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The Genesis of Animal Play

Testing the Limits

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2 Footprints in the Sand: The Origins and Radiation of Play Theory

I sit alone,
by my fire,
Surrounded by these lonely men,
Who like me,
Passed this spot
On the back of the Serpent's tail.
—Robinson (1992: 11)

2.1 Introduction

This book is about what we can learn from what has gone before. This statement may seem obvious when we talk about the origins or genesis of any phenomenon, and here my goal is to trace the evolutionary origins of playfulness. However, there is another sense in which we learn from the past, from the history of our attempts at understanding nature. Thus, at the epistemological heart of this volume is the conviction that when we deal with something as complex and enigmatic as play, the efforts and ideas of prior laborers in the sand dunes of play must be considered and evaluated with respect. This is not just dusty scholarship; the effort is critical in facilitating our study of play so that we (1) do not spend efforts arriving at concepts already formulated and somewhat worked out, (2) build on and extend the promising leads of the past and (3) avoid dead ends already encountered. In short, we should not ignore the often surprisingly sophisticated conceptualizations of different eras that could enrich our toolkit of ideas in areas where improved theory is urgently needed (Fagen, 1981).

Many scientists view the footprints of scientists from previous generations as being left in sand. They seem to think that their predecessors left imprints too indistinct and unreliable for us to examine for direction, size, and pattern, let alone follow them. Besides, we have new tools that they did not have. Can we not go straight to the goal and forget the footprints entirely? Yet, to me, the early struggles to understand

difficult issues are as important to the progress of science as understanding the fossilized footprints left by dinosaurs in the Cretaceous mudflats 100 million years ago (mya). They might once have been left in sand, but now are enduring clues to an ancient era that laid the foundations for the present world.

There are all kinds of footprints, and a useful starting point is to consider some of those left by our intellectual forebears in the attempt to understand play. The views summarized here are best appreciated in the original sources, but the edited books of selected excerpts by Bruner, Jolly, and Sylva (1976) and Müller-Schwarze (1978) are useful. I summarize the most influential and enduring older views of play here, often in the authors' original wording, because current textbook summaries are often too cursory to be useful, and often appear derived from secondary sources that are themselves erroneous or misleading. Unfortunately, working scientists in an area may ignore prior work because of faulty textbooks, or because graduate program curricula (and Web sites) downplay the importance of reading original material that is more than a decade or two old.

A comprehensive survey of all theories of play is not possible here. I do attempt to provide a framework in which a careful reader could situate the most similar older views and thus identify what is new. More important, I hope to motivate the reader to dip into some of the early writings by those who struggled to make sense of play, especially its origins, adaptiveness, and evolution.

My goal in this chapter, then, is to encourage readers to go behind current fashions and recognize that what is new is often recycled, and that what is novel is often a matter of emphasis. Care is needed in winnowing claims, those in this book included!

2.2 Play and Animal Play

The English word *play* has many meanings. According to the great eleventh edition (1911) of the *Encyclopaedia Britannica*, play originated as a term with the primary meaning of exercise or active movement. *Play* can refer to the play of light and color on a surface, the play of flames in a fireplace, the play of an axle in a wheel, or the play of thoughts or ideas. However, these uses may derive from the more specific meaning "of the free movement of parts of a mechanism on each other, of a joint or limb, & c" (Vol. 21: 830). Thus, playing a musical instrument referred to the movement of the fingers on or across it. Indeed, until the eighteenth century one used the word *play* with the name of the instrument, as in "to play on a recorder." The use of play as a noun to refer to a dramatic production is also an early use, as was the use of the term to refer to active recreational sports or amusements.

Play, broadly considered then, incorporates more than what is generally meant in psychology and education today by the play of animals and children: engaging in

nonserious amusement. Play may mean something other than amusement to the performer; the amusement is transferred to the audience. Thus we have theatrical productions, concerts, and sporting events in which the performers may be playing in terms of the original meaning, but the modern derived meaning that play is spirited, voluntary, and fun, may not apply. For the audience, however, attendance at such events may involve all three aspects. Today, the same issue is posed by professional sports stars and coaches who may earn enormous salaries for “playing a game” that most people engage in “just for fun.” Thus, the seeds are planted for the innumerable controversies in conceptualizing what play really is and what it is for, even in animals. Brian Sutton-Smith’s seven rhetorics of play listed in chapter 1 incorporate some of these broader conceptions of play.

Play is not only a word that has meant different things throughout the years in English-speaking cultures. Words in any language can always mean more or less than the phenomenon to be captured. For example, other languages often do not have any word at all that captures what we casually mean by play in English (Bax, 1977). Consequently, developing a set of criteria for identifying “play” in a scientific sense should not be held hostage to the various ways in which the English word is used (Sutton-Smith, 1997).

An attempt to break some new ground in defining play that goes beyond the English word *play* to the underlying behavioral concept more amenable to rigorous analysis is delayed until the next chapter. Here I trace the different views of play that grew out of Darwin’s attempt to have us look at all organic life as a product of evolutionary change and differentiation, largely based on natural selection. These new approaches to understanding the diversity of life led, in the late nineteenth century, to much interest in mental and behavioral similarities across all species, including humans (Richards, 1987). It is not surprising that the first enduring attempts to construct a theory of play occurred in the years of the late nineteenth century.

Writers on animal and child play generally recognize that the views of play contentiously debated a century ago have elements that are found in most modern theories as well. These early views are important because they set the stage for the kinds of ideas and phenomena that theorists have tried to deal with as more data accumulated. The power of any integrative approach is measured by the success with which it can accommodate the valid points of conflicting theories. It turns out that the positive points at the core of many of these theories are much more on target than the criticisms their proponents made of competing views.

The discussion that follows is an extension of an earlier exploration of this literature (Burghardt, 1984). Here I describe (1) what aspects of play various theories addressed, (2) some of the examples used, and especially (3) points relating to the evolution and origins of play.

2.3 An Early Description of Animal Play

Play, sports, games, amusements, and recreation have been important components of human behavior in all known cultures throughout history (Avedon & Sutton-Smith, 1971). For example, Janssen and Janssen (1990) describe how the activities of children in ancient Egypt included ball games; tug-of-war; gymnastics and acrobatics; pretend games; and the use of many toys, including balls, dolls, moveable figures and animals, tops, puppets, and model boats. Lancy (1996), who extensively observed play in an African village, is representative of many ethnographers who have described play in nonwestern cultures. Games from various cultures are being used in modern classrooms and schools (Clements, 1995).

Play has also long been recognized as occurring in animals, especially in common companion animals such as dogs and cats. Consider the entry on playfulness in a 150-year-old “encyclopedia” of comparative psychology and animal behavior by Edward Thompson (1851) titled *The Passions of Animals*. The first sentences convey the way that play in animals was viewed then and in many respects now.

