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Comparative Psychopathology: Connecting Comparative and Clinical Psychology

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The animal welfare movement was empowered by decades of animal studies focused on the ontogeny of psychopathology in non-human primates and other species. When H. F. Harlow induced aberrant behaviors in rhesus macaques, collaborators began the search for effective behavioral and psychopharmacological interventions. Years later, working with human subjects in his clinical practice, Harlow's first graduate student, A. H. Maslow developed a "Hierarchy of Needs" and the hypothetical construct of self-actualization. Following Harlow's practice of using human models to design monkey studies, present day psychologists apply what is known about maladaptive behavior and the factors that facilitate positive human behavior to improve the quality of life for non-human taxa living in captive settings. We know how to prevent psychopathology in monkeys and apes, but nonhuman primates are still confined in restricted, substandard facilities that introduce trauma and suffering. Felids, ursids, elephants and cetaceans have also suffered this fate. As a result, there is good reason for clinical and comparative psychologists to collaborate to ameliorate aberrant behaviors while creating conditions that enable all captive animals to thrive.

Comparative Psychology and Psychopathology

Early in the history of comparative psychology, defined as the scientific study of the development and evolution of behavior (Papini, 2008), scientists working with a variety of animals in research laboratories and zoos recorded many bizarre behavior patterns that resembled human psychopathology (Morris 1969; Zubin & Hunt, 1967). Nonhuman primates in research settings have expressed locomotor stereotypies, catatonia, eating disorders (regurgitation and reingestion), self-injurious behavior, and other deprivation acts associated with isolation, social and sensory deprivation, and long-term confinement (Berkson, 1968; Erwin, 1979; Erwin, Mitchell, & Maple, 1973; Gluck & Sackett, 1974; Maple, Erwin & Mitchell, 1974; Mason & Berkson, 1975; Tinklepaugh, 1928). In his classic study, Tinklepaugh recorded agitated depression in an adult male rhesus monkey that self-mutilated when his consort was replaced by other females. Similarly, Maple et al. (1974) described a socialized male rhesus monkey that engaged in self-biting during normal bouts of copulation. Psychopathology is generally characterized as a "mental disorder" which may originate in physiological or life history events (Brune, Brune-Cohrs, McGrew, & Preuschoft, 2006). Therefore, comparative psychopathology is a field of research that investigates abnormal behavior through empirical comparisons of animal and human behavior. The most fruitful comparisons, given evolutionary considerations, are those that investigate the primate order, especially the closely related genera *Pongidae* (great apes) and *Homo* (human beings). Animals raised by human caretakers, isolated from their parents at birth, and managed as solitary subjects, also proved to be hyper-aggressive when introduced to conspecifics. Attempts to breed animals raised in this way were doomed to failure, while animals that somehow reproduced typically exhibited neglect, abuse, or a total lack of interest in the offspring (Rogers & Davenport, 1969). In the years when ethology and comparative psychology were in full bloom, laboratory scientists began to study the etiology of these disorders.

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Outside of the lab, zoological institutions and the people charged with caring for the animals housed in them did not yet fully comprehend the psychological needs of the animals they exhibited, and failed to recognize abnormal behavior. An exception was the Swiss zoo director Heini Hediger, who raised awareness on the psychology of zoo animals with a series of important books published in German and English (Hediger, 1950; 1955; 1965). Hediger's position as Professor of Ethology at the University of Zurich provided unique opportunities to disseminate the findings of the emerging field of zoo biology. His scholarly interests included human behavior, and he recorded many examples of deviant behavior in the people who visited zoos in Europe. Hediger lamented that research was always designated as the lowest priority in budgets allocated and approved by governing boards in the three Swiss zoos he directed (Rubel, 2009). He supervised graduate students and the research of curatorial staff and encouraged its publication. Despite his administrative demands, Hediger became the most prolific zoo director in the world. Throughout his career, his scholarship was a beacon that helped to elevate the priority of zoo research in Europe and North America. Hediger's stature and his scholarly productivity encouraged the systematic study of zoo animal behavior, but institutional commitments to research are still resisted by many zoo directors (Maple & Perdue, 2013). As a trained zoologist, Hediger was unique in his search for psychological insight, explaining his approach in the following statement:

