding cats, Catherine Crawmer (2001) describes the technique known as targeting this way:

> "If we could get a cat to touch his nose to a stick on cue what could we do with that behavior? The answer is a question: What couldn't we do with it?" (p. 57)

Targeting is the behavior of touching a body part (e.g. beak, wing, or foot) to a designated object or mark and it is taught easily to parrots with shaping. By teaching birds how to target the end of a wooden dowel with their beaks, caretakers can predict and control the bird's movements. For example, an untamed bird can be taught to target a stick while inside its cage, enabling the caretaker to safely increase interaction with the bird, deliver positive reinforcement and establish two-way communication. A bird that refuses to come off the top of his cage can be targeted to a perch inside it; a wary bird can be targeted into a travel crate for veterinary visits; and an aggressive bird can be quickly redirected to the target to distract it from biting. Also, enrichment behaviors can be taught with targeting such as turning in a circle, climbing up and down ladders, and ringing a bell. Target training is an important basic skill for all companion parrots as it opens the door to all sorts of positive reinforcement and management opportunities.

Differential Reinforcement of Alternative Behaviors. Differential reinforcement is any training procedure in which certain kinds of behavior are systematically reinforced and others are not. Shaping is one example of differential reinforcement; at any point in the shaping sequence reinforcement is delivered for one approximation and withheld for all earlier ones. The process of withholding reinforcers that previously maintained a behavior is called extinction and it results in an overall reduction in the frequency of the behavior. Thus, differential reinforcement is technically two procedures, positive reinforcement and extinction, the combined effect of which is to increase the reinforced behavior and extinguish (decrease) the unreinforced one.

The relevance of differential reinforcement procedures to companion parrot behavior is enormous, specifically as an alternative to punishment. Punishment procedures focus solely on decreasing or suppressing behavior, teaching what *not to do*, which necessarily reduces the amount of positive reinforcement available to the bird. Instead, differential reinforcement of alternative behavior focuses on reinforcing appropriate replacement behaviors, teaching what *to do*, while at the same time the undesired behavior is ignored. When properly implemented, the result is a high rate of positive reinforcement for the bird, and a low rate of the problem behavior for the teacher.

There are three things to consider when selecting an alternative behavior for a differential reinforcement procedure (Alberto & Troutman, 2003). First, although the behavior targeted for reduction is a problem to people, it serves a legitimate function to the parrot or it would not continue to exhibit the behavior. The function is either to gain something of value (positive reinforcement, e.g. social attention, items or activities, sensory reinforcement) or to remove something aversive (negative reinforcement, e.g. escape), as when screaming gains attention from caregivers and lunging removes intruding hands. An alternative behavior should be selected that replaces the function served by the problem behavior but in a more appropriate way. If the alternative behavior is incompatible with the problem behavior, (i.e., if both behaviors can't physically be performed at the same time) the behavior change program will be that much more powerful. For example, talking is incompatible with screaming, and waiting on a far perch is incompatible with lunging at the feed door.

Second, the alternative behavior must result in the same amount or more reinforcement than the problem behavior, in order to successfully compete with and replace it. This is predicted by the matching law, which states "... that the distribution of behavior between alternative sources of reinforcement is equal to the distribution of reinforcement for these alternatives" (Pierce and Cheney, 2004, p. 434). Thus, given a choice between two alternatives, parrots will exhibit the behavior that results in the greater reinforcement. Third, the alternative behavior should be one the bird already knows how do; a well established behavior is more likely to be performed than one that is newly acquired.

When alternative behaviors are strengthened and maintained, differential reinforcement can provide long-lasting results. As this method relies on positive reinforcement to reduce problem behaviors by teaching birds what to do, it offers a positive, constructive, and practical approach to managing parrots in captivity.