In the waking hours the influence of the imagination manifests itself by a playfulness of manner, and an exuberance of animal spirits. The animal in its sportive moments abandons itself to a feeling in which its whole being seems to be concentrated in the performance of one of its passions, whether of joy or mischief, defiance or fear. (E. P. Thompson, 1851: 61)

Thompson then provides a series of examples, many of which would be accepted by play researchers today. His first example, oddly, is of crabs that “play with little round stones, and empty shells, as cats do with a cork or small ball” (1851: 62). However, this is quickly followed by examples that are more familiar.

Dogs, particularly young ones, are carried away with the impulse, rolling over and chasing each other in circles, seizing and shaking objects as if in anger, and enticing even their masters to join in their games. Horses in freedom, gallop hither and thither, snort and paw the air, advance to their groom, stop suddenly short, and again dash off at speed. A horse belonging to one of the large brewing establishments in London, at which a great number of pigs were kept, used frequently to scatter the grains on the ground with his mouth, and as soon as a pig came within his reach, he would seize it without injury and plunge it into the water-trough. The hare will gambol round in circles, tumble over, and fly here and there. . . . Whales, as described by Scoresby, are extremely frolicsome, and in their play leap twenty feet out of the water. (E. P. Thompson, 1851: 62)

After these examples, Thompson adds several more in an attempt to systematize and generalize the kinds of play.

Deer often engage in a sham battle, or a trial of strength, by twisting their horns together, and pushing for the mastery. All animals that pretend violence in their play, stop short of exercising it; the dog takes the greatest precaution not to injure by his bite, and the ourang outang, in wrestling

with his keeper, attempts to throw him, and makes feints of biting him. Some animals carry out in their play the semblance of catching their prey; young cats, for instance, leap after every small and moving object, even to the leaves, strewed by the autumn wind; they crouch, and steal forward ready for the spring, the body quivering and the tail vibrating with emotion, they bound on the moving leaf, and again watch, and again spring forward at another. Renegger saw young jaguars and cuguars [sic] playing with round substances like kittens.

Young lambs collect together on the little hillocks and eminences in their pastures, racing and sporting with each other in the most interesting manner. Birds of the Pie kind, are the analogues of the monkeys, full of mischief, play and mimicry. There is a story told of a tame magpie, which was seen busily employed in a garden, gathering pebbles, and with much solemnity, and a studied air, dropping them in a hole, about 18 inches deep, made to receive a post. After dropping each stone, it cried, Currack! triumphantly, and set off for another. On examining the spot a poor toad was found in the hole, which the magpie was stoning for his amusement. (E. P. Thompson, 1851: 63)

In these few short paragraphs Thompson gives examples that encompass the range of play as described today. An admirable diversity of species and play types are mentioned: locomotor play; object play; play with prey or prey substitutes; and social play, including play chasing, wrestling, fighting, and dominance contests. Play is linked with exploratory behavior, energetic activity, and the realization that it is often most evident in young animals (kittens, puppies, lambs). We see the inhibition of behavior, biting, for example, which is a frequently noted characteristic of social and predatory play (but note the touch of cruelty to the toad). The view that play involves pretense (semblance) is evident, as is the recognition that there are play-soliciting signals that even other species can recognize. Indeed, play with humans is cited several times. By current standards the comparison of some birds (magpies) with primates in their level of curiosity (mischief) and play is prescient. The development of games by animals that are not exclusively the product of instinctive or genetically controlled behavior is also mentioned. In short, virtually every behavioral aspect of animal play commonly studied today is listed.

However, Thompson was not a modern student of play in animals. These were the days before experiments on animal behavior were either formalized or developed. Even post-Darwinian authors such as Romanes (1883), Lindsay (1879), and Büchner (1880) relied heavily on anecdotes, often by reliable observers, but too often not. The last example quoted from Thompson (1851), although certainly compatible with what we know about the behavior of corvids, including magpies, reads like an oft-told tale. Thompson also was hampered by the limited knowledge of the natural history of the animals described. Thus, he did not get everything right by current lights. For example, he apparently confused courtship rituals in cranes with social play. On the other hand, courtship can have its playful, gamelike aspects in humans, and we might want to keep open this possibility in other species as well.

2.4 The Early Darwinian Legacy

The aftermath of the publication of *On the Origin of Species* was an intense search for commonalities between the behavior of human and nonhuman animals. Darwin contributed to this search with two important books that emphasized the links between us and other species in terms of social behavior, intelligence, and emotional expression (Darwin, 1871, 1872). Darwin discussed play, but did not add any new theoretical substance:

... the lower animals, like man, manifestly feel pleasure and pain, happiness and misery. Happiness is never better exhibited than by young animals, such as puppies, kittens, lambs, &c., when playing together, like our own children. Even insects play together, as has been described by that excellent observer, P. Huber, who saw ants chasing and pretending to bite each other, like so many puppies. (Darwin 1877: 68)

It is worth noting that for Darwin, like Thompson and other writers in the nineteenth century, play was not limited to vertebrates or even mammals, although the majority of examples always came from eutherian (placental) mammals.

In actuality, during the nineteenth century not much progress was made in our detailed knowledge of animal play. Lindsay (1879) recounted many examples, again anecdotal, on play in animals in chapters on “deception” and “practical jokes.” He went beyond Thompson in drawing out some further characteristics of play. For example, he noted the limits to the distinction between serious and nonserious activities or, as he wrote, “the perception of the distinction between *jest and earnest*. Unfortunately, just as in children, there is the same tendency in the mimic fights of young cocks or sporting dogs for jest and sport to pass into earnest. And the consequences of such a transition are sometimes quite as serious or sad in other animals as in man” (Lindsay, 1879: 530). The fact that internal or motivational factors as well as the topography of the playful acts (what they look like) are both relevant is integral to this distinction. Nonetheless, Lindsay’s attribution of pretense, humor, and make-believe to the behavior of animals was wildly and uncritically anthropomorphic, assuming a level of consciousness and intentionality (Bekoff & Allen, 1998) that would be rejected today without much better evidence. The early search for the evolutionary roots of human psychology too often led to similar overreaching (Lorenz, 1985).

Although the collection of more data on play lagged, after Darwin the emphasis switched to developing a theory that would explain why play occurred and how it evolved among species and developed in individuals. This was important because play, if viewed as not serious or not important to survival or reproduction, posed a problem for evolutionists (see Rosenberg, 1990, for a more recent critique). How can we explain through natural selection the occurrence of something that did not seem important, just fun? This challenge to viewing play as a product of evolution was recognized by

neither Darwin nor the early post-Darwinian writers such as Romanes (1883). In the early days of Darwinian theory, trying to explain the evolution of the vertebrate eye and sterile castes in social insects seemed much more urgent difficulties to attend to. Nonetheless, by the turn of the century, several views of human and animal play were formalized and competition among them was intense.

