A HISTORICAL VIEW ON THE STUDY OF PLAY STATEMENT OF THE PROBLEM[1]

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I. INTRODUCTION

The study of play in animals has, historically, suffered from a variety of theoretical problems and a lack of empirical verification. "In 1945, Beach stated: 'Present-day understanding of animal play is regrettably limited and current views on the subject are considerably confused.' This could have been written today. Very little progress has been made in the past 25 years" (Müller-Schwarze, 1971:246). This is, perhaps, an overly severe indictment of the study of play in both human and nonhuman animals. This chapter attempts to set out the parameters of the problems manifest in the study of play by using a historical approach to the problem. It is quite clear that until those who are engaged in research on play set some reasonable standards of intellectual comfort, the study of play will continue to receive the criticism it has so justly deserved in the past from both biological and social scientists. If we intend to understand this complex behavioral event called play, then a clear perception of the problem is required.

At present, we are experiencing a growing interest in the study of play. Anthropologists, ethologists, psychologists, sociologists, among others, are becoming aware that the study of play is an important area of interest if we are to under-

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stand behavioral development and social organization among animals (Bekoff, 1973a). This interest is documented by the increasingly large number of studies of play in a variety of animals.[2]

Since publication of Beach's (1945) classic work, there have been a number of theoretical reviews of play (Baldwin and Baldwin, 1977; Bekoff, 1972, 1976a; Berlyne, 1969; Dolhinow and Bishop, 1970; Fagen, 1974, 1976; Gilmore, 1966; Herron and Sutton-Smith, 1971; Hutt, 1970; Loizos, 1966, 1967; Lorenz, 1956; Meyer-Holzapfel, 1956; Millar, 1968; Miller, 1973; Müller-Schwarze, 1971; Poirier and Smith, 1974; Welker, 1961, 1971). However, a concise definition of play has not emerged from these reviews, nor has a widely accepted view of the function of play. Darling noted (1937) that play is a phenomenon easier to describe than explain, while Hurlock (1934), on the other hand, stated that there is little concern over the definition of play among writers. The importance of play in normal social development has been suggested by a number of

[2] *For example, Brownlee (1954) on domestic cattle* (Bos taurus), *Chepko (1971) on goats* (Capra bircus), *Müller-Schwarze (1968) on black-tailed deer* (Odocoileus hemonius columbianus), *Poole (1966) on polecats* (Putorius putorius putorius), *Poole and Fish (1975) on rats and mice* (Rattus norvegicus *and* Mus musculus), *Wilson and Kleiman (1974) on three cavimorph rodents* (Octodon degus, Octodontomys gliroides *and* Pediolagus salinicola), *Rensch and Dücker (1959) on mongooses* (Herpestes ichneumon *L.*), *Schenckel (1966) on lions* (Panthera leo), *Steiner (1971) on Columbian ground squirrels* (Spermophilus columbianus columbianus), *Tenbrock (1960) on red foxes* (Alopex lagopus), *Wilson (1973) on voles* (Microtus agrestis), *Wilson (1974) and Wilson and Kleiman (1974) on seals* (Phoca vitulina vitulina, Halichoerus grypus *and* Phoca vitulina concolor), *Wilson and Kleiman (1974) on pygmy hippopotami* (Choeropsis liberiensis) *and giant pandas* (Ailuropoda melanoleuca), *Farentinos (1971) and Gentry (1974) on sea lions* (Eumetopias jubata), *Bekoff (1974) on canids* (Canis *sp.*), *Henry and Herrero (1974) on black bears* (Ursus americanus), *Lazar and Beckhorn (1974) on ferrets* (Mustela putorius), *Welker (1959) on raccoons* (Procyon lotor), *Wemmer and Fleming (1974) on meerkats* (Suricata suricatta), *Baldwin and Baldwin (1973, 1974) on squirrel monkeys* (Saimiri *sp.*), *Fedigan (1972) on vervets* (Cercopithecus aethiops), *Dolan (1976) on Sykes' monkeys* (Cercopithecus mitis kolbi), *Symons (1973), Redican and Mitchell (1974), Lichstein (1973a,b), Meier and Devanney (1974), Smith (1977),* et al., *on rhesus macaques* (Macaca mulatta), *Welker (1954, 1956a,b), Bierens de Haan (1952),* et al., *on chimpanzees* (Pan troglodytes), *and Freeman and Alcock (1973) for gorillas* (Gorilla gorilla gorilla) *and orang-utans* (Pongo pygmaeus pygmaeus).

researchers; however, satisfactory definitions and empirically tested theoretical propositions about play are scarce.

A literature review reveals considerable variability in what has been called play. Hutt (1966) noted that play included such widely divergent behavior patterns as the darts and gambols of young birds and mammals to the ritualized games of adult humans. Clearly, this suggests that the assumption has been made that play in all species arises from similar motivational sources (Meyer-Holzapfel, 1956). The extension of the use of the term play in its colloquial sense from human to nonhuman animals further confounds the issue, and has contributed to the confusion surrounding this class of behavior.

Historically, play as a behavioral category was first mentioned by Plato (Millar, 1968), who recognized its practical value in the development of young individuals. Aristotle, too, thought children should be encouraged to play at what they were to do seriously as adults. Educational reformers, from Comenius in the seventeenth century to Rousseau and Pertalozzi in the eighteenth and early nineteenth centuries, accepted that education should consider all aspects of child development, including play. These general philosophical ideas culminated in Frobel's stress on the importance of play in learning (Millar, 1968), but were of limited theoretical value. However, as early as the mid-nineteenth century, a number of theoretical views of play were beginning to emerge in the literature.