> The separation of animal psychology from human psychology . . . is becoming more and more exceptional. Instead we nowadays hear far more about comparative psychology, or about investigation into comparative behavior, both of which subjects include the behavior of animals as well as of man. The removal of this artificial, out-of-date barrier is proceeding rapidly, especially in zoos, the points of similarity of behavior on both sides of the railings being too obvious to miss. (1955, p. 1)

The Evolving Zoo

Meyer-Holzapfel (1968) provided a detailed review of psychopathology in zoo animals, noting that these behaviors were considered abnormal because they were uncommon or absent in free-ranging animals. She suggested that the study of zoo animals should be of interest to clinical psychologists and psychiatrists and extolled the value of comparative studies (see also White, 1974). Meyer-Holzapfel concluded that abnormal behaviors resulted from stress due to changes in surroundings, absence of adequate quarters, or social tension. Such conditions may lead an animal to stop eating, express hyper-aggression or hyper-sexuality, or after parturition, to engage in abnormal or neglectful behaviors with offspring. A behavior common to many zoo apes is aggression directed toward staff or guests, shaking and kicking the barriers; spitting water; and throwing rocks, feces, and other objects. At the time of her review, Meyer-Holzapfel observed that zoos had changed substantially, and abnormal behavior was becoming less common. Similarly, Hosey and Skyner (2007) gathered survey data that indicated self-injurious behavior (SIB) is not a major problem in zoo primates. However, persistent psychopathology can still be observed in rescued and retired chimpanzees housed in sanctuaries. A recent article by Ferdowsian et al. (2011) found evidence of mood and anxiety disorders in captive great apes. The study concluded that previously traumatized chimpanzees demonstrated persistent abnormal symptoms and that these clustered into syndromes that are similar to PTSD and depression in human beings. The investigators were careful to consult experts in ethology and psychiatry to ensure accuracy in their evaluations. This research is an example of contemporary collaboration between clinical and comparative psychologists interested in psychopathology in primates.

Noted scholars have compared zoos to prisons and mental hospitals (Ellenberger, 1960; Sommer 1974; 2008). Sommer (1974) compared the three institutions as examples of "hard architecture." He suggested that

it is in our best interest to see that conditions of confinement are not so unnatural as to deform behavior. Accordingly, he concluded:

> The hard zoo consisting of concrete boxes, steel bars, and fixed routine of feeding, watering, and washing by outside maintenance personnel, distorts the behavior of the animals. This distortion reduces the behavior of the animals . . . <and> reduces the value of the zoo for public education, research, and as a breeding institution to assist endangered species. (p. 69)

While some of the hard institutions that Sommer studied have not changed, leading zoos began to soften in the 1970's (Maple, 1979). By 1999, when Sommer reviewed the totality of his findings, he regarded zoos as the only hard institutions that experienced significant reform. He attributed the change to the contributions of psychological science and ethology. Naturalistic zoos today, are places for restoration and revitalization for animals and guests. Such zoos are especially important to urban settings. The architect Jon Coe (1985) regarded the transformation of municipal zoos as the spread of an "urban Eden". Modern zoos have expanded their mission to include botanical exhibitory that further softens the overall landscape.

Impact of Harlow and his Collaborators

When Harry F. Harlow began his studies of rhesus monkeys at the University of Wisconsin in 1930, he was determined to utilize monkeys as models of human behavior. Because the university had not yet built a laboratory for Harlow's comparative research, his early projects, in collaboration with his first graduate student, Abraham H. Maslow, were conducted in zoological settings in Madison and New York, respectively (Maslow, 1936; 1940). Although Maslow's research was based on systematic observation, Harlow initiated a program of experimentation conducted over five decades (e.g., Mitchell, 1970; Sackett, 1968). Harlow's many students and post-doctoral collaborators carried out a long-term, exhaustive study of primate social development and learning focusing on one species, the rhesus monkey (*Macaca mulatta*). The continuing impact of Harlow's legacy is demonstrated in the recent research of Melinda Novak (2003) who explored the etiology, physiology, and treatment of self-injurious behavior (SIB) in rhesus monkeys. Novak noted that SIB is also a significant human health problem associated with profound intellectual disabilities, genetic diseases, and psychiatric conditions. Novak's population of monkeys at the New England Primate Research Center was maintained to determine parallels with the human condition. As with humans, SIB in monkeys may be a coping strategy to reduce arousal (Nock, 2009).