The theories that were to eventually dominate discussion for much of the twentieth century were summarized in the entry on play in the seminal *Dictionary of Philosophy and Psychology* edited by the founder of developmental evolutionary psychology, James Mark Baldwin (1902b). Baldwin wrote the essay on play and provides a good benchmark for evaluating where we are today a century later.

Baldwin grouped the theories of play into two camps: the biological and the psychological. From the biological perspective, he listed the “surplus energy” theory developed by Herbert Spencer and the “instinct practice” theory of Groos. A third view mentioned by Baldwin was “recuperation” theory. On the psychological side, Baldwin listed the “semblance” theory and “autotelic” theories. Another major theory of the time, not mentioned by Baldwin, was the “recapitulation” theory of G. Stanley Hall, which did not become widely known until shortly after Baldwin’s dictionary appeared.

The three main contending theories are described here with their original labels: surplus energy, instinct practice, and recapitulation. This is risky since names alone can foster premature dismissal of good ideas. Energy, instinct, and recapitulation were all to be eventually, and authoritatively, flung on the ash heap of science by leading scientists. Harlow (1971: 33) dismissed these theories of play as “quaint and curious,” as they were based on anecdotes and outmoded ideas about physiology and evolution. The phenomenal reality underlying these terms was forgotten in attacks on various weaknesses of each theory, problems that limited their scope to be sure, but which in retrospect did not discredit them completely. It is interesting that the biological bases of all three terms have been resurrected, albeit in altered form, by modern scientific methods that would have been inconceivable to the critics!⁴ The lesson to be learned is that if one goes beyond the rhetoric, one finds a core of commonsense ideas at the root of these views. The problem is that the theories often addressed different levels and domains of explanation. This is where analytical application of the five ethological aims plays a critical role.

In the following section these three main contending early theories on animal play (Müller-Schwarze, 1978) are presented and are followed by some others listed by Baldwin (1902a) and Carr (1902) that presaged later influential approaches to human as well as animal play.

4. I have discussed some of this history elsewhere (Burghardt, 1973, 1984, 1985a,b, 1998b).

2.5 Three Major Sources of Modern Play Theory

2.5.1 Surplus Energy Theory

In the early nineteenth century, Friedrich Schiller wrote a series of influential letters on aesthetic education (F. Schiller, 1967, original 1795). A major German playwright and poet, he developed a complex theory of beauty that is still promoting debate and clarification. For Schiller, civilized society began with “a propensity for ornamentation and play” (F. Schiller, 1967: 193). Now what are the conditions in which this happens? Schiller makes the following case in his twenty-seventh letter.

It is true that Nature has given even to creatures without reason more than the bare necessities of existence, and shed a glimmer of freedom even into the darkness of animal life. When the lion is not gnawed by hunger, nor provoked to battle by any beast of prey, his idle strength creates an object for itself: he fills the echoing desert with a roaring that speaks defiance, and his exuberant energy enjoys its *self* in purposeless display. With what enjoyment of life do insects swarm in the sunbeam; and it is certainly not the cry of desire that we hear in the melodious warbling of the songbird. Without doubt there is freedom in these activities; but not freedom from compulsion altogether, merely from a certain kind of compulsion, compulsion from without. An animal may be said to be at work, when the stimulus to activity is some lack; it may be said to be at play, when the stimulus is sheer plenitude of vitality, when superabundance of life is its own incentive to action. (F. Schiller, 1967: 207)

Putting aside Schiller’s lack of modern understanding of insect swarming and bird song, the point is clear that play occurs only when the animal is not under compulsion from external demands. And in this he also sees the essence of true human freedom. He not only makes a link to animal play as in the quotation, but goes even further to include trees that put forth more buds, roots, branches, and leaves than are needed for survival, suggesting the linkage of play with the essence of life itself.

Although Schiller may be the original framer of a surplus energy view of play and its origins, the theory discussed and dismissed first in almost all reviews of play is Herbert Spencer’s (1872) surplus energy theory. It is found in the second edition of his *Principles of Psychology*, in the very last chapter (of seventy-five) titled “Aesthetic sentiments.” In a compact six-page discussion, Spencer builds on something he had read by a “forgotten German author,” undoubtedly Friedrich Schiller (Elias, 1973), that artistic endeavors “originate from the play-impulse” (Spencer, 1872: 627). He proceeds brilliantly to show how this might have occurred, but first he shows how play itself originated and domesticates Schiller’s wilder prose.

Spencer begins by noting that unlike most other bodily functions and behavior patterns, artistic and play activities are not necessary for life. “The activities we call play are united with the aesthetic activities, by the trait that neither subserve, in any direct way, the processes conducive to life” (1872: 627). This view is embedded in the then-fashionable “faculty psychology”: “From the primary action of a faculty there results

the immediate normal gratification, *plus* the maintained or increased ability due to exercise, *plus* the objective end achieved or requirement fulfilled" (Spencer, 1872: 628). Play and art only satisfy the first two objectives, not the third, which for Spencer is limited to "proximate ends that imply ulterior benefits." Notice that the second objective asserts that play *does* have a function of producing "increased ability due to exercise," even if benefits such as eating, mating, or accessing other resources are not attained.

How did play originate? Spencer provided an insightful but ultimately flawed answer.

Inferior kinds of animals have in common the trait, that all their forces are expended in fulfilling functions essential to the maintenance of life. They are unceasingly occupied in searching for food, in escaping from enemies, in forming places of shelter, and in making preparations for progeny. But as we ascend to animals of high types having faculties more efficient and more numerous, we begin to find that time and strength are not wholly absorbed in providing for immediate needs. Better nutrition, gained by superiority, occasionally yields a surplus of vigour. The appetites being satisfied, there is no craving which directs the overflowing energies to the pursuit of more prey, or to the satisfaction of some pressing want. . . . When there have been developed many powers adjusted to many requirements, they cannot all act at once: now the circumstances call these into exercise and now those; and some of them occasionally remain unexercised for considerable periods. Thus there happens that in the more-evolved creatures, there often recurs an energy somewhat in excess of immediate needs, and there comes also such rest, now of this faculty and now of that, as permits the bringing of it up to a state of high efficiency by the repair which follows waste. (Spencer, 1872: 628–629)

In brief, Spencer proposed that play originates in "higher" animals (mammals), which have more efficient and more numerous ways of obtaining food, avoiding enemies, and solving other day-to-day problems. Better nutrition may give rise to a surplus of energy or vigor and at the same time certain behavioral faculties are not used for some time. This leads to lowered thresholds for both behavior patterns and their associated motivations and emotions ("desires"). The latter idea derived from the neurophysiological model that Spencer developed to explain what was going on inside the animal's brain (this in the days when neurophysiology hardly existed!). His theory of nerve centers held that those parts of the nervous system that are undischarged through behavior become "unusually ready to undergo change, to yield up molecular motion" (1872: 629). His views are remarkably prescient of Lorenz's model of action-specific energy (Lorenz, 1981), one of the first useful models developed by the ethologists (see chapter 5).

