

What is Play For? Sexual Selection and the Evolution of Play

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Play primarily affords juveniles practice toward the exercise of later skills.

Peter K. Smith (1982)

The only thing that play prepares you for is more play.

Brian Sutton-Smith (often)

Peter K. Smith and Brian Sutton-Smith are two of the premier play theorists of our time. How is it, then, that their opinions about the purpose of play seem to differ so dramatically, at least as based upon the two statements quoted above? Indeed, what is the purpose of play? Why does it exist? These are all difficult questions but the latter two seem to be especially intransigent. The purpose of this paper will be to examine the first question—how can Smith¹ and Sutton-Smith hold such apparently contradictory opinions—in the hope of shedding some new light on the second and third.

Eminent biologist and co-architect of the synthetic theory of evolution, Ernst Mayr, has noted that every question that one can ask has two very distinct kinds of answers (Goldsmith, 1991; Mayr, 1997). Why do birds sing? Why do people look for food if they have not eaten for a time? Both of these reactions can be explained as more or less predictable responses to the effects of certain environmental conditions on the nervous systems of birds and of people (Goldsmith, 1991). This is an explanation of proximate cause but it says nothing about how these responses developed in evolutionary time. If we claim that birds sing in order to attract mates or to establish territories wherein they can successfully support their offspring and that people eat because self-correcting homeostatic mechanisms that we, along with all other living things, have evolved kick into action when energy reserves run low, then we have evoked an explanation of ultimate causation. In cultural terms, proximate explanations may enlighten us regarding the outbreak of World War I but if we ask why war exists at all, we must look for ultimate, hence evolutionary, explanations. Explanations of proximate and ultimate cause do not compete, but are complementary in both the biological and cultural realms, and that the preference to seek one, rather than the other, is based on personal interest, not any notion that either sort of explanation is somehow more correct than the other. Indeed, each should inform the other.

Explanations of play that involve either proximate or ultimate cause, or both, are common in the literature. However, though evolutionary explanations—and hence ultimate explanations—of play pepper the literature, their success in answering the question, “What is play for?” has been limited. Explanations of the ultimate causation of play (e.g., Smith 1982, Poirier 1982, and Lewis 1982) represent the perspective that play developed, through natural selection, because it is somehow beneficial to the species. That is, it aids somehow in survival and reproductive success. Sutton-Smith, asserts that such explanations are poppycock, though he does not hint at why play should be so ubiquitous among mammals. Why should being prepared for more play be of any evolutionary significance?

The major studies of the evolutionary significance of play—and there are many of them—almost always begin with natural selection, Darwin’s (1859) great insight into the engine of biological evolution. Darwin (1859) expressed it as follows: “As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurrent struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be *naturally selected*. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form” (p. 3). Thus, living things express four features:

1. Many more offspring are born than can possibly survive
2. Though offspring typically resemble their parents, they always exhibit some measure of variation from their parents and among themselves.
3. Some variation in traits can be inherited
4. Inheritable traits that afford some individuals greater opportunity to survive and reproduce will increase in the population.

Hence, the fit of organisms to their environments is improved through natural selection. But, natural selection does not “improve” organisms in any moral sense, nor is it goal directed. Human beings were not an inevitable result of the evolutionary process on Earth and would likely not result again should the process somehow be restarted (e.g., Gould 1989, 1996). The fit of organisms to their environment is based on their phenotype, the expression of their genotype, and phenotypes involve both the physical character of organisms and their behavior. Play, as such, is a characteristic of most, if not all, mammalian phenotypes.

Though the evolution of play is virtually always considered as the result of natural selection (see, e.g., Fagen 1981; Smith 1982; Bekoff & Byers 1998), Darwin's two related engines of evolution, artificial and sexual selection, are rarely mentioned. However, given that play has been slow to yield its nature to studies of ultimate causation based solely on natural selection, the purpose of this paper is to suggest that play be considered in light of artificial selection and, especially, sexual selection. First, however, it seems prudent to review some of the things that we think we know about play at the most general level.

WHAT DO WE THINK THAT WE KNOW ABOUT PLAY?