Maslow's keen interest in the dominance relationships and sexual proclivities of monkeys contributed to his preference for psychotherapy although he happily spent his graduate years as "a behaviorist". After completing his Ph.D. at the University of Wisconsin, he made his mark as one of the founding fathers of humanistic psychology. Maslow's iconic book *Toward a Psychology of Being* (1962) launched the new "human potential movement", while his construct of the "hierarchy of needs" has been applied widely to human beings and most recently to animals (Maple & Perdue, 2013). He was one of the first psychologists to argue that theories of human behavior should be based on studies of well-adjusted individuals, rather than the maladjusted. Maslow believed that self-actualizers were the best of humanity, who provided clues about our highest innate traits: love, compassion, creativity, ethics, and spirituality. The following chart is an adaptation of Maslow's ideas that we believe apply equally to humans and to animals (Maple & Perdue, 2013). Maslow identified seven attributes that contribute to psychological well-being and the state of self-actualization or the achievement of one's full potential:

I. The existence of a biologically-based and uniquely individual species-specific inner nature.
II. A nature that can be studied and discovered.
III. A nature that is neutral, pre-moral or good.
IV. Its nature should be encouraged; suppression leads to sickness.
V. A nature that is strong and unmistakable.
VI. A nature that is always pressing for actualization.
VII. Overcoming obstacles results in healthy self-esteem.

Based on its efficacy with human beings, the utility of overcoming obstacles has been recently applied in animal management to provide captive wildlife the opportunity to thrive (Maple, 2016). Zoo exhibit architects influenced by "wellness-inspired design" concepts attempt to build habitats and facilities that challenge animals to solve problems and defeat impediments.

Harry F. Harlow became one of the world's most successful psychologists who influenced many specialties including the psychology of learning, clinical psychology, developmental psychology, physiological psychology, and comparative psychology. He exhaustively studied psychological dysfunction within his paradigm of deprivation. His findings became important in the study of autism and depression. Collaborators experimented with pharmacological agents to ameliorate the symptoms and deeper effects of isolation and deprivation (McKinney, 1974). His work also shed light on the effects of children raised in confinement, such as orphanages and psychiatric hospitals. Harlow's studies of the effects of social isolation influenced the management of monkeys and apes in zoos, and changes were made so that newborn monkeys and apes were raised in social groups by their mothers (Beck & Power, 1988; Maple & Hoff, 1982). Ultimately, Harlow and his collaborators contributed a massive set of data to assist in the promulgation of higher standards and better practices in zoos and animal laboratories. The experimental data produced by Harlow and his colleagues and graduate students in combination with research detailing how primates live in nature, have prepared zoos to design and build naturalistic habitats that contribute to psychological well-being and optimal wellness (Maple, 2016). Abnormal behavior is generated, if not exacerbated, by restrictive physical space and breakdowns in social relationships. Superior environments and natural social groupings of animals lead inevitably to normal behavior development. The construct of "wellness" is an alternative to regulatory standards of animal welfare which tend to be minimal rather than optimal.

Many of Harlow's research ideas were grounded in human studies. One of his many books was entitled *The Human Model: Primate Perspectives* (Harlow & Mears, 1979). A review of this book by McKinney (1981) asserted that ". . . much if not most of the contents of this book is now noncontroversial --- even accepted as dogma --- in clinical psychiatry. This has not always been true, especially in the area of . . . attachment systems, the importance of love and of play, and the use of monkeys to study meaningfully human psychopathology." Harlow's influence on clinical psychology is immense.