Spencer also viewed play as on a continuum with nonplay. For example, rats have incisors that continue to grow and are normally worn down throughout life; in captivity rats will gnaw anything available to keep their incisors worn. Similarly, house cats, deprived of the opportunity to hunt, will claw at chair coverings or tree bark to

stretch and exercise their limbs. This captivity-induced activity, “which hardly rises to what we call play, passes into play ordinarily so called where there is a more manifest union of feeling with the action. Play is equally an artificial exercise of powers, which in default of their natural exercise, become so ready to discharge that they relieve themselves by simulated actions in place of real actions” (1872: 630). This feeling or affect can be interpreted as pleasurable or fun.

An important aspect of Spencer’s view is that play is often a simulation and reflects a species’ characteristic behavioral repertoire. Thus predatory dogs have chasing and fighting games, kittens pounce after cotton balls, and boys chase and wrestle with one another and thus “gratify in a partial way the predatory instincts.” Children play with dolls, give tea parties, and show other “dramatizings of adult activities” (1872: 631). Child and adult games of skill are all based on achieving victory, and this can extend to chess, conversation and repartee, and wit combat in general. “That is to say, this activity of the intellectual faculties in which they are not used for purposes of guidance in the business of life, is carried on partly for the sake of the pleasure of the activity itself, and partly for the accompanying satisfaction of certain egoistic feelings which find for the moment no other sphere” (1872: 631).

Remarkably, Spencer’s theory was on the surface able to cover all aspects of play, and was quite successful in postulating a satisfactory understanding of how playful activities evolved from nonplayful ones. It contains the seed of the theory advanced in this book. If the psychologist reader thinks that Spencer’s reliance on a nineteenth-century faculty psychology renders his views suspect, this may be too harsh; while the original nineteenth-century faculty psychology has not come round again, the approach has resurfaced as “modularity of mind” theory (Fodor, 1983) and has become increasingly popular in evolutionary, psychological, and neurophysiological circles (Barkow, Cosmides, & Tooby, 1992; Restak, 1994; Shettleworth, 1998).

2.5.2 Instinct-Practice Theory

Already in Spencer we see that the forms of play seen in animals were related to the characteristic and instinctive activities the species performed “seriously.” Lindsay was one of the first to explicitly state that “playfulness, sportiveness, or friskiness in the young” were instincts (Lindsay, 1879: 131). Indeed, he advances what is today a major interpretation of play that is gaining support (K. V. Thompson, 1998): that through play animals master skills and assess their abilities.

Self-tuition includes systematic muscular exercise... The play of all young animals is to be regarded as an important part of physical *education*, as a means of imparting or developing that bodily agility which is so necessary in the struggle for life. Hence their mimic fights and races, their gambols, games, sports, pastimes of all kinds, have a high educational value, as well as an important relation to health, mental and bodily. (Lindsay, 1879: 280)

Here we see a shift that was soon to cause much confusion, that from the proximate causes of play behavior to the survival value or functions of play. The main protagonist in this shift was Karl Groos, a philosopher who wrote two highly influential books. His book on the play of animals (Groos, 1898)⁵ was until Fagen (1981) the only comprehensive treatment of the topic. A later volume on human play (Groos, 1901) was the first thorough treatment of that topic as well.

Groos argued, in quite modern fashion, that most behavior patterns, including song learning in birds, are a combination of instinct and experience. When a tiger cub is first confronted with prey it must capture alone, any “hereditary impulse” to creep up to, leap on, and seize prey would not be very successful unless such maneuvers had been practiced earlier. That is, the instinctive mechanisms would have to be near perfect. Groos considered such innate mastery impossible in more intelligent animals. “In the very moment when advancing evolution has gone so far that intellect alone can accomplish more than instinct, hereditary mechanism tends to lose its perfection, and the ‘chiseling out of brain predispositions’ by means of individual experience becomes more and more prominent. And it is by the play of children and animals alone that this carving out can be properly and perfectly accomplished” (Groos, 1898: 74). As support for this view, Groos notes that playful versions of necessary activities appear earlier in an animal’s life than when they are needed seriously. His very long book can be summed up in this famous quotation:

Animals can not be said to play because they are young and frolicsome, but rather they have a period of youth in order to play; for only by so doing can they supplement the insufficient hereditary endowment with individual experience in view of the coming tasks in life. (Groos, 1898: 75)

Thus play is founded on instinct, play perfects instinct, and play is necessary for the adequate development of mind and body. A large role is claimed for play in these few words. Fagen (1981), though critical of many specifics, largely endorsed the functional approach of Groos.

A problem Groos faced was play in adult animals. An adult should have no need for practice once instinctive behaviors are perfected. Groos uses the proximate pleasures of play to explain play in adult animals. (“A creature that once knows the pleasure of play will derive satisfaction from it even when youth is gone” Groos, 1898: 81.) The Baldwins (J. D. Baldwin & Baldwin, 1977) unwittingly rediscovered this explanation in their application of reinforcement theory to the retention of play in adult monkeys. Groos also pointed out that that “preservation of the species is advanced by exercise of the mind and body even in later years” (Groos, 1898: 81).

5. The original German edition was published in 1895. The English translation by Mark Baldwin’s wife, Elizabeth, omits some text and otherwise alters the original and must be treated as a somewhat different edition.

Groos devoted a long chapter to the weaknesses of surplus energy theory. He summarized the theory as follows (1898: 6):

1. The higher animals being able to provide themselves with better nourishment than the lower, their time and strength are no longer exclusively occupied in their own maintenance, hence they acquire a superabundance of vigour.
2. The overflow of energy will be favored in those cases where the higher animals have need for more diversified activities, for while they are occupied with one, the other special powers can find rest and reintegration.
3. When in this manner, the overflow of energy has reached a certain pitch, it tends to discharge.
4. If there is no occasion at the moment for the correlative activity to be seriously exercised, simply imitative activity is substituted, and this is play.

Groos (1898) states that although the surplus energy theory is plausible, it is easily shown to be inadequate. He criticizes each main aspect, primarily by pointing out exceptions. Although young well-fed animals in comfortable surroundings may be exuberant, he points out that tired animals may play, as when a kitten chases a leaf that blows past “even if it has been exercising for hours and its superfluous energies entirely disposed of” (1898: 19).

Furthermore, the “physical and mental overflow of energy” cannot be the main process since “it does not explain how it happens that all the individuals of a species manifest exactly the specific kind of play expression which prevails with their species, but differs from every other” (1898: 12). For Groos, the answer lies in instinct, not surplus energy or imitation.

Finally, the imitative process in point 4 cannot apply to the first occurrences of play in young animals and children. Imitation is learning details of behavior by observing another animal perform the behavior. As Groos states, such forms of play “at the very outset . . . are not imitative repetitions, but rather preparatory efforts. They come before any serious activity, and evidently aim at preparing the young creature for it and making him familiar with it” (1898: 7).