Punishment

As discussed above, even with the most proficient and proactive behavior management skills, the time will likely come when the frequency of some behavior needs to be decreased. Although the following behavior reduction procedures may be useful adjuncts to positive reinforcement, they should not be used alone (Kazdin, 2001). Overall, punishment is used too frequently and less effectively than it should be, partly because it is such an ambiguous concept. In behavior analysis it has specific, technical meaning: Punishment is the procedure of contingently providing consequences for a behavior that decrease or suppress the frequency of that behavior. Positive punishment is a behavior reduction procedure in which a behavior is followed by the presentation (+) of an aversive stimulus. Negative punishment is a behavior reduction procedure in which a behavior is followed by the removal (-) of positive reinforcers. Examples of positive and negative punishment are listed in Table 4. As can be seen in the table, the frequency of the target behaviors is decreased in each example as that defines punishment.

Table 4

Examples of Positive and Negative Punishment

		Behavior	Consequence	

	Antecedent			Future Behavior
Positive Punishment	Grace passes Sam's cage	Sam charges again bars	Grace sprays water at Sam	Sam charges bars less
	Grace is on the telephone	Sam bites her hand	Grace drops Sam to the floor	Sam bites less
Negative Punishment	Grace offers hand	Sam hangs on cage door	Time Out - Grace walks away for a few minutes	Sam hangs on cage door less
	Grace enters home	Sam whistles shrilly	Extinction - Grace remains silently out of sight	Sam whistles shrilly less

Like reinforcement, punishment is defined solely by its effect on behavior. Punishment can be said to have occurred only if the frequency of the target behavior decreases. Statements like, "I've sprayed him a million times, punishment doesn't work with parrots!" are nonsensical. There is no such thing as failed punishment (or reinforcement). When an attempt to reduce the frequency of a behavior produces no immediate change whatsoever, punishment has not occurred and different strategies should be implemented (Chance, 2003). Although both positive and negative punishment decrease or suppress behavior, positive punishment is associated with particularly adverse side effects discussed in the next section. It seems logical that having something of value taken away (negative punishment) is ultimately less aversive, although not necessarily less effective, than having something noxious administered (positive punishment). This makes negative punishment the preferred strategy after antecedent arrangements and differential reinforcement of alternative behaviors.

Like reinforcement, punishing stimuli can be classified as primary (automatic) or secondary (learned by association with existing punishers), and the effectiveness of punishment procedures depends on clear contingency, close contiguity, type, magnitude, and schedule of delivery, as well as other factors.

The problems with positive punishment. Positive punishment, such as shaking perches, banging cages, spraying, hitting, laddering, flashing lights and plucking out feathers, is problematic for parrots and their relationship with humans for several reasons. Like all learned behaviors, problem responses continue because they are reinforced. When we implement punishment we not only fail to teach what to do, we necessarily reduce the amount of reinforcement previously available to the learner for misbehaving – a double negative of sorts, as punishment is added and reinforcement is subtracted. This makes it vitally important to use punishment in conjunction with positive reinforcement procedures to strengthen desirable behaviors and maintain a reinforcing environment. This guideline is called the fair pair rule (White & Haring, 1976).

Another problem with punishment is the severity required to produce lasting effects. Research has shown (e.g. Azrin & Holtz, 1966) that high intensity punishment is more effective than either low intensity punishment or escalating levels of punishment. The intensity required to suppress parrots' problem behaviors is often greater than that which meets acceptable standards of ethical practice or is comfortably administered by caregivers.

With negative reinforcement an aversive stimulus is present in the antecedent environment, the removal of which reinforces the escape behavior. With positive punishment the aversive stimulus is administered without escape, which sets the stage for the detrimental side effects frequently observed with positive punishment. They are, escape behaviors; aggression and other emotional reactions; generalization of emotional reactions to unrelated people, settings and items; apathy (a general reduction of all behavior); and behavioral contrast (the increase of the target behavior in other settings). These side effects are well established having been broadly investigated for many decades with countless species of animals (e.g. Azrin, Hutchinson & McLaughlin, 1965; Sidman, 1989); and, they are startlingly common among captive parrots, many of which show extreme aggression, apathy and fear.

It is the narrow view that effectiveness is the sole criterion for choosing behavior-change procedures that perhaps keeps so many people using punishment. Unfortunately, every time a problem behavior is successfully decreased with positive punishment, the person delivering the punishment is negatively reinforced for having used it. Of course this will result in an increased probability that positive punishment will be used more. Yet, based on the nature of parrots' problem behaviors in captivity, the known detrimental side effects of positive punishment, and the power of reinforcement-based alternatives, there can be little justification for using positive punishment with captive parrots.