Direction of Nonhuman Primate Research

In Harlow's time, psychopathology was induced in labs by isolating or socially depriving young monkeys separated at birth from their mothers. At the Yerkes National Primate Research Center in Atlanta, Richard K. Davenport and Charles Rogers reported that chimpanzees raised in isolation also exhibited serious deficits in social and parental behavior in adulthood (Rogers & Davenport, 1969). Zoos did not purposely create isolates, but the effects of their management errors were evident to anyone who looked closely. By the late seventies, the growing population of scientists studying nonhuman primates led to the founding of two

important societies: the International Primatological Society and the American Society of Primatologists, and two scientific journals published by them. The success of the American Journal of Primatology led directly to the formation of a third journal, Zoo Biology in 1982, with a strong psychological orientation and the endorsement of Hediger himself.

Due to the similarity of monkeys, apes, and people, and their common evolutionary history, primate studies became important in the programs of the National Institute of Mental Health. Research output was greatly facilitated when the federal government established seven primate research centers in the states of California, Georgia, Louisiana, Massachusetts, Oregon, Washington, and Wisconsin. Each of these research centers originally carried out psychological studies, building on the tradition of founders such as Robert M. Yerkes and Harry F. Harlow. It was Yerkes (1916), who first called for a national program of research on nonhuman primates in a paper published in the journal *Science*. Ironically, the high degree of similarity between apes and humans ultimately led to the retirement of great apes from government service in 2015. Similarly, zoos are now facing increasing criticism for the confinement of apes and the continuation of their captivity (Wallace-Wells, 2014).

The Comparative Approach to Research and Practice

The belief that animal models illuminate human behavior created a niche for the field of comparative psychology. Once it was combined with the field of ethology, animal behavior research reached its zenith in productivity and impact. This stature was illustrated in 1973 when the European ethologists Konrad Lorenz, Niko Tinbergen, and Karl von Frisch were awarded the Nobel Prize for Medicine and Physiology. For his achievements in psychological science, Harlow was awarded the prestigious National Medal of Science in 1967. Because humans are members of the order Primates, we are comfortable designating monkeys and apes as models for human health and behavior. An important publication by Hodos and Campbell (1969) reminded psychologists that an evolutionary approach to comparison (a phylogenetic tree) would be more successful than comparisons that were based on a linear hierarchy or phylogenetic scale. For example, both field and laboratory scientists have noted that comparisons throughout the primate order revealed strong similarities in facial expressions and bodily movements (Ekman, 1993; Ekman & Friesen, 1971). The universal primate "bared-teeth display", and the "play-face" are regarded as homologous in apes and humans (Parr & Waller, 2006; Van Hooff, 1972). The more fruitful approach to comparative research is therefore, the study of closely related species-for example, comparisons witin the genus *Macaca*, the genus *Pan*, the genus *Panthera*. The close genetic relationship between *Pan troglodytes*, *Pan paniscus*, and *Homo sapiens* suggests that comparisons of these taxa may yield insight into psychopathology, the closest analogue of human mental illness. Moreover, for some investigators, the behavioral abnormalities and measurable signs of distress in captive great apes are suggestive of homologies with human psychopathological conditions (Brune et al., 2006).

Comparative psychology is represented today as a sister subject of "comparative cognition" and the impact of this research has resulted in recognition that many animals, especially primates, are capable of higher order reasoning. Apes are capable of cooperation, deception, and empathy, when confronted with opportunities to behave this way with conspecifics. Many studies have also demonstrated that apes, like people, have at least a rudimentary capacity for a "theory of mind" (Hare, Call, & Tomasello, 2001). With such advanced mental capacity, this may indicate they are also susceptible to serious mental illness, for example the phenomenon of "post-traumatic stress disorder" (Bekoff, 2007). Chimpanzees, elephants, and orcas are animals that may have been victims of PTSD (Bradshaw, Capaldo, Lindner, & Grow, 2007; Ferdowsian et al., 2011; Lillienfeld,