It is at this point that Groos’s critique of Spencer collapses, for Groos’s assertion that imitation is at the heart of Spencer’s theory is based on a quotation from someone else (or a translator) who apparently confused imitation with “simulation,” the word Spencer actually used. Simulation is not imitation, but is Spencer’s word to indicate that the behaviors were not functional but “as if” (see the discussion on semblance theory in the next section).⁶ Furthermore, Spencer clearly tied the type of play animals perform to their specific instinctive activities. In addition, the fact that animals that appear to be exhausted still manage to engage in another round of vigorous play will not be surprising to any parent of a 3-year-old child.

6. Schiller clearly does use imitation in his theory, and this could be a source of the confusion as well.

Why was Groos so set on discrediting Spencer, and why was James Mark Baldwin such a supporter, a disciple more doctrinaire than the prophet? (According to J. M. Baldwin's preface to the English translation, Groos's criticisms of surplus energy theory "put this theory permanently out of court" [Groos, 1898: iii].) My surmise is that to enthusiastic evolutionists such as Baldwin, Spencer's theory did not sufficiently address the "biological significance of play," which obviously had to be practice of adult behavior! As Groos eloquently states:

Can a phenomenon that is of so great, so incalculable value possibly be simply a convenient method of dissipating superfluous accumulations of energy? In all this there seems nothing to hinder the assumption that the instincts operative in play, like so many other phenomena of heredity, first appear when the animal really needs them. Where, then, would be the play of the young? It would not be provoked either by overflowing nervous energy or by the need for recreation. Yet the early appearance of this instinct is of inestimable importance. Without it the adult animal would be but poorly equipped for the tasks of his life. He would have far less than the requisite amount of practice in running and leaping, in springing on his prey, in seizing and strangling his victim, in fleeing from his enemies, in fighting his opponents, etc. The muscular system would not be sufficiently developed and trained for all these tasks. Moreover, much would be wanting in the structure of his skeleton, much that must be supplied by functional adaptation during the life of each individual, even in the period of growth. The thought presents itself here that it must be the iron hand of natural selection that brings into bold relief without too compelling insistence and apparently without serious motive—namely by means of play—what will later be so necessary. . . . A condition of superabundant nervous force is always, I must again emphatically reiterate, a favorable one for play, but it is not the motive cause, nor, as I believe, a necessary condition for its existence. Instinct is the real foundation of it. Foundation, I say, because all play is not purely instinctive activity. On the contrary, the higher we ascend in the scale of existence the richer and finer become the psychological phenomena that supplement the mere natural impulse, ennobling it, elevating it, and tending to conceal it under added detail. (Groos, 1898: 23–24)

Groos and Spencer were both correct in many respects, and their controversy was largely due to trying to understand different aspects of play: origins, mechanisms, and functions. Issues of energy and instinctive behavior are both crucial for understanding the origins of play.

In his subsequent book on human play (Groos, 1901) Groos altered his views. Whereas in animals play is derived from instinct, for humans instinct is not an appropriate concept. Likewise, while he earlier viewed imitation as a process separate from instinct, now "Imitation is the connecting link between instinctive and intelligent conduct" (Groos, 1901: 281). Writers at this time were not aware of the ways in which social experience could influence the performance of behavior patterns typically labeled as instinctive. Thus Groos's dilemma: Is imitation a social process (by which one animal repeats movements or sounds performed by another), a substitute

or replacement for instinct, or is it a kind of instinct itself? This problem would not be resolved by ethologists and comparative ethologists for another 70 years (cf. Lorenz, 1969 and Galef, 1998). Now we know that social learning processes (song learning, food preferences, language acquisition) are themselves rooted in evolved (“instinctive”) adaptations, although the exact mechanisms are still controversial (Zentall, 2003).

Harvey Carr, a thoughtful comparative psychologist of the early twentieth century and in the 1920s a president of the American Psychological Association, wrote a balanced review of both surplus energy theory and Groos’s two efforts (Carr, 1902).

In conclusion it will be noticed that if Groos limits the qualities of instability and forceful reactivity to hereditary impulse alone—those based upon instinct—his position is open to all the objections urged against the pure instinct conception of play, while the essential characteristic of his final position is really identical with Spencer’s surplus energy theory which he attempts to overthrow. (Carr, 1902: 10)

Most early treatments of animal behavior such as those by Morgan (1920), Alverdes (1927), and Hornaday (1922), repeated the views of these two primary competing theories: surplus energy and instinct practice. Today, however, surplus energy is generally given little attention.

2.5.3 Recapitulation Theory

The last of the three major theories is most associated with G. Stanley Hall, a major figure in American psychology, especially human developmental psychology. His two-volume opus on adolescence (G. S. Hall, 1904) is still cited in textbooks today (e.g., Berk, 1996). Hall strongly disagreed with Groos that play has its origins in the need to anticipate and prepare for the future needs of life. He viewed play in people, especially children, as the residue of behavior once necessary in the life of primitive humans, but now not needed in a serious manner. Play is not to be understood in terms of the needs of the future, but in the evolutionary past.

The view of Groos that play is practise for future adult activities is very partial, superficial, and perverse. It ignores the past where lie the keys to all play activities. True play never practises what is phyletically new, and this, industrial life often calls for. It exercises many atavistic and rudimentary functions, a number of which will abort before maturity, but which live themselves out in play like the tadpoles [sic] tail, that must be developed and used as stimulus to the growth of legs which will otherwise never mature. In place of this mistaken and misleading view, I regard play as the motor habits and spirit of the past of the race, persisting in the present, as rudimentary functions sometimes of and always akin to rudimentary organs. The best index and guide to the stated activities of adults in past ages is found in the instinctive, untaught, and non-imitative plays of children which are the most spontaneous and exact expressions of their motor needs. (G. S. Hall 1904: 202)

Play, for Hall, as for Groos and Spencer, is based on instinct. Hall noted the prevalence of play fighting in many animals and the many human games involving throwing, kicking, hitting, running, and dodging. These were once crucial activities: "The power to throw with accuracy and speed was once pivotal for survival, and non-throwers were eliminated. Those who throw unusually well best overcame enemies, killed game, and sheltered family. . . . running and dodging with speed and endurance, and hitting with a club, were also basal to hunting and fighting" (G. S. Hall, 1904: 206). Nevertheless, it is important to note that Hall did not conclude that play had no role in life, being mere atavistic remnants. On the contrary, although play behaviors are now "less urgent for utilitarian needs, they are still necessary for perfecting the organism" (1904: 206).