We think that we know some things about play and it is probable that some of the things that we know are actually true. Several of these will be listed below. However, what we think we know about play depends to a significant degree on how play is defined. There are numerous definitions of play in the literature and I do not wish to select one of them or conjure up others here. It is sufficient to say at this point that there is relatively high inter observer consensus in describing behavior labeled as play, at least as it occurs among most species (Bernstein 1982). Burghardt (1998), for example, describes "phenomena, if seen in a mammal or bird, would be readily labeled playful by most observers" (p. 2) in turtles. Obviously, the further that other species are removed phylogenetically from our own, the less reliable such observations will be.

1. *Play is characteristic of vertebrates.* Though a contemporary of Darwin reported observing play among ants, there is currently only equivocal evidence to suggest that it occurs, at least extensively, among any non-vertebrates. Among vertebrates, play is generally thought to be all but a universal among mammals. Though it occurs among many birds, it seems to be either rare or non-existent among other vertebrates, including fish, amphibians, and reptiles. There are, however, reports of possible play among crocodilians (Lazell & Spitzer 1977), among juvenile African chameleons (Burghardt 1982), and some turtles (Burghardt 1998). Object play has even been reported recently in the octopus (Service 1998) which, if correct, would be the first convincing evidence for play in an invertebrate species. A problem, of course, is that recognizing play among reptiles, other vertebrates, or invertebrates may be extremely difficult. While the play face, for example, is widespread among certain mammal groups (e.g., primates, canids), it is difficult to imagine what it might look like in the octopus. Finally, the fact that invertebrates greatly outnumber vertebrates among the animal species of the world means that play is a relatively rare phenomenon (Fagen 1995).

2. *Play is characteristic of organisms with relatively long life spans.* It is often said that long term benefits must outweigh immediate costs in order for play to be adaptive. If there is no long term, then the costs of play would be too high to bear. On the other hand, some very long-lived species apparently do not play. Some turtles, for example, as well as other reptiles have very long life spans but lack play. The same is true of certain amphibians and even some insects (e.g., locusts). Non sexually reproducing microorganisms (e.g., amoeba) have, in principle, infinite life spans, but do not play. So this particular truism about play may generally be true among mammals but not among animals in general.

3. *Play seems to be correlated with the relative size and complexity of the neocortex.* This point is, of course, related to the first. Mammals have larger and more complex brains than do birds, reptiles, other vertebrates and invertebrates (though the octopus, an invertebrate, may outdo many vertebrates, including some mammals, in this respect). Brain size and complexity correlates with size of behavioral repertoire, particularly with the part of the behavioral repertoire that is learned. During their lifetimes, plants apparently never learn anything and the vast majority of animals learn very little. Big-brained mammals learn a lot and there are probably still a few social and behavioral scientists around who ascribe to the view that humans must learn everything that they end up knowing. Since it must be assumed that increased brain size and complexity came about for adaptive reasons during evolution, it should therefore be difficult to dismiss play from this process.²

4. *Play is most typical of young animals and peaks during periods of maximal cortical development.* Lawick-Goodall (1968) found that the frequency of play among wild chimpanzees changes dramatically across the life span. Among chimps between the ages of 0 and 2, she observed more than 60 play sessions per 100 observational periods. This figure rose to more than 200 for chimps between the ages of 2 and 9 years. After that period, the frequency of play dropped dramatically with adult males engaging in fewer than 10 play sessions per 100 observational periods and adult females fewer than 5. Adult females with an offspring did play more, exhibiting approximately 25 play sessions per observational period. Similar observations have been made of other playful species. Bekoff and Byers (1981, p. 297) indicate that since “natural selection operates at all ages” it is likely that “differential early play experience most probably can affect subsequent individual development and reproductive fitness.”

5. *Play commonly involves behavior patterns adapted from their usual contexts.* The behaviors exhibited in animal play seem to be largely taken from the survival related contexts affectionately known as the “four F’s,” that is, fighting, fleeing, feeding, and mating. These are all obviously important and if, as the quote from Smith (1982) suggests, learning that takes place in juvenile play affords greater success in any of all of these as an adult, then play should be worth the risks that it poses. And the risks are real. Play can result in injury, devolve into actual fighting, opens animals involved in play to predation, and is seemingly wasteful of both time and energy.