Regardless of the definitional problems associated with play and confusion over its causation and function, play is restricted to homiotherms, with a few exceptions among the poikilotherms [see Fagen (1976) for a listing of the poikilotherms that have been observed to engage in playful behavior, as well as a suggested evolutionary basis for this difference]. Welker (1961) has developed an exhaustive list of different taxa which have been reported to play.

II. THEORIES OF PLAY

It is important to consider the variety of theories of play to appreciate the problems surrounding this behavior. Out of a plethora of theories have come attempts at definitions and descriptions of play in a wide array of species, which must be considered in an evolutionary perspective to understand the diversity of expression of play behavior.

Theories of play can be broadly classed into two general categories: 1) those dealing with the developmental aspects of play in human and nonhuman mammals; and 2) those dealing with human imaginative play. Since some have assumed that all

play arises from the same motivational state (Meyer-Holzapfel, 1956), has the same physiological base, and often is identical, or similar in form (Rensch, 1973), a brief review of both types of theories is presented.

A. Developmental Aspects of Play

1. Surplus Energy Theory. One of the oldest theoretical statements concerning the significance of play is attributed to Schiller (1875) and Spencer (1873), although it may have had its origin in the writings of seventeenth and eighteenth century educational reformers. Schiller (1875) called play the expression of exuberant energy. Curti (1930) noted that Schiller merely suggested that play occurred when an ample supply of energy was available, although later writers offered considerable reinterpretation of the original statement. Spencer (1873) elaborated on Schiller's notions by suggesting a neurophysiological basis for this "excess energy". According to Spencer (1873), nerve centers disintegrate with use and need time to be restored. A nerve center which has been at rest for a considerable period becomes physically unstable and, therefore, is over-ready to respond to any kind of stimulation. This instability of neural centers was interpreted as surplus energy; hence, the common name of the general theory.

Briefly, this position holds that play results from surplus energy which exists because the young are freed from self-preservation through parental action. The surplus energy theory postulates a quantity of excess energy available to the organism, and a tendency to expend this energy, even though it is not necessary for the maintenance of life (Gilmore, 1966). The surplus energy theory has enjoyed widespread appeal and has been presented in a variety of other forms (Alexander, 1958; Tinklepaugh, 1934; Tolman, 1932).

Beach (1945) notes the following objections to the surplus energy theory: 1) These notions are based on circular reasoning. The catch lies in the definition of "surplus" - the decision as to whether or not expended energy is surplus depends on the interpretation of the behavior as playful or "serious". 2) "In the area of mental or emotional energy...it is sheer nonsense to predicate explanations of behavior upon supposed accumulation and discharge of hypothetical forces. Definition of one unknown in terms of a second unknown is good algebra, but poor psychology" (Beach, 1945:528).

Lorenz's (1950) psychohydraulic model of motivation is consistent with the surplus energy theory; however, both falter mainly in the fact that there is little evidence that physical energy can be stored in an organism like water in a

reservoir (Bekoff, 1973a). Mitchell (1912) objected to the surplus energy theory based on the interpretation that the discharge of energy was a "waste product". Morgan (1900) also noted that "normal" rather than "surplus" energy is involved in the play of animals. Groos (1898), among others, has observed that superabundant energy is not always a condition of play. Animals will play to apparent exhaustion and be ready to play again with a very brief rest or no rest at all (Beach, 1945). Hinton and Dunn (1967) note that the unfortunate shortcoming of the surplus energy theory is that it directs attention away from the selective dimensions of play and implies that play is its own motivation.

Others have developed a variant on this theory, noting that play is the result of an inner drive, is intrinsically rewarding, or done for sheer pleasure (Aldis, 1975; Buhler, 1930; Dobzhansky, 1962; Döhl and Podolczak, 1973; Dolhinow and Bishop, 1970; Eibl-Eibesfeldt, 1975; Gehlen, 1940; Lazarus, 1883; Morris, 1962; Patrick, 1916). Perhaps the only support for this theory lies in the fact that young animals play more than do adults (Cooper, 1942); however, the reasons for this seem to be much more complex than those implied in this theory (Bekoff, 1973a).

2. *Relaxation Theory*. Another classical theory views play not as a product of surplus energy, but resulting from a deficit of energy. Lazarus (1883) and Patrick (1916) noted that play is a mode of dissipating inhibition resulting from fatigue due to relatively new tasks to the organism. Therefore, play most frequently occurs in the early developmental stages and replenishes energy for the unfamiliar cognitive activities of the young (Gilmore, 1966). Winch (1906a,b) added a neurological interpretation of the relaxation theory when he noted that play exerted little demand on the higher nervous centers.

3. *Optimal Arousal Theory*. Baldwin and Baldwin (1977) note that sensory stimulation which serves to keep the individual within an optimal arousal zone is reinforcing; but overstimulation or understimulation is aversive. The tendency for young animals to seek an optimal arousal level has been well documented for nonhuman primates in both field and laboratory studies (Harlow and Harlow, 1965, 1969; Jay, 1965; Mason, 1965, 1967, 1968, 1971; Schaller, 1963; van Lawick-Goodall, 1967). From clinging to an arousal-reducing mother to arousal-increasing play and exploration, the young nonhuman primate vascillates during much of the waking day. Andrew (1974), Berlyne (1969), Bindra (1959), Hebb (1949, 1955), Leuba (1955), Schneirla (1959), and Welker (1956a,b), among others, have elaborated the arousal theory in various fashions. Finally,

Heckhausen (1964) notes that play may be the behavioral event that strives to keep neural activity at an optimum level.