Gershon, Duke, Marino, & de Waal, 1999). Although the science of comparative cognition is fairly robust, the number of animal laboratories that offer comparative and behavioristic research opportunities at the undergraduate or graduate level has diminished considerably in recent years (Maple & Segura, 2015). At one time, all clinicians with an operant orientation learned the basics under the supervision of behaviorists who worked in the laboratory with rats or pigeons. Clinicians and therapists looking for this background today will find it difficult to obtain due to a scarcity of basic animal labs and an abundance of applied practitioner-oriented clinical graduate programs, and virtually no combination of the two. To demonstrate the value of connecting the two fields, Marston and Maple (2016) wrote a book for clinical psychologists and therapists titled: "What Animal Behavior Can Tell Us About Human Psychology." Despite a decline in the influence of animal experimental psychology, the accumulated knowledge from studies of animal behavior and animal psychopathology remain a valuable storehouse with clear applications for understanding human behavior.

The Zoo as a Venue for Psychological Science and Practice

As American colleges and universities continue to close animal laboratories previously devoted to comparative and behavior analytic research (Maple & Segura, 2015), our nation's zoological parks may become the only facilities where animals can be studied by psychologists. Naturalistic groupings of chimpanzees, gorillas, and orangutans will be particularly valuable for the study of mental, social, and emotional life. Many highly endangered species have never been studied by psychologists, so it will be important to identify projects that include rare birds, felids, and marine mammals. SeaWorld is preparing for the retirement of its Orca collection, so now is the time to study this population. Other cetaceans, such as belugas (*Delphinapterus leucas*) and pilot whales (*Globicephala melus*), are available for psychological study at SeaWorld and other marine parks. Research that compares their behavior in human care compared to life in the open ocean should be a high priority. Given the biodiversity available in the world's zoos and aquatic parks, comparative studies of felids, small antelopes, raptors, crocodilians and many other taxa will be attractive opportunities for behavioral scientists. For example, herpetologists were surprised to discover American alligators in the Okefenokee Swamp tended their nests and exhibited considerable parental behavior after the eggs had hatched (Hunt, 1975). There is much more to be learned about animals that await serious study.

Zoos are rapidly evolving to become naturalistic settings for the exhibition of captive wildlife. Enclosures are larger, groups are closer to typical for the species in nature, and efforts to activate sedentary animals is a normal protocol in all accredited institutions. For example, African elephants in the new four-acre herd at Dallas Zoo are now able to walk more than five miles per day, a figure comparable to wild living elephants (Maple, 2016). As a result of these changes, many abnormal behaviors (stereotypies, deprivation acts, etc.) have been reduced or eliminated. When they occur, zoos are beginning to utilize certified behavior analysts with intervention protocols to change behavior. A formal program of "applied animal behavior analysis" is part of the new Wildlife Wellness unit at the Jacksonville Zoo & Gardens in Florida. An important goal of the program is to exceed regulatory welfare related goals, and aim to provide opportunities for animals to truly thrive in human care. In the process, it will be necessary to understand what thriving means for each species and individual. The Jacksonville Zoo and Gardens Wellness Initiative also aims to document all of the adaptations animals experience while coping with captivity, including behaviors classified as psychopathology.

At present, the Jacksonville Zoo and Gardens Wellness unit is conducting multiple studies aimed at quantifying the degree to which daily husbandry practices promote or maintain species-appropriate behaviors and decrease maladaptive behaviors. For example, trained observers are actively following the day to day

changes in affiliative social behaviors in recently introduced female African elephants. Documenting the shifts in affiliative behavior and relaying that information to those responsible for managing the elephants will help them to make data-driven decisions when it comes to daily husbandry practices. The goal of this type of teamwork is to keep practices that increase bonding or affiliative behaviors and modify practices that produce antagonistic behaviors (e.g., chasing, displacing, charges.) University of North Florida (UNF) graduate student, Kaylin Tennant, is leading a project aimed at identifying characteristics of unique multi-silverback heterosexual gorilla troop. In addition to behavioral data, caretakers at multiple Association of Zoos and Aquariums (AZA) accredited zoos are being asked to identify personality characteristics using a standardized personality index (Gold & Maple, 1994), and hormone analyses are being conducted. Information obtained from this study will not only be used to manage a unique population of western lowland gorillas, but to also potentially help other institutions seeking to identify alternatives to the growing population of bachelor groups. These studies were enlightened not only by findings from field studies, but also by the breadth of the human oriented wellness-related literature.