Hall did not neglect less aggressive kinds of play. His discussion of dolls in Hall (1904) is elaborated in Ellis and Hall (1921), originally published in 1896. Dolls are not just played with by girls, nor should they be. Boys are more likely to play with adult and animal dolls than baby dolls. Likewise, even for girls "before puberty dolls were more likely to be adults; after puberty they are almost always children or babies" (G. S. Hall, 1904: 209). Hall claimed that it was doubtful if girls who played most with dolls would "make the best mothers later, or if it has any value as preliminary practise of motherhood" (1904: 209). Hall is somewhat inconsistent, however, because Ellis and Hall (1921) "are convinced that, on the whole, more play with girl dolls by boys would tend to make them more sympathetic with girls as children, if not more tender with their wives and with women later" (Ellis & Hall, 1921: 190).

Since play reflects the evolutionary past, Hall (1904: 202) is skeptical about the value of the content of play in current times. What is important is that we enjoy these activities, for even in our modern (circa 1900!) urban life, they "touch and revive the deep basic emotions of the race." Universal human play activities should be encouraged as they provide "*interest, zest, and spontaneity*" (1904: 207). The dreary conformity and regularity of much industrialized societal life leads to the urge for fatigue, to play till one drops. Even a "hunger for fatigue" is a basic human trait separate from urges for activity or achievement, and is most prevalent during youth. Thus, Hall counters one of Groos's main objections to surplus energy theory.

Hall's views concerning the order of the unfolding of the play types in ontogeny have been most controversial and cannot be sustained, as is true of recapitulation views in embryology. This does not mean that development does not proceed through some stages that reflect limits established by earlier evolutionary history. Many terrestrial vertebrate embryos go through a gill slit stage that can only be there because of an aquatic ancestry.

The earliest recapitulation view that I have found predates most of Hall's writings and explicitly derives lessons for childhood education. Here play is more than just enjoyment for the jaded adult.

Science has shown that the embryonic period of physical development is a masquerade of long-vanished forms of life. In like manner the children of each new generation seek instinctively to revive the life that is behind them and in their favorite occupations and amusements re-enact the prehistoric experiences of mankind. All children crave living pets, build sand houses, and make caves in the earth; are fond of intertwining bits of straw, paper, or other pliable material; delight in shaping bowls and cups and saucers out of mud; and are inveterate diggers in the ground, even when, as in city streets and alleys, such digging is wholly without result. Can we fail to recognize in these universal cravings the soul echoes of that forgotten past when man began the subjugation of Nature by the taming of wild beasts, the erection of rude shelters, the weaving of garments, and the manufacture of pottery? Can we doubt that the order of history should be the order of education, and that before we teach the child to read and write we should aid his efforts to repeat in outline the earlier stages of human development. (Blow, 1894: 125–126)

Given this early statement in a prominent education text, it is unclear why Groos, Baldwin, and Carr all ignored recapitulation. It was not ignored, although heavily criticized, after the 1904 discussion by Hall. Recapitulation ideas still reverberate today in the writings of major evolutionary biologists (e.g., Mayr, 1994). Calvin's (1983, 1993) ballistic theory of human intelligence is based on the need for throwing accuracy in our early hominid history. S. T. Parker and Gibson (1979) and Parker (1996) use an explicit recapitulationist model of mental development in tracing cognitive stages in primate evolution, a thesis exhaustively blended with Piagetian stages of cognitive ontogeny in S. T. Parker and McKinney (1999).

2.6 Additional Early Views

2.6.1 Recuperation Theory

Play in animals, as in people, might be a time for recuperation from serious and stressful occupations, allowing exercise of bodily functions neglected during serious activities and work, but with less strain and effort. Carr (1902) postulated that circulatory and muscular reactions during play could remove toxic substances that build up in response to physical or mental work. One of the main theories, then as now, for the function of sleep, was to allow time for exhausted systems to recuperate. Play, like sleep, was a pleasurable means to accomplish this need.

2.6.2 Recreation Theory

In the late nineteenth century, the industrial revolution in the western world was only a few decades old. Large numbers of workers, including children, were undereducated, ill used, poorly paid, and worked to the limits of endurance. Recreation and play were now seen as not only opposites of work and labor, but also as remedies for the desperate plight of the exploited working class. Play involved a subset of recreational activities and diversions separated from work at the same time that work itself be-

came sharply delimited from other activities. Perhaps more important, in the rising industrial environment others controlled one's work schedule. Before this, the farmer, trader, shop owner, and artisan were more independent and able to schedule their work activities themselves. Enjoyable, even playful, elements could be incorporated into one's work, much as they are today by artists, craftspersons, scientists, and even teachers when they are not overburdened. Marxists and socialists were among the first to recognize the deterioration of communal and recreational life caused by industrialization.

Darwin's protege, George John Romanes (1897, original in 1877), himself a wealthy man, saw the plight of the working class and realized that recreation was as important for them as for the more refined (and delicate) upper classes. Recreation, as Romanes emphasizes, is "re-creation." If appropriate recreation is provided, the worker will be renewed and more fit for work.

... what our forefathers saw in recreation was not so much play, pastime, or pleasantry, as that of the restoration of enfeebled powers of work. . . . Recreation is, *or ought to be*, not a pastime entered upon for the sake of pleasure which it affords, but an act of duty undertaken for the sake of the subsequent power which it generates, and the subsequent profit which it ensures. (Romanes, 1897: 166–167)

Romanes takes a less crassly utilitarian, or capitalistic, bottom-line approach as his lengthy essay proceeds, although he never once mentions evolution. He does incorporate recuperation, both psychologically and physiologically, in his analysis, but notes that it is change and variety of activity, rather than the actual activities engaged in, that provide the recuperative function. This is another idea newly "discovered" in recent years.

G. S. Hall (1904) argued that the popularity of sport fishing is derived from a response to our ancestors who fished, resulting in a "fishing instinct." Thus today people fish who have no need of fish to eat, and hunt for game they do not need for survival. For more than 30 years I have participated in a poker group; one of our members is a professor who spends 10 weeks or so every summer on a remote island fishing and then smoking the captured fish. He keeps track of the days he does *not* fish at least once. Another member, a wealthy business school professor, eats virtually no meat, but is an avid deer hunter, often using only bow and arrows. He gives the meat to friends and family, but his financial status and investment acumen is such that buying even expensive steaks would be more prudent (and perhaps less risky). The little meat he does eat is from the animals that he kills himself.

Changes in recreational activities occur that may not be due merely to fads. When I grew up in the Midwest, hunting was highly popular and fishing even more so. Even a decade or so ago fishing was labeled the most popular sport in the United States. Today this does not seem to be the case. Fishing, especially lazy still fishing from a pier or an

anchored rowboat, does not seem quite as popular in the country today when population increases are taken into account. Could it be that fishing was a more popular recreation when most men worked at hard manual labor and fishing was a rather quiet, sedentary activity serving a recuperative function? The growth of bass fishing, fly fishing, and deep-sea fishing, with their attendant technology, may reflect a need for more active participation. Similarly, in games today, fewer American children appear to play baseball compared to their engagement in the more active sports of basketball, football, tennis, and soccer.