4. Pre-exercise Theory. Karl Groos (1898, 1908) presented a theory of play based broadly on natural selection, in which he emphasized that only animals best fitted to cope with the environment survive. If animals play, it is because play is useful in practicing skills needed in later life. Only animals endowed with detailed instinctive patterns which are perfect on the first trial have no need to play (Millar, 1968). Consequently, some animals must practice and perfect their incomplete hereditary skills before a serious need to exercise them arises (Poirier and Smith, 1974). Groos (1898) draws heavily on accounts of play-fighting among young animals as support for his pre-exercise theory.

Pycraft (1913) claims that Groos' theory makes infancy seem an irresponsible apprenticeship to the seriousness of life. Millar (1968) notes that the play of mature animals is less easily accommodated by a theory that play is an instinct to practice instincts used in adult life.

These "practice" hypotheses presuppose that all social learning is adaptive; however, they only partially explain playful behavior (Fagen, 1974). Clearly, those who differentiate between "experimental" practice (play) and simple practice (Beach, 1945; Bruner, 1973a,b) imply that the special structure of play is an observable correlate of a "playful" learning mechanism. These observers indicate that playful practice requires varied experiences, and stress the interactions of skill and the environment, while rote practice perfects the application of a specific behavior pattern (i.e., infant transport) without contributing behavioral flexibility (Fagen, 1974). Similarly, Loizos (1967) states that play is not necessary for practice of adult behaviors.

Bekoff (1973a) notes that Gross' theory ignores the social importance of play for the developing organism. Furthermore, recent research (Fox, 1969; Poole, 1966) has demonstrated that many instincts required for "serious" adult life tend to be unmodified by early experience. Nonetheless, Groos' pre-exercise theory underscores one important dimension of play, the necessity of exercising various motor patterns (coordination of reflexes, muscular and skeletal development) (e.g., Brownlee, 1954; Fagen, 1976), but ignores the impact of this highly social behavior on the developing organism (Bekoff, 1973a).

5. Recapitulation Theory. In 1906, G. Stanley Hall posited the recapitulation theory of play. This theory rests on the notion that children are a link in the evolutionary chain between human and nonhuman animals, and pass through all the stages from protozoan to human in their lives as embryos

(ontogeny recapitulates phylogeny). Hall (1906) extended the notion of recapitulation to the whole of childhood, and claimed that the child passes through a series of play stages corresponding to, and recapitulating, the cultural stages in the development of races (Gilmore, 1966). Winch (1906a,b) notes that the recapitulation theory, simply stated, says the work of the father becomes the play of the children, and the past holds the key to all play activities (Lehman and Witty, 1927). Admittedly Lamarckian in perspective, Hall's recapitulation theory served to stimulate interest in the developmental behavior of children (Millar, 1968).

6. Growth Theory. Appleton (1910) suggested another position with respect to play. She concluded that play is a response to a generalized drive for growth in the organism, although not instinctual pre-exercise as envisioned by Groos (1898, 1908). A child plays because it "knows" that play is the method by which it will grow (Gilmore, 1966). This theory seems to differ little from Groos', except the organism is supposedly conscious of its activities, and is exercising its drive for growth (Bekoff, 1973a). Many of the same criticisms initially directed toward the pre-exercise theory of Groos can be leveled against Appleton's growth theory.

B. Human Imaginative Play

1. Infantile Dynamic Theories. In the late nineteenth and early twentieth centuries, theories of play were developed which differed from classical theories primarily in that they invoked explanations based on dynamic factors of individual personality, and were designed to explain individual variability in play behavior (Gilmore, 1966). Buytendijk (1934) rejected earlier pre-exercise theories and interpreted play, which for him was directly associated with object manipulation, as a product of youthful dynamics (Meyer-Holzapfel, 1956). Buytendijk (1934) states that a child plays because it is a child. Gulick (1920) notes that if you want to know what a child is, study its play; if you want to effect what the child will become as an adult, direct its play (Ghosh, 1935).

Lewin (1933) suggests that play occurs because the individual's cognitive life space is unstructured, resulting in a failure to discriminate between the real and unreal. In general, the infantile dynamics theories rest on the proposition that play is the child's way of thinking (Gilmore, 1966).

Of all infantile dynamics theorists, Piaget (1951) is perhaps the best known. Generally, Piaget viewed play as the product of a stage of intellectual development, through which the child must pass in developing from the original egocentric

and phenomenalistic viewpoint to the adult objective and rationalistic outlook (Gilmore, 1966). Play, for Piaget, seems to be a process whereby the individual fits bits of information into an existing conceptual schema. Additionally, Piaget's theory makes a sharp distinction between causes and effects of play. His entire theoretical orientation towards play is intimately related to his general theories of cognitive development. Piaget's work, however, is closely related to cathartic and psychoanalytic theories of play (see below).

2. Cathartic and Psychoanalytic Theories. Mitchell and Mason (1934) suggest that Aristotle may have offered the earliest thoughts on the cathartic theory of play. Generally, the cathartic theory views play as the child's attempts to master situations which, at first, were too difficult. The cathartic theory was first suggested by Carr (1902); however, others were soon to follow with variants of the main theme (e.g., Curti, 1930; Reaney, 1916; Robinson, 1920).