Negative Punishment. The two negative punishment procedures relevant to parrot behavior are time out from positive reinforcement (time out) and extinction. Time out is the contingent, temporary removal of access to all positive reinforcers and extinction is the contingent, permanent removal of the specific reinforcer(s) maintaining the problem behavior. Both procedures can be very effective when used correctly but they are frequently misunderstood and very poorly implemented.

The effectiveness of time out is undermined by unclear contingency, slow contiguity (timing) and inadvertent reinforcement, also known as "bootleg" reinforcement (Chance, 1998 p. 458). For example, chasing the bird, scolding, and marching to distant cages can provide bootleg reinforcement that renders time out ineffective. Under these conditions, the parrot has little chance of perceiving clearly the contingent withdrawal of positive reinforcers thereby obscuring the association between the offending behavior and being returned to its cage. Time out is more effective when the guidelines below are followed.

- Plan the time out location ahead of time to ensure that it can be managed with clear contingency and immediacy. For many tame parrots, simply turning away or being set down for a short time is an effective time out from positive reinforcement.

- Increase the salience of the contingency between the behavior and the consequence by keeping the time out interval short (approximately 30 seconds to a few minutes). Watch the clock or count out the seconds to track the time systematically.

- Immediately after the time out interval, give the bird the opportunity to practice the appropriate behavior and reinforce it amply every time it is exhibited.

- Allow time out to do all the work decreasing the problem behavior. There is no need for other consequences or emotional displays from the caregiver which may provide bootleg reinforcement for the problem behavior.

Extinction used in combination with positive reinforcement has already been discussed as it applies to shaping and differential reinforcement of alternative behavior. To implement extinction as a single behavior reduction procedure, the reinforcer that maintains the problem behavior should be identified first by conducting a functional assessment (ABCs). In the case where the maintaining reinforcer is human attention, extinction is tantamount to inviolate ignoring – the total and permanent withholding of attention. Unfortunately, for some parrot behaviors like excessive screaming, biting and chewing unapproved items, rigorous ignoring is a lot easier to prescribe than it is to apply.

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unapproved items, ignoring is easier to prescribe than it is to implement effectively.

As discussed by Alberto and Troutman (2003), careful consideration should be given to the following points before using extinction to decrease a problem behavior. First, extinction tends to be a slow procedure. Once the maintaining reinforcer is withheld, the behavior continues for an indeterminate amount of time. As discussed previously, behaviors with an intermittent reinforcement history are the slowest to change, the most resistant to extinction. Second, the frequency, intensity and/or duration of the behavior may sharply increase before a significant decrease in the problem behavior occurs. This phenomenon is known as an extinction burst. This predictable escalation is often beyond toleration for caregivers. As a result, they abandon the program by providing attention and the behavior is unintentionally reinforced at the new level of intensity. Third, behaviors associated with frustration, such as aggression, are commonly induced by extinction. For parrots, this may mean an increase in the frequency and intensity of already severe biting. Fourth, as with time out, bootleg reinforcement can be a problem. Reinforcement can be delivered by other pets, children, or even an echo in the room. Further, some behaviors appear to be automatically reinforcing. When the maintaining reinforcer is not in the control of the trainer, extinction cannot be effective.

The fifth point to consider is spontaneous recovery, also known as resurgence (Sulzer-Azaroff & Mayer, 1991). Resurgence is the reappearance of the extinguished behavior after an extended period of time. Forewarned, the immediate reimplementation of strict extinction conditions will return the behavior to its pre-recovery frequency. Seventh, the problem behaviors that caregivers ignore can be imitated by other parrots. This produces additional behavior problems for caregivers to solve and increases the probability of bootleg reinforcement: One parrot’s imitative behavior can reinforce another parrot’s problem behavior.

On the whole, ignoring is most effective as a preventative strategy rather than a problem solution. It offers a window of opportunity to avoid giving the problem behavior function by withholding reinforcement the very first time it is exhibited. Once a problem behavior is well-established, differential reinforcement of alternative behaviors is usually the better strategy.