The extreme games (X games), mountain biking, rock climbing, and whitewater sports all challenge the individual in extreme environments. Hall might argue that this change in popular pastimes is due at least in part to an increased need to engage in vigorous activity as labor, youth, and life itself grow more sedentary. Of course, the availability of more resources and opportunities may also play a role in shifting play priorities. Against this line of thought would be the popularity of golf. Courses are sprouting up everywhere and golf does not have the energy costs of football. Still, golf frequently involves walking and being outdoors in parklike surroundings, however domesticated. Hall's ideas might be tested by looking at the kinds of recreational activities employed by cultures over time and different subsets of those cultures (Avedon & Sutton-Smith, 1971).

2.6.3 Diversion Theory

Diversion theory (Carr, 1902) is related to the closely linked recuperation and recreation theories. Play is a pastime: literally it is performed to pass the time. The movement to establish urban playgrounds in the United States started in the late nineteenth century as a way of diverting the behavior of uneducated immigrant children from delinquent and socially disruptive activities (viewed with some fear by middle-class and socially progressive citizens) that flourished in boring, impoverished communities (Mergen, 1982). In fact, play often does appear to be primarily a product of boredom, but may often, especially in the elderly, provide some mental stimulation, as in playing cards with a group (which also provides socialization) or alone (including the computer variant of solitaire). It might appear that these pastimes are not practice for anything at all, except perhaps to play a game better. However, Microsoft originally added solitaire to its operating system so computer novices could obtain practice using a computer mouse.

Theories concerning recuperation, recreation, and diversion can be traced back to the ancients, as in the writings of Plato. Thus modern conditions of life, although they may influence the specific forms of some kinds of play activities, are not the cause or origin of playfulness. Indeed, it has long been known that play can be therapeutic for adult humans. Burton (1883, original 1652) was quite positive about this in his section on the cures for melancholy, which we currently label depression.

Of these labours, exercises, and recreations, which are likewise included, some properly belong to the body, some to the mind, some more easy, some hard, some with delight, some without, some within doors, some natural, some are artificial. Amongst bodily exercises, Galen commends *ludum parvae pilae*, to play at ball, be it with the hand or racket, in tennis-courts or otherwise, it exerciseth each part of the body, and doth much good, so that they sweat not too much. (Burton, 1883: 309)

The role of physical exercise in treating depression is increasingly recognized today, and it may be superior to both psychotherapy and drug treatment; it is certainly a good adjunct to them. Burton treated at length different kinds of activities, not just physically energetic ones, as useful in distracting and refreshing people. These included sports, hunting, hiking, traveling, wildlife observation, reading, playing chess, dancing, singing, feasting, puppetry, and playing with children and pets.

This which I aim at, is for such as are *fracti animis*, troubled in mind, to ease them, over-toiled on the one part, to refresh: over idle on the other, to keep themselves busied. And to this purpose, as any labour or employment will serve to the one, any honest recreation will conduce to the other, so that it be moderate and sparing, as the use of meat and drink; not to spend all their life in gaming, playing, and pastimes, as too many gentlemen do; but to revive our bodies and recreate our souls with honest sports. (Burton, 1883: 317)

But unlike some of the more recent writings that idealize play (cf. P. K. Smith, 1996), Burton also found much evidence that play, especially when tied to gambling, was too seductive a diversion.

They labour most part not to pass the time in honest disport, but for filthy lucre, and covetousness of money. . . . that which was once their livelihood, and should have maintained wife, children, family, is now spent and gone. . . . So good things may be abused, and that which was first invented to refresh men's weary spirits, when they come from other labours and studies to exhilarate the mind, to entertain time and company, tedious otherwise in those long solitary winter nights, and keep them from worse matters, an honest exercise is contrarily perverted. (Burton, 1883: 315)

With the increase in legalized gambling almost everywhere, including throughout the United States, this addiction is now recognized as a psychological disorder that is due to the very problems that Burton wrote about 350 years ago. Play can take many forms and have many consequences.

2.6.4 Semblance Theory

In semblance theory, the essence of play is its quality of make-believe, "as if," pretend, or pretense. It includes what today we call sociodramatic play or role playing, as well as the play of animals with inanimate objects as if they were prey. It was a key aspect of the view of Schiller, who stated: "And as soon as the play-drive begins to stir, with its pleasure in semblance, it will be followed by the shaping spirit of imitation, which

treats semblance as something autonomous" (F. Schiller, 1967: 195). Although listed by J. M. Baldwin (1902a) as a separate psychological theory of play, semblance is better viewed as a characteristic of much, although not all, play. This aspect of play is the focus of much research in child behavior and is often incorporated in kindergarten and daycare settings (Power, 2000). True pretend play is often limited to the great apes and humans (S. T. Parker & McKinney, 1999), an issue I will return to later.

Psychoanalytic theory, as construed by Freud (1959, original 1931), Walder (1978, original 1933), Winnicott (1971), and others is largely a variant of semblance theory. For example, young children play "doctor" so that they can deal with their own pain and anxiety resulting from visits to the doctor. By actively reliving unpleasant experiences in a safe and playful manner, children gain experience in "mastering the outside world" (Freud, 1959: 264). Play also involves wish fulfillment and oedipal conflicts (Marans & Cohen, 1991). Such views constitute the rationale behind much of the play therapy movement in child psychotherapy (Coppolillo, 1991). Play therapy may involve scribbling, modeling clay, and playing with dolls, as well as "innocent" games meant to relax the child and increase rapport with the therapist. As Winnicott states: "the child does not usually possess the command of language that can convey the infinite subtleties to be found in play" (1971: 39). Play therapy is frequently applied, using realistic dolls and other props, in the exploration and treatment of sexual abuse in children (Webb, 1991). Play may indeed have beneficial effects in these contexts, but such work takes us too far from the origins of play in normal animals.

2.6.5 Autotelic Theory

Autotelic theory derives from the view that all play is done for its own sake. As Spencer noted, the play performance is its own gratification, not the putative end or goal. Thus, autotelic means that the goal (*telos*) of the behavior is itself (*auto*). By itself, this characteristic of play, which Groos acknowledges is universal, is not a theory at all. Furthermore, not all behavior patterns performed in this manner would be considered play, as Spencer realized in his play continuum process. Lorenz (1981) also made this point in his theory of instinctive behavior. From the animal's point of view, the goal of instinctive (consummatory) acts was the behavioral performance itself. This performance, not the nourishment from eating food, the offspring resulting from copulation, or the increased survival of offspring that was due to having built a nest, was both goal and reward. Lorenz's view was explicitly derived from the distinction made by Wallace Craig between appetitive behavior and consummatory acts that terminate behavioral sequences (Craig, 1918). This seems the best explanation, at the causal or control level (see chapter 1), for the rewarding effect of unsuccessful predatory attacks. For example, it is known that newborn gartersnakes (*Thamnophis sirtalis*) will attack cotton swabs rubbed on prey the species normally eats, such as earthworms. If snakes have struck at

such swabs but never have eaten, they later strike more at earthworm swabs than they would have without such unsuccessful attacks (Burghardt, 1990). Rather than being deterred (habituated) by stimuli that lead to no conventional reward, the animal's performance of a behavior in the presence of certain stimuli appears to be rewarding in some way. Bühler's (1930) "*Funktionslust*" theory, in which play is maintained by the sheer pleasure of performing it, is another later variant of autotelic theory. More recently, R. W. Mitchell (1990) has advanced an explicitly autotelic theory of play (chapter 4).