The psychoanalytic theory of play is the most recent variation of the general cathartic theories. Freud (1955, 1959a,b) developed the psychoanalytic theory of play which is, of course, only a small portion of his more general theory of psycho-social development. Play, for Freud, shares many of the same unconscious components which shape dream life, and in this sense is somewhat similar to Piaget's notion of play. Freud conceived of play as closely related to fantasy; in fact, he defined play as fantasy woven around real objects, as contrasted to daydreaming which is pure fantasy (Gilmore, 1966). Erikson (1950, 1951) made additional contributions to the psychoanalytic theory of play by emphasizing the coping and anxiety reducing aspects of play.

These psychoanalytic theories of play are theoretically sophisticated and well developed; however, they have led to little empirical research (Gilmore, 1966). Gilmore (1964) seems to have made one of the few attempts to experimentally test these theories of play. In general, psychoanalytic theories have dealt with the behavior of children in terms of adult behavior and have not been concerned with the perceptions of the child (Bekoff, 1973a).

In sum, these theories of play have led to confusion rather than clarity in explaining and understanding play behavior. To some extent, this confusion rests in the colloquial use of the term and its interchangeability from human to nonhuman mammals. Clearly, there is an intuitively recognized similarity between the play of children and young animals (Müller-Schwarze, 1971) which adds to the confusion, although it is precisely because of these similarities that there is high interobserver agreement on when animals are playing (Bekoff, 1973a,b; Loizos, 1966, 1967; Miller, 1973). Some

suggest (Berlyne, 1960, 1969; Müller-Schwarze, 1971; Schlosberg, 1947; Welker, 1971) that the generic term, play, has become so confused that it should be abandoned in favor of more precise terminology, i.e., ludic behavior, motor play, exploratory play.

Additionally, some of the confusion over a theoretical basis for play lies in a failure to understand the conceptual difference between theories of the causation of play and theories of the function of play. For example, the surplus energy theory, the relaxation theory, and the optimal arousal theory are concerned with the underlying causal basis for play; while the pre-exercise theory is a theory of the function of play. It may be that these various theories have invoked different levels of explanation to account for the same phenomenon.

III. FUNCTIONALISTS VS. STRUCTURALISTS -- DIFFERENT VIEWS OF THE SAME PHENOMENA

Fagen (1974) has clarified much of the theoretical literature by suggesting that there are two vastly different conceptual positions with respect to the study of play (e.g., Gilmore, 1966; Sutton-Smith, 1971). "Functionalists study the causes of play, including underlying behavioral mechanisms and/or possible adaptive significance (e.g., Ewer, 1968), whereas structuralists consider the form and appearance of play (e.g., Loizos, 1966, 1967; Müller-Schwarze, 1971)" (Fagen, 1974:851). Playful behavior for the functionalist is necessarily play at something [e.g., play mothering (Lancaster, 1971), play fighting (Aldis, 1975; Symons, 1973)], while the structuralist claims play has a particular unique structure (Fagen, 1974).

A. Structuralists

This position concerns itself with careful description of the behavior itself, and manifests itself in a variety of descriptions and definitions, although some researchers have noted that because there is a consensus on what is play, a precise definition is not required (Lorenz, 1956; Thorpe, 1956). Welker (1971) notes that play and, for that matter, exploration are not unique behavioral categories distinct from other elements of the behavioral repertoire. Furthermore, precise differentiation of any behavioral category on any but a neurophysiological basis seems unfruitful according to Welker (1970), although some would disagree.

1. Categories of Play. These differences not withstanding, Millar (1968) has suggested four general classes of play: 1) general activity where there is not some immediate response to an environmental stimulus (e.g., gambolling of puppies, frolocking of lambs); 2) parts of behavior patterns which normally lead to fulfillment of a definite biological function, but occur out of context, or without accomplishing the purpose (e.g., play-fighting, sex play of sexually immature animals, etc.); 3) interactions involving at least two animals and occurring mainly between members of organized groups, and may overlap considerably with (2) (e.g., parental play, play-fighting, etc.); and 4) activities which include investigating and manipulating the environment and experimenting with objects (Kohler's chimpanzees, Menzel's chimp's invention of ladders, etc.)

Müller-Schwarze (1971:230) notes, "Despite the confused terminology and difficulties of new definitions for the various kinds of 'play', there exists one distinct category, motor play. These are juvenile social and solitary behaviors which, in context, sequence and function, differ clearly from other behaviors." Mears and Harlow (1975) have offered a further classification of play, self-motion play or peragration, which is defined as motion of the self as a reinforcer. They further suggest that self-motion play can be either social or non-social.

2. Theoretical Definitions of Play. Clearly, many researchers have asserted that play exists, but relatively few have attempted precise, unambiguous definition. Although Millar (1968) has established categorical distinctions of types of play, she never precisely defines play. However, some definitions of play have been presented in the literature: 1) Bekoff (1972:417) has stated, "Social play is that behavior which is performed during social interactions in which there is a decrease in social distance between the interactants, and no evidence of social investigation or of agonistic or passive-submissive behaviors on the part of the members of a dyad (triad, etc.), although these actions may occur as derived acts during play. In addition, there is a liability of the temporal sequence of action patterns, actions from various motivational contexts." 2) Fagen (1974:850) notes that play is "...active, oriented behavior whose structure is highly variable, which apparently lacks immediate purpose, and which is often accompanied by specific signal patterns." 3) Müller-Schwarze (1971: 223) provides a definition of motor play as "...the performance of a mixed sequence of mostly stereotyped behavior patterns by an immature animal. These patterns belong to different functional systems and do not serve their usual functions. The patterns often occur in a social situation under moderate

general arousal, but low specific motivation." 4) In a study of social play in free-living baboons, Owens (1975:387) notes that play "...is generally composed of behavior patterns seen in other functional contexts...but lack of immediate biological end is used here as a distinguishing criteria." Additionally, Owens (1975) describes the movement patterns in aggressive, sexual, and parental play, his three classifications of social play. 5) Poole and Fish (1975:63), in a study of play in rats and mice, define play as "...apparently goalless behavior in which the movements were energetic and exaggerated. This was particularly noticeable if the play behavior pattern were compared with the nearest equivalent form of adult behavior, performed in the usual context."