Stereotyped Behavior

Restricted space produces one of the most ubiquitous forms of psychopathology. Stereotyped locomotion is also one of the most studied of these phenomena. Georgia Mason published a comprehensive review in 1991. In this publication, she defined stereotypies as "repetitive, invariant behavior patterns with no obvious goal or function." As Mason revealed, stereotypies are abnormal, since they do not occur in the healthy, free living animal. However, it is unclear if there is any cost that outweighs the benefit of stereotypies, and therefore, this behavior may not be maladaptive. Since stereotyped behavior occurs in other forms (e.g., rocking, self-destructive head-banging, vocalizing), and because institutionalized human beings are similarly affected, this is one form of psychopathology that requires continuing study. The zoo has become an ideal venue to observe, monitor, and intervene with behavioral or pharmacological methods. Wechsler (1991) studied walking stereotypies at the Zurich Zoo, concluding that the behavior was not due to frustrated migratory activity, but more likely due to frustrated appetitive behavior. Locomotor stereotypy is frequently observed in terrestrial bears, while polar bears are prone to both walking and swimming stereotypies.

There are many theories as to the root causes for stereotyped behavior. In the field of behavior analysis, practitioners are trained to use experimental or quasi-experimental methods to identify causal variables located in an individual's environment. If it is possible to identify variables (i.e., identify the function) maintaining aberrant, self-injurious, or stereotyped behavior, we can then attempt to modify the environment to promote alternative, incompatible species-appropriate behaviors instead. Function-based approaches to curbing problematic behavior in humans has a long history (see Hanley, Iwata, & McCord, 2003 for a review), but has been underutilized for use with nonhuman animals apart from a few studies (e.g., Dorey et al., 2009; Farmer-Dougan, 2014; Martin, Bloomsmith, Kelley, Marr, & Maple, 2015;). In addition to functional analyses, functional behavior assessments can also be used to modify behavior. Functional behavior assessments utilize non-experimental methodology (e.g., structured and unstructured interviews, direct observation) to identify potential environmental variables maintaining behavior. At Jacksonville Zoo and Gardens, UNF graduate student, Megan Morris, is leading a project utilizing this methodology to gain information about the various environmental variables correlated with pacing and tail-sucking in a male jaguar. Studies like these have contributed to growing interest in applied animal behavior publications. Because zoos are highly motivated to change behavior that upsets visitors, clinical psychologists should pay attention to the comparative psychology and applied behavior analysis literature.

Empirical Zoos

The world's elite zoos, in partnership with collaborating scientists in academia, are committed to empirical, evidence-based management principles. However, the traditional zoo culture is typically non-scientific and there is a lingering propensity to emphasize entertainment over education. Thankfully, the traditional approach to zoo management is changing due, in part, to public pressure to raise welfare practices and standards. The very best world zoos have established scientific programs and employed dedicated scientists (e.g., San Diego Zoo, Lincoln Park Zoo, Brookfield Zoo, and Zoological Society of London.) One factor contributing to the advance of scientific zoos is the history of animal welfare. Animal management standards and practices, reformed by the application of compelling data that could not be ignored by institutional decision-makers. Mirroring changes in the biomedical and agricultural fields, zoo research has also influenced animal welfare standards and practices. As new data are acquired, the knowledge gained will eventually elevate standards for all zoos, with early adopters reaching the goal of optimal animal welfare. If animal welfare and wellness becomes our first priority, coequal to conservation, then we cannot avoid the conclusion that research is also a very high priority. Evidence-based empirical studies convinced administrators to raise the priority of animal welfare, and it is systematic research that will monitor and evaluate welfare standards. To keep pace with innovative standards and practices, all zoos must evolve to become empirical zoos.