Conclusion

The allure of companion parrots is often outweighed by the collateral challenges of keeping them in captivity. This is especially true when the welfare of the animals is kept in the foreground. A basic understanding of how behavior works combined with a practical, humane teaching technology will help stem the tide of parrots advertised for resale in newspapers and relinquished to shelters and sanctuaries.

There are currently several popular belief systems regarding how best to manage parrot behavior. When opinions differ, and emotions are strong, and the stakes are high, science should hold a higher value than conventional wisdom and personal recipes about behavior. Science demonstrates an important association between behavioral health and empowerment, that is, the personal power to control significant environmental events. Overpowering parrots with forceful and coercive training methods should be understood as stealing behavior that could be given to us instead with facilitative antecedents and positive reinforcement. Empowering captive parrots to the greatest extent possible within the context of appropriate training objectives, may mitigate the behavioral pathologies so prevalent among them.

Given a choice between different behavioral interventions, selecting the most positive, least intrusive, effective strategy meets the highest standard of ethical practice. Antecedent changes and positive reinforcement procedures should always be tried before implementing negative punishment (removing positive reinforcers) or negative reinforcement (escape training). Positive punishment procedures, in which aversive stimuli are applied, should be used rarely, if ever. Finally, all three procedures, negative reinforcement, negative punishment and positive punishment, should only be used as an adjunct to positive reinforcement strategies.

Taking full responsibility for parrots' learning and behavior is the first and most important step to supporting their behavioral health. Companion parrots offer their caregivers the opportunity to educate themselves about behavior and significantly improve the quality of life for parrots in captivity.

[1] The term theory is used technically to mean an established explanation accounting for known facts or phenomena, as opposed to the non-technical usage which means an unproven guess or personal opinion. Other theories of learning and behavior are named according to their particular focuses such as cognitive theory and psychodynamic theory.

References

Alberto, P. A., & Troutman, A. C. (1999). *Applied Behavior Analysis for Teachers* (6th ed.). Upper Saddle River, NJ:

Merrill Prentice Hall.

Azrin, N. H. & Holz, W. C. (1966). Punishment. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application*. New York: Appleton-Century-Crofts.

Azrin, N. H., Hutchinson, R. R., & Hake, D. F. (1966). Extinction induced aggression. *Journal of the Experimental Analysis of Behavior*, *9*, 191-204.

Azrin, N. H., Hutchinson, R. R., & McLaughlin, R. (1965). The opportunity for aggression as an operant reinforcer during aversive stimulation. *Journal of the Experimental Analysis of Behavior, 8*, 171-180.

Balph, D. F., & Balph, M. H. (1983). On the psychology of watching birds: the problem of observer-expectancy bias. *Auk 100*, 755-757.

Barnett, S. A. (1981) *Modern Ethology*. NY: Oxford University Press.

Barrow, E. M. *Animal Behavior Desk Reference: A dictionary of Animal Behavior, ecology, and evolution* (2nd ed.) FL: CRC Press.

Brown, G. E., Hughs G. D. & Jones, A. A. (1988). Effects of shock controllability on subsequent aggressive and defensive behaviors in the cockroach (Periplaneta americana). *Psychological Reports, 63*, 563-569.

Chance, P. (1998). *First Course in Applied Behavior Analysis*. Pacific Grove, CA: Brooks/Cole Publishing Company.

Chance, P. (2003). *Learning and behavior* (5th ed.). Belmont, CA: Wadsworth/Thomson Learning.

Cloutier, S. Beaugrand, J. P., & Lague, P. C. (1995). The effect of prior victory or defeat in the same site as that of subsequent encounter on the determination of dyadic dominance in the domestic hen. *Behavioral Processes,* 35, 293-298.

Coulton, L.E., Warren, N.K., Young, R. J. (1997). Effects of foraging enrichment on the behavior of parrots. *Animal Welfare, 6*, 357-363.

Crawmer, C. (2001). *Here Kitty, Kitty: Catherine Crawmer on Training Cats*. Sand Lake, NY: Author.