3. Operational Definitions of Play. Problems with semantics have caused considerable confusion and prompted a number of researchers to abandon their attempts at theoretical definition. Many now favor description in operational terms of precisely what behavior patterns are seen in playful interactions. For example: 1) Aldis (1975) notes that "...almost everyone would agree that chasing and play-fighting in young animals is play...these behaviors are usually accompanied by play signals and are modified in certain ways from their serious counterparts." 2) Wilson (1974:38) describes play in seals *(Phoca vitulina vitulina* and *Halichoerus grypus)* as "...leaping and splashing in the water and exaggerated flapping towards one another over the rocks or shore." 3) Baldwin and Baldwin (1974:304) describe social play in squirrel monkeys (*Saimiri* sp.) as "...social interactions that include wrestling, chasing, sham-biting, jumping on, pulling tails, carrying, steep leaps, and other related activities." 4) Freeman and Alcock (1973), in a study of juvenile interactions in gorillas (*Gorilla gorilla gorilla*) and orang-utans (*Pongo pygmaeus pygmaeus*) describe social play as including wrestling and tug-of-war encounters. 5) Welker (1961:175-176) defines play as "...a wide variety of vigorous and spirited activities: those that move the organism or its parts through space such as running, jumping, rolling, and somersaulting, pouncing upon and chasing objects or other animals, wrestling, and vigorous manipulation of body parts or objects in a variety of ways." 6) Harlow and Harlow (1965), in addition to discussing the ontogeny of interactive play in young rhesus macaques (*Macaca mulatta*), describe three types of social play. Rough-and-tumble play consists of infant monkeys, rolling, wrestling and sham-biting each other without injury and seldom becoming frightened. Approach-withdrawal play, a more complex type, involves mutual chasing in which physical contact is minimized. "Genteel rough-and-tumble play, in the second year of life, becomes superceded by a kind of physical contact and release

can be physically painful and the biting responses may evoke cries of distress and anguish from the monkey being bitten" (Harlow and Harlow, 1965:313).

4. Structural Characteristics of Play. Often observers simply characterize playful activities apart from non-playful ones. Beach (1945) suggests the following outstanding characteristics of play:

(a) Play is typically thought to have an emotional element of pleasure associated with it (e.g., Bekoff, 1974; Bertrand, 1969; Csikszentmihalyi and Bennett, 1971; Loizos, 1966; Poole, 1966). Washburn (1973:130) suggests that, "Judged by their behaviors, play is pleasurable to the young primate." Although we may be able to operationally define the pleasurable elements of play, how could this be tested?

(b) Play is generally thought to be characteristic of immature rather than adult animals; however, adults of many species do play, particularly in the mother/offspring context (Altman, 1966; Fox, 1971; Jay, 1963; Jolly, 1966; Kruuk, 1972; Rheingold, 1963). However, instances of adult play have been reported outside the mother-offspring network [e.g., free-ranging bonnet macaques, *Macaca radiata* (Simonds, 1965); captive squirrel monkeys, *Saimiri sciureus* (Winter, 1968); free-ranging mountain sheep, *Ovis canadensis* (Geist, 1971); captive (Bingham, 1927) and free-ranging chimpanzees, *Pan troglodytes* (van Lawick-Goodall, 1968); free-ranging hyenas, *Crocuta crocuta* (Kruuk, 1972); captive (Redican and Mitchell, 1974), enclosed (Gordon, Rose and Bernstein, 1976), and semi-free-ranging rhesus macaques, *Macaca mulatta* (Breuggeman, 1976; Kaufmann, 1967); and others].

(c) Play differs from non-playful responses in having no relatively immediate biological result or when benefits are delayed until a later age. In other words, play is customarily regarded as non-utilitarian, with no immediate purpose (Fagen, 1974).

(d) The expression of play is species specific. For a description and comparison of social play in two platyrrhine monkeys (*Saimiri sciureus* and *Allouatta palliata*), see Baldwin and Baldwin (1977). Wilson and Kleiman (1974) offer an excellent comparative study of play in three South American rodent species (*Octodon degus*, *Octodontomys gliroides* and *Pediolagus salinicola*).

(e) The amount, duration and diversity of play in a given species may be related to certain ecological characteristics. In general, primates and carnivores tend to play more than most other mammals (Baldwin and Baldwin, 1977), while play typically decreases in frequency as one descends the phylogenetic scale (Aldis, 1975; Eibl-Eibesfeldt, 1975; Welker, 1961). Meyer-Holzapfel (1956) adds the following:

(f) Play is an expression of a high general motivational state, not a specific motivation. Contrarily, Mason (1965) suggests play can be suppressed when young primates are overly stimulated, and play typically occurs in moderately arousing environments. Furthermore, Eibl-Eibesfeldt (1975:276) notes that "...there exists a specific motivation for play which is based on a curiosity drive; that is, a mechanism which moves the animal to seek new situations and to experiment with new objects."