Comparative psychology and ethology are synergistic fields that are necessary if we are to understand the basic biology and behavior of the animals we manage in zoos. By building empirical zoos we can create a setting where zoo animals thrive and live much as they would in the natural world. Psychopathology was common in hard zoos, but naturalistic, soft zoos are fundamentally different. Soft zoos encourage natural behavior patterns, enable socialization and movement, and expand space by providing innovations such as verticality (Maple & Perdue, 2013). The full continuum of zoos which generate abnormal behavior and-those that promote fully functional behavior can be found in world zoos. Psychologists who carry out research in the zoo will gain insight into human behavior, but they will also find that their services and their applications will dramatically change the zoo into an oasis of naturalism. The goal is to go from understanding the mechanisms that create and sustain maladaptive and deprivation behaviors in zoos, to understanding what factors create and maintain behaviors indicative of thriving for animals living in human care. In this way, the information gleaned from research in empirical zoos can potentially be applied to problems of social significance for humans living in managed care (e.g., prisons, convalescent homes, nursing homes, boarding facilities, and mental health crisis centers). For the past forty years, our research group has been fortunate to implement change and then study the change in zoos, sanctuaries, safari parks, and primate research centers (Maple 2016; Maple & Perdue, 2016). These settings have been our living laboratories for the study of animal behavior and we can expect to see them open their doors to a new generation of psychologists who will help to document future change.

Since the innovative Woodland Park Zoo opened its naturalistic facility in 1977 (Jones, Coe, & Paulsen, 1976), other zoos have created naturalistic habitats for wildlife. Some of these exhibits have been studied (Maple & Finlay, 1987) using the technique of Post Occupancy Evaluation (POE). By continuing to evaluate the behavioral effects of these innovations in design, we will also learn about how different species react to opportunity. Although change is stressful, abnormal behavior should be reduced or eliminated by positive changes in the quantity and quality of space and social opportunity.

From Psychopathology to Wellness

While zoos may eventually replace animal laboratories in universities as the preferred setting for behavioral research, the reformation that led to naturalistic zoos will change our focus from abnormal to normal behavior. Just as Maslow chose to focus on well rather than disturbed individuals in his practice, we can now begin to study animals that thrive, essentially the equivalent to Maslow's self-actualized individuals. The wellness construct enables our focus to shift from coping to thriving. As we engineer physical and social environments to encourage wellness, we will activate animals to reach their full physical, social, and mental potential. Elephants in many zoos can now walk five miles a day on a soft substrate, occupy a large, socially stratified herd, and solve mental and physical problems introduced by caregivers to encourage resilience. By challenging them, we provide opportunities to live like wild elephants.

A zoo built through a process of wellness-inspired design will enable animals to express their inner nature and provide our guests with a wildlife experience that is functionally equivalent to an authentic African safari. If our guests perceive that animals in the zoo are living well; if they no longer feel sorry for zoo animals; then we can be sure they have confidence in the zoo's stewardship. If they trust the way we care for zoo animals, they are much more likely to believe our messages about conservation. The modern, naturalistic zoo is a superior setting for studying the mental, social, and emotional behavior of wildlife and one more reason why universities should partner with zoos with an equal commitment to understanding animal behavior. Studies of zoo animals can now be compared directly to studies of wild animals. With a greater focus on achieving wellness, clinical psychologists and therapists should appreciate that comparative psychology is concerned about how animals reach their full potential in settings conducive to living well. Clinical and comparative psychology are uniquely synergistic as both fields contribute to our understanding of the continuum of mental health leading to self-actualization. There is much to do if we are to arrange effective partnerships between academic scientists, clinical psychologists, and the zoological institutions that must be prepared to accommodate visiting and collaborating scientists. In Jacksonville, we aim to encourage graduate students and faculty throughout the state of Florida to study our populations of wildlife for the benefit of basic science and the welfare of the animals in our care.

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