Gall, M. D., Gall, J. P. & Borg, W. R. (2003). Educational Research (7th ed.). Boston: Allyn and Bacon.

Gilbert-Norton, L. 2003. Captive birds and freeloading: The choice to work [Electronic version]. *Research News, 4*.

Gould, S. J. (1981). *The Mismeasure of Man*, New York: W. W. Norton & Company.

Inglis I .R., Ferguson, N. J. K. 1986. Starlings search for food rather than eat freely available food. *Animal Behaviour, 34*, 614-616.

Kazdin, A. E., (2001). Behavior Modification in Applied Settings (6th ed.). Belmont, CA: Wadsworth/Thomson.

Kerkhove, W. (2004). A Fresh Look at the Wolf-Pack Theory of Companion - Animal Dog Social Behavior. *Journal of Applied Animal Welfare Science, 4*, 279 – 285.

Lattal, K. A. (1995). Contingency and behavior analysis. *The Behavior Analyst, 24*, 147-161.

Laudenslager, M. L., Ryan, S. M., Drugan, R. C., Hyson, R. L., (1983). Coping and immunosupression: Inescapable but not escapable shock suppresses lymphocyte proliferation. *Science, 221*, 568-570.

Maier, S. F., & Seligman, M. E. P. (1976). Learned Helplessness: Theory and evidence. *Journal of Experimental Psychology: General, 105*, 3-46.

Manning, A., Stamp Dawkins, M. (1992) *An Introduction to Animal Behavior* (4th ed.). Cambridge: Cambridge University Press.

Mech, L. D. (1999). Alpha status, dominance, and division of labor in wolf packs. *Canadian Journal of Zoology*, 77, 1196-1203.

Mech, L. D. (2000). Leadership in wolf, canis lupus, packs. *Canadian Field-Naturalist, 114*, 259-263.

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of Analysis of Behavior, 37*, 149-155.

Osborne, S. R. 1977. The free food (contrafreeloading) phenomenon: A review and analysis. *Animal learning & Behavior, 5*, 221-235.

Overmier, J.B & Seligman, M.E.P (1967). Effects of inescapable shock upon subsequent escape and avoidance responding. *Journal of Comparative and Physiological Psychology, 63*, 28-33.

Pierce, W.D. & Cheney, C.D. (2004). *Behavior Analysis and Learning* (4^{th} ed.). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Schneider, J. W. (1973). Reinforcer effectiveness as a function or reinforcer rate and magnitude: A comparison of concurrent performance. *Journal of Experimental Analysis of Behavior, 20*, 461-471.

Seibert, L. M., & Crowell-Davis, S. L. (2001). Gender effects on aggression, dominance rank, and affiliative behaviors in a flock of captive cockatiels. *Applied Animal Behavior Science, 71*, 155-170.

Sidman, M. (1989). *Coercion and its fallout*. Boston, MA: Authors Cooperative.

Seligman, M. E. P. (1990). *Learned Optimism*. New York: Knopf.

Simmons, R. (1924). The relative effectiveness of certain incentives in animal learning. *Comparative Psychology Monographs*, 7.

Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Appleton-Century-Crofts.

Skinner, B. F. (1981). Selection by consequences. *Science, 213,* 501-504.

Sulzer-Azroff, B., & Mayer, G. R. (1991). *Behavior analysis for Lasting Change*. Orlando, FL: Harcourt, Brace, Jovanovich.

Schwartz, B., Wasserman, E. A., Robbins, S. J., (2002). *Psychology of Learning and Behavior* (5th ed.). New York, NY: W. W. Norton & Company, Inc.

Todorov, J. C., Hanna, E. S., & Bittencourt de Sa', M. C. N. (1984). Frequency versus magnitude or reinforcement: New data with a different procedure. *Journal of the Experimental Analysis of Behavior, 4*, 157-167.

Van Kerkhove, W., (in press). A fresh look at the wolf-pack theory of pet dog social behavior. *Journal of Applied Animal Welfare Science.*

White, O. R., & Harin, N. G. (1976). *Exceptional Teaching*. Upper Saddle River, NJ :Merrill/Prentice Hall.