(g) Behavioral elements which comprise play are drawn from a variety of contexts, and the elements are mixed and replaced by each other in an irregular manner (Baldwin and Baldwin, 1977; Bekoff, 1972; Dolhinow and Bishop, 1970; Loizos, 1966, 1967; Marler and Hamilton, 1966). However, Müller-Schwarze (1971) found sequential stability in sequences of play behavior in blacktailed deer (*Odocoileus hemonionus columbianus*).

(h) Depending on the motivational level, play can be released by non-specific external stimuli or by no discernible stimuli at all. Eibl-Eibesfeldt (1975) clarifies this point by noting that motivating mechanisms present in the "normal" expression of a behavior pattern are frequently absent in its playful expression. However, identification of discernible stimuli responsible for elicitation of play behavior may be difficult, as "natural contingencies of reinforcement" (Baldwin and Baldwin, 1977) obscure the traditional stimulus-response design.

(i) Play occupies a relatively low position in the hierarchy of types of behavior, and occurs only when the animal's essential needs have been met, and not in stressful situations (Poole and Fish, 1975). Several field reports have clarified the nature of the relationships between food ecologies and play, and pointed out the effect of abundance and dispersion on its expression. Baldwin and Baldwin (1972, 1973), Hall (1963) and Loy (1970) have documented the effect of food deprivation on the reduction in frequency of the expression of play in free-living primates. Rosenblum, Kaufman and Stynes (1969) for pigtail macaques (*Macaca nemestrina*), Southwick (1967) for rhesus macaques (*Macaca mulatta*) and Baldwin and Baldwin (1976) for squirrel monkeys (*Saimiri sciureus*) found a significant decrease in play with a reduction in food supply in controlled laboratory investigations. Poole and Fish (1975) suggest some additional characteristics:

(j) Play can be recognized by its exaggerated movements. Play sequences are often a collection of disrupted activities, extravagent, uneconomical, clumsy, and fragmented, unlike the orderly and efficient behavior of adults (Baldwin and Baldwin, 1977; Marler and Hamilton, 1966; Miller, 1973).

(k) Finally, play may be characterized as having certain exclusive behavior patterns which distinguish it from "serious"

behavior (Dolan, 1976). It has been suggested that these behavior patterns signal a readiness to play, and thereby communicate to potential interactants an individual's intent. Altmann (1967) described communication as a process whereby the behavior of one individual affects the probability of behavior of another; and further notes that the development of a system of metacommunication, communication about communication, allows an individual's full participation in all adult behaviors. In a study of coyotes (*Canis latrans*), Bekoff (1975) found certain metacommunicative signals employed in social play bouts to establish a "play mood". Bateson (1955a,b) noted that play can only occur when primates are capable of some degree of metacommunication in that their reference is the interaction (Bateson, 1955a,b).

The most frequent specific signal, the primate play face, has been extensively reviewed (Altmann, 1962; Chevalier-Skolnikoff, 1973, 1974; Goodall, 1965; Loizos, 1967; van Hooff, 1967, 1972; van Lawick-Goodall, 1968). Sade (1973) notes that transverse body rotation functions as a play specific invitation in rhesus macaques, while Struhsaker (1967) reports a play call for vervet monkeys. Play vocalizations are known for other primate species, e.g., squirrel monkeys, *Saimiri sciureus* (Winter, Ploog and Latta, 1966), chimpanzees, *Pan troglodytes* (van Lawick-Goodall, 1968), and gorillas, *Gorilla gorilla beringei* (Schaller, 1963). For non-primate mammals, play specific behaviors have also been observed in blacktailed deer, *Odocoileus hemonionus columbianus* (Müller-Schwarze, 1971), canids, *Canis* sp. (Bekoff, 1973b), Columbian ground squirrels, *Spermophilus columbianus columbianus* (Steiner, 1971), domestic cats, *Felis catus* (West, 1974) and seals, *Phoca vitulina vitulina* and *Halichoerus grypus* (Wilson, 1974).

By identifying salient characteristics of play, we are indeed closer to a definition; however, it should be noted that there exist differences of opinion regarding the characteristics of this behavioral constellation (see b, f, g and i for examples). Beach (1945:538) noted correctly that "...it should be recognized that no single hypothesis can be formulated to explain all forms of play in every animal species. The types of activity which are commonly termed playful are so variable in form and complexity that a different interpretation is indicated, at least for each major category." Bekoff (1974:228) has also stated that "...it is safe to conclude that no one theory or explanation is applicable to all animals." Finally, Poole (1966) cautions that a study of play in a single species does not allow formulation of a general theory of play.

Today, some researchers are not attempting a broad theoretical definition of play applicable to all species, but are defining playful behavior for individual species in specific

settings. Furthermore, as has been discussed, play may be recognized by a number of characteristics, intrinsic to the behaviors themselves (e.g., exaggerated, uneconomical movements, etc.), but as Bateson (1955a,b) has noted, the contextual aspects of particular behaviors should not be overlooked in forming a definition. In other words, behaviors may be essentially similar in form and differentiated in meaning only by context (Breuggeman, 1976).