2.6.6 Exercise Theory

The view that motor and perceptual development is facilitated by, if not dependent upon, play is perhaps the most popular current theory (cf. Byers, 1998; Fagen, 1981). The modern version of the theory is generally credited to Brownlee's (1954) writings on cattle, but it had already been described by Carr (1902) and was implicit and even explicit in some of the earlier views I quoted. Carr was able to cite experiments showing that both sensory stimulation and motor activity are needed for proper development. Both the motor and neural systems need such stimulation; such systems then become linked and associations are formed that enhance later intellectual development. Carr advocated the use of different modes of providing such stimulation for children, noting that through free play young animals and children spontaneously and naturally aided their own development. Could nonplay activities be as effective as playful ones in obtaining this stimulation? Perhaps, but Carr thought that play involved specific parts of the brain associated with important natural behavior and thus could be uniquely valuable in development. For example, physically active free play, rather than rote gymnastics, should be encouraged in educational settings.

2.6.7 Cognitive Theories

Going well beyond the instinct-practice view, Carr (1902) also discussed the role of play in the transmission of ideas and anticipated Huizinga (1955). Important aspects of culture, such as traditions, customs, religion, ideals, and history, can be conveyed through legends, myths, poetry, songs, and dance. These are all-important features of preliterate societies. Just as active play is more effective than rote gymnastics, so too is play important in cognitive development. Carr noted favorably that "Arithmetic is being taught under cover of the play reaction. The dramatic method of reading aims to secure a more vivid and lasting association between the idea and the symbol" (Carr, 1902: 24). Mental play was important.

Chess and mental puzzles organize neural associations. Myths, fairy stories, daydreams, etc., are plays among ideas, plays of the imagination, which physiologically are nothing but reactions involving new associations. Reveries to some extent are the play periods of the intellect; they stimulate growth and new associations and lay out lines for voluntary thought. (Carr, 1902: 24)

The role of play in cognitive development has been explored in a most influential manner by Piaget (1962), who credits James Mark Baldwin as a major influence on him (Richards, 1987). Imagination as play has been explored by many (see J. L. Singer, 1991), the book by D. J. Singer and J. L. Singer (1990) being perhaps most well known.

2.6.8 Socialization Theory

The possibility that social play is important in establishing one's role in a group or in learning social skills became very popular in the 1970s (Fagen, 1981). Carr also recognized these types of theories. Group games, such as football, involve the development of "the habits of emotional control, of co-operation, subordination and obedience to authority" (Carr, 1902: 23).

In addition to discussing the role of play in helping an individual function effectively in a group, Carr also included a lengthy section on the role of play in unifying groups or cultures, especially if they later needed to act as a cohesive society against an external threat. The low visibility of play is reflected in the fact that this role is not included in the recent debates on possible mechanisms of group selection in human behavior (D. S. Wilson & Sober, 1994; Sober & D. S. Wilson, 1998).

The rediscovery of writings by Vygotsky in the 1930s (e.g., Vygotsky, 1967; Vygotsky & Luria, 1993), has reinvigorated the study of social and cultural factors in play and child development, areas rather neglected by Piaget. However, these ideas, too, were far from being new, even in the period between the two world wars.

2.7 Conclusion

This survey illustrates that many of the most seminal ideas about the causal bases for play, its origin, its development, and its possible adaptive value had already been outlined a century ago. Most, except for the surplus energy, instinct practice, and recapitulation theories, focused on the possible functions of play in enhancing an animal's life, not on play's genesis in ontogeny and phylogeny. Unfortunately, limited data were available for testing any of these ideas and sorting through the many conflicting claims. The conceptual tools needed to evaluate them in terms of the differing ethological aims were not available to clarify sources of confusion and, perhaps for that reason, none of the early theories were developed in any depth or evaluated with extensive data for many decades to come.

Carr (1902) wisely noted that theories proposed for the function of play, such as the exercise, cognitive, and socialization theories, were neither exhaustive nor mutually exclusive. There was no necessary reason to hold that play *had* to serve these functions; other more serious activities might do as well. He did, however, advance five "special utilities of play," suggesting that play might be a superior mode of achieving certain ends.

- **Ease of the reaction** By this, Carr means that playful reactions are readily performed. The requisite motor, sensory, neural, and regulatory processes are already in place. Insofar as they lead to adaptive ends, they would be selected for and thus survive.
- **Increased activity** Play is a process encouraging activity that, as we have seen, is valuable in exercising body and mind. “In work there is precision and definiteness of certain continually recurring reactions. Whim and caprice—change in the reacting centres—is reduced to a minimum; all is constraint and drear monotony. Thus fatigue is easily engendered and rest is a necessity. Play with its change and continual variability in reacting centres allows time for rest and recuperation and thus tends to a more continued activity” (Carr, 1902: 28).
- **Greater intensity of reaction, including emotions** Play involves attention and concentration: “The attentiveness and self-absorption of children at play is remarkable. Players in games involving a decided vaso-motor reaction are characterized by an energetic whole-souled attitude” (Carr, 1902: 29). Carr contrasts the college grind with the healthy active athlete.
- **Greater stimulation to growth and development** Carr presents many aspects of the physiology of young animals in which stimulation is critical to proper development. Play, by involving so many aspects of the organism, is particularly valuable in this respect.
- **Increased variability of reactions and ideas** This is probably the most prescient of Carr’s suggestions and is again being advocated (e.g., Sutton-Smith, 1997), but itself derives from Spencer’s view that play is the source of artistic creativity.

Read without prejudice, almost the entire body of modern play research in both animals and humans can be seen as working on the themes listed above and throughout this chapter. Recognizing the footprints left a century ago takes a bit of practice and pays off in increased insight and humility. Science suffers if we fail to appropriately identify the truly new and novel, place it in context, and give priority and credit where they belong.

Some recent developments of these early theories have been mentioned in passing here and will be discussed more fully in later chapters. Today we know much more about biology and the nature of animal diversity, and play researchers are clarifying and testing these and other ideas with increasing rigor. Much of the state of the art on animals’ play can be read in detail in Bekoff and Byers (1998) and Power (2000). Similarly, J. E. Johnson, Christie, and Yawkey (1999); Frost, Wortham, and Reifel (2001) and Pellegrini and Smith (1998) are good sources for updates on child play theory.

Unfortunately, as at the end of chapter 1, the issue of what play *is* and how to recognize it, has still not been addressed. It is time.