6. *Play disappears under stress.* If you happen to be a member of a prey species, and your response to the appearance of a predator is play, your genes have a diminished chance of being passed on to the next generation. Similarly, the frequency of play has been observed to diminish under conditions of deprivation, particularly of food (e.g., Baldwin & Baldwin 1976; Poirier 1982; Müller-Schwarze et al. 1982).

7. *Play typically involves the communication, “This is play.”* Animals engaged in social play or who wish to play with others commonly communicate that through stylized gestures, postures, movements, or facial expressions (the “play face”) (Smith 1982; Lawick-Goodall 1968; Bekoff 1974; Bekoff & Byers 1981; Bekoff & Allen 1998). This is functional, given that play behaviors are typically derived from important adult behavior contexts (the “four F’s” again). Obviously, it is important that animals be able to differentiate between play fighting and real fighting (e.g., Aldis 1975; Bekoff 1975; Pellis & Pellis 1996, 1998) since the latter can result in injury or even death.

8. *Species that maintain significant levels of playfulness into adulthood typically also retain other neonatal characteristics.* In 1926 Louis Bolk described a number of neonatal characteristics in humans (compared to apes), including a rounded, vaulted cranium, a juvenile face (flat, with small jaws and teeth, no brow ridges), forward positioning of the foramen magnum, delayed closure of the cranial sutures, an unrotated, unopposable big toe, and an extended period of playfulness. We have bred neonatal characteristics into domestic animals, as well, especially in dogs, but also in animals such as pigs, cattle, and cats. Recent evidence indicates that all dogs are descended from wolves. However, adult wolves play only rarely while dogs remain playful throughout their lives. Many breeds retain various other neonatal characters, as well. The currently most popular breed in the United States, the Labrador retriever, is a good example. Like pups, the Lab retains floppy

ears, a relatively short muzzle (by wolf standards), a thick body and relatively short legs. I have heard it said of Labs that they remain puppies for about 12 years and then they die.

9. *Play is fun.* Play has long resisted definition (see e.g., Fagen 1981; Martin & Caro 1985; Burghardt 1998) but it seems to invoke high inter-observer agreement when seen. We know it when we see it and one of the things that tells us that an activity is playful is that it looks like fun. Colts gamboling or dogs play-fighting seem to be having fun, though that certainly is an anthropomorphization. As with the other characteristics of play reviewed here, its property of fun becomes more difficult to recognize in animals that are more widely separated from us phylogenetically.

Other characteristics have been described for play, including that it has no clear immediate function, that it is energetically expensive, that it involves breakdown or reversal of typical role relationship, and that it involves awkward or exaggerated movements (see e.g., Burghardt 1984). There may be more, as well, but the above list is sufficient for the purpose of this paper. Given these characteristics, the next question to ask is whether or not and, if so how, is play adaptive.

IS PLAY ADAPTIVE?

The amount of controversy and discussion resulting from this question is probably second only to that produced by the many efforts to define play. Even the concept of adaptation itself is controversial. Several quotes will frame the problem.

Play would not be so widespread among mammals were it not adaptive.

Poirier (1982, p. 167)

To begin with, it seems reasonable to assume that play, like all other behavior (and structure), has evolved for some reason (often assumed to be an adaptive reason).

Lewis (1982, p. 166)

If play were not functional, animals that played would be at a selective disadvantage compared to non-playing animals that husbanded their resources, used their time more profitably, and avoided the inevitable

risks of injury and exposure to predators.

Symons (1978, pp. 2-3)

Even were play a necessary condition for normal development, as may well be the case, it does not follow that animals play for that reason.

Ghiselin (1974, p. 260)

The apparent lack of a single function or selectional basis for play should come as no big surprise, given the vastly different sets of selection pressures that have operated on the diverse species that display play.

Suomi (1982, p. 169)

What is Adaptation?

Durham (1991) defined adaptation as “the appropriateness or ‘fit’ of an organism’s form and function to prevailing environmental conditions” (p. 14). However, simply functioning well in an environment is not enough. Barash (1979) pointed out that “the ultimate measure of such functioning is how successfully an individual is in replicating itself while others are independently trying to do the same thing (p. 20). So, for play to be adaptive, it would assist playful animals both to function well in their environments and to reproduce successfully. Since, by many definitions, play lacks immediate functions or benefits, it has typically been assumed that the benefits of play are delayed. So, while a behavior, such as play, that appears to have immediate costs (e.g., dangerous, costly in time and energy), has long term benefits that outweigh the immediate costs, the behavior can be adaptive. Play has been so described (Smith 1982).

But, there is a long-standing argument about adaptation and it is still being played out on the most public of arenas (for such a thing). In one corner, we have Richard Dawkins, British biologist, ultra-Darwinist, and adaptationist. In the other, lurks Steven Jay Gould, American biologist, Darwinist of sorts, and anti-adaptationist. The fun part is that Dawkins and Gould are undoubtedly the world’s two most prominent popularizers of evolutionary thinking. Each has written several influential books on evolutionary theory that are intended for scientific and public consumption. While their argument is beyond the scope of this paper, a couple of relevant points should be made. In the quotes above, Poirier, Lewis, and Symons indicate strongly that play *must* be adaptive or it would not

exist. On the other hand, Gould and Lewontin (1979) use the apocryphal characterization “adaptationist program” to characterize those who attempt to show the adaptedness of organisms and their characteristics. Lewontin (1979) presented the extreme version of this position as those who assume “without further proof that all aspects of the morphology, physiology, and behavior of organisms are adaptive optimal solutions to problems” (p. 6). Parts of our physiology, such as wisdom teeth and the appendix, clearly are not adaptive and some are nice, but obviously did not evolve for certain present functions. Five digits on each hand are nice for touch typing and piano playing but certainly did not evolve for those activities. So, trying to explain how *all* phenotypical characters, both morphological and behavioral, are adaptive is doomed to failure. Later, Gould and Vrba (1982) suggested that the term “adaptation” only be used when a trait possessed by an organism both promotes the fitness of the organism and currently performs the function for which it was selected. For other structures that are useful for their present role, but were not designed for it, they proposed the term “exaptation.”

Burghardt (1998) indicates that there are “two perennial views of why play exists” (p. 5). These are, first, that play somehow prepares the player for the future, or, second, that “play is a legacy from the past” (p. 6). The quotes from Smith and Sutton-Smith at the beginning of this paper are examples of the former, though they differ in terms of what the player is being prepared for. If the former interpretation is correct, then play seemingly is an adaptation, as any preparation that would permit an organism to succeed as an adult would be valuable. On the other hand, if play is a leftover (either as a form of recapitulation or as the expenditure of surplus energy on activities already well fixed in instincts), play would, at best, be an exaptation. The possibility that play is an exaptation has been discussed by Burkhardt (1988) but the great majority of ultimate causal explanations for play are of the preparation theory sort (Burkhardt 1998).

Hypothesized Functions of Play.

A relatively small number of preparation for the future benefits for play have been proposed. Numerous functions have been attributed to play but nearly all fall into three general categories: play as physical training, play as social training, and play as cognitive training (Bekoff & Byers 1981). More specific effects of play include skill development (in terms of predation, fleeing, and sexual behavior), social bonding, learning, cognitive development, development of behavioral plasticity, and problem solving. Play could have been selected for each or all of these, though in different proportions for different species.

For extensive reviews of these hypothesized functions of play, see, e.g., Bekoff and Byers (1981), Fagen (1981), Smith (1982, 1995).

The problem is that there seems to be little solid evidence for any of the hypothesized functions of play (Bekoff & Byers 1981; Smith 1995). Fagen (1981) reviews substantial evidence that indicates that, instead of preceding the mastery of many skills, play follows it in many cases. Moreover, the fact that play occurs among adults in many species, though it may not occupy nearly so large a percentage of time as among juveniles, renders practice-for-the-future hypotheses suspect (Bekoff & Byers 1981; Fagen 1982; Hall 1998). Further, it