As with other categories of behavior (e.g., aggression, submission, caregiving), a definition of play must have as its basis a precise, unambiguous description of the motor patterns involved. However, identification of the precise motor patterns is only a first step. Typically, through an intuitive idea of what motor patterns constitute a particular class of behavior, researchers have lumped these molecular units of behavior into larger, functional molar classes (e.g., sex, aggression, etc.). From the high interobserver agreement on the identification of play as a behavioral phenomenon, one might infer that there are some interspecific characteristics of this behavior (Miller, 1973). However, often these intuitive behavioral typologies rely only on face validity. Frequently, these intuitive typologies are anthropomorphic and, to some extent, egocentric in perspective. Play is particularly susceptible to these abuses, for when one engages in any activity which does not fulfill primary needs, it is often character ized as play (Loizos, 1966, 1967). On the other hand, Reynolds (1967) suggests that play is really the "work" of immatures, as it is accompanied by intense concentration and a motivation for continuation until mastery is achieved.

To identify molar behavioral classes without ascribing underlying motivation is a difficult task. Only in recent years have researchers begun to be concerned that, through the labels we attach to particular behaviors, a consistency in animal behavior is being projected which may or may not be present in reality (Baldwin and Baldwin, 1977). The quest for a definition of play, clearly a molar class of behavior, in some respects is representative of definitional problems with other behavioral categories (e.g., aggression). However, factors intervene in a discussion of play which are not so apparent in other behavioral classes, namely the cross-specific, anthropomorphic recognition of playful behaviors. Marler and Hamilton (1966) noted that play is a troublesome class of behavior to define; however, the difficulties should not obviate any attempts at precise definition.

B. Functionalists

Instead of concern over structural or definitional problems, functionalists are concerned with the adaptive significance of play for the organism. Müller-Schwarze (1971:240) notes that, "The amount of time and paper spent on speculations on possible functions of motor play in immature animals is in inverse proportion to the amount of facts available on the question." Certainly, numerous functions for play have been postulated, although many without adequate data (Beach, 1945; Welker, 1971). Such speculations have, in some instances, had the effect of generating testable hypotheses. It should be noted (Baldwin and Baldwin, 1977) that there are alternative kinds of experiences that may produce the same functional ends as play and exploration (i.e., normal social development) and that play can result in dysfunctional (maladaptive) consequences. Many researchers have argued, quite convincingly, that play is adaptive and functional, both for the individual and the species (e.g., Bekoff, 1972; Dolhinow and Bishop, 1970; Loizos, 1967; Poirier, 1969, 1970, 1972; Rensch, 1973; Suomi and Harlow, 1971; Washburn, 1973).

1. Functions of Play. Numerous functions have been ascribed to play [for a list of 30, see Baldwin and Baldwin (1977)], but they can be organized into five general categories:

a. Physical development. Many researchers have suggested that play offers an opportunity for physical stimulation necessary for proper development of muscle tissue, skeleton, and the central nervous system, as well as developing motor skills essential for survival (Beach, 1945; Brownlee, 1954; Dobzhansky, 1962; Dolhinow and Bishop, 1970; Ewer, 1968; Fagen, 1976; Groos, 1898; Hinde, 1971; Levitsky and Barnes, 1972; Poirier, 1970; Riesen, 1961, 1965; Southwick, Beg and Siddiqi, 1965; Volkman and Greenough, 1972; West, 1974).

b. Social development. Many researchers note that play is an important aspect of normal psycho-social development (Baldwin, 1969; Dolhinow, 1971; Dolhinow and Bishop, 1970; Eibl-Eibesfeldt, 1967; Fedigan, 1972; Harlow and Harlow, 1965, 1969; Miller, 1973; Poirier, 1972; Poirier and Smith, 1974; Welker, 1961; White, 1959). Furthermore, play may allow the developing individual to gain valuable information about the environment (Baldwin, 1969; Birch, 1945; Eibl-Eibesfeldt, 1967; Fedigan, 1972; Lancaster, 1971; Loizos, 1967; Lorenz, 1956; Schiller, 1957; Symons, 1973; Tsumori, 1967; Washburn and Hamburg, 1965). Historically, some theorists felt that play actually served as practice for adult activities (Groos,

1908; Mitchell, 1912; Pycraft, 1913), a position which in recent years, has received renewed attention (Dolhinow and Bishop, 1970; Hansen, 1966; Suomi and Harlow, 1971; Washburn and Hamburg, 1965). Loizos (1967) points out, however, that it is not necessary to play in order to practice, and as Poole (1966) noted, play in polecats is stereotyped and unmodified by experience.

c. Establishment of dominance hierarchy. Carpenter (1934) has suggested that play may facilitate learning a position in the social order. Although dominance among juveniles may be partially a function of maternal rank (Koford, 1965; Loy and Loy, 1974; Marsden, 1968; Sade, 1967), relative size (Symons, 1973), or seniority in the group (Drickamer and Vessey, 1973; Vessey, 1971), during play juveniles gain experience and become familiar with dominant and subordinate situations (Dolhinow and Bishop, 1970; Hall and DeVore, 1965; Harlow and Harlow, 1965; Jay, 1965).[3] Rhine (1973) calls social play "behavior testing", where active social experimentation allows individuals to determine each other's strengths and weaknesses.

d. Social communication. Play is suggested to facilitate learning appropriate communicative responses, and developing communication skills (Dolhinow, 1971; Jolly, 1972; Mason, 1965; Poirier and Smith, 1974; Rumbaugh, 1974). Fedigan (1972) notes that the development of social perception, the ability to predict another's behavior and respond accordingly, is a fundamental social skill of primates and may develop in playful interactions (Poirier and Smith, 1974).

e. Social integration. Etkin (1967) has suggested that play may be a method whereby animals maintain social familiarity with other individuals. Play facilitates an individual's integration into the troop structure (Rosenblum and Lowe, 1971; Southwick, Beg and Siddiqi, 1965), and formation of social bonds (Carpenter, 1934; Jay, 1965; Poirier, 1969, 1970, 1972; Suomi and Harlow, 1971). Furthermore, Poirier (1972) emphasizes that play functions to enable the individual to learn the limitations of self-assertiveness, clearly important in proper social integration.

These functions which have been suggested for play, although appealing and interesting, are based on comparatively little data (Beach, 1945; Müller-Schwarze, 1971; Welker, 1971). Loizos (1967) has suggested that it is presently more

[3] *See Symons (1978) for a critical discussion of this proposition.*

important to conduct precise, systematic observations of play than to propose additional hypotheses. More data are needed to evaluate the adaptiveness of play, and, as Baldwin and Baldwin (1977) note, there are alternative avenues to normal social development. Furthermore, Welker (1971) points out that play should not be considered totally adaptive on *a priori* grounds, solely because it is a common activity.

It is important to realize that play can have disadvantages and maladaptive consequences for the individual. Thorpe (1956:86) postulated that, "Provided, then, that the conditions of life are easy, play, however great in its practical value may be a means of learning about and so mastering the external world, is always in danger of becoming the main outlet for the animal's energies, and so dysgenic."

Baldwin and Baldwin (1977) suggest that play may be maladaptive in some respects, for individuals may be placed in dangerous or risky situations. Berger (1972) found that juvenile male olive baboons suffered the highest mortality as a result of their exploratory play behavior and of being driven from the troop by dominant males. Additionally, young primates are, in many cases, exposed to higher risks than other age classes (Poirier, 1972).

It has been noted (Baldwin and Baldwin, 1977) that maladaptive learning experiences can result from playful interactions. This has been effectively demonstrated in a wide variety of species, including humans (Byrd, 1972; McKearney, 1969; Weiner, 1965, 1969), particularly in laboratory situations, although not in the field situation. Statements about the adaptiveness of particular behaviors (i.e., play) are mostly speculative since there is very little direct data by which to evaluate them (Rowell, 1972). Welker (1971:189) notes, "...none of these views regarding the adaptive function of play constitutes an explanation in the scientific sense; rather, they appear as very general hypotheses that have not been verified or are not testable." Fagen (1974:852) concludes, "Evidence that play facilitates generic learning, or indeed any demonstrable function, is difficult to obtain."

Frequently, researchers rely on play deprivation studies (Chepko, 1971; Harlow, Harlow and Hansen, 1963; Müller-Schwarze, 1968; Oakley and Reynolds, 1976) to demonstrate the functional significance of play; however, their results are confounded by behavioral and/or social deprivation of other types (Bekoff, 1976b); e.g., motor activity (Chepko, 1971), peer contact (Harlow, Harlow and Hansen, 1963; Marler and Hamilton, 1966). Dolhinow and Bishop (1971:15) note, "The problem remains whether it is peer contact or the act of playing that results in normal behavior, and this would be very difficult to test experimentally."

Deprivation studies are further confounded by data on

squirrel monkeys in Western Panama (Baldwin and Baldwin, 1973, 1974). During a 10-week study of *Saimiri* at Barqueta, no playful behavior was recorded; however, these animals were reported to have exhibited grossly normal behavior patterns. In spite of the lack of play, animals maintained close individual distances and functioned as a cohesive troop, although Poirier (1969) noted that Nilgiri langur troops *(Presbytis johnii)*, which exhibited little social play, fissioned. Baldwin and Baldwin (1973, 1974, 1976) suggest the absence of play was due to a dearth of foods preferred by squirrel monkeys *(Saimiri sciureus)*, a failure to satisfy all primary needs (Meyer-Holzapfel, 1956). Furthermore, Baldwin and Baldwin (1973) report these animals spent 95% of each 14-hour day in foraging and traveling. Clearly, there is a growing body of literature which strongly suggests normal social development is possible in the absence of play; however, Baldwin and Baldwin (1973: 379-380) conclude that, "...the opportunity to play provides learning experiences in which young animals can develop more complex, varied social interaction patterns and stronger habits for engaging in frequent overt exchanges."

The main problem in the functional approach to the study of play is how to test any of the suggested functions of play. In other words, how can one develop a null hypothesis and test it? Fagen (1976) has recently reviewed the "exercise" or physical training hypothesis and has made several physiologically based predictions that should prove useful to researchers in the study of play. Alternatively, the social development, social integration and related social functions might be tested by raising young animals in a social group with procedures that would prevent play [e.g., a "slow feeder" apparatus (Baldwin and Baldwin, 1976)] without depriving the animals of social contact, sensory stimulation, exercise, etc. Without these kinds of empirical tests, the functions of play will remain, at best, educated guesses.

IV. CONCLUSION

In sum, there are different views of play which must be considered if a real understanding of play is to emerge. Considerable care must be exercised so as not to confuse these theoretical positions, as this can only lead to further problems. Clearly, it is out of a historical milieu that has been guilty of anthropomorphism that new insights into play must be acquired. Hansen (1974:183) noted, "...that investigations done on play activities in primates seem to have barely scratched the surface with respect to the potential knowledge

that is available concerning the particulars of how play activity may involve the key to understanding behavioral development."

It should be clear that regardless of theoretical position (structuralist vs. functionalist), or alternative, the only way in which the study of play can make any real advances is through the development of well planned experiments which explicitly state and test various hypotheses. Until this is done, those who study play will be guilty of proof by assertion, and not empirical verification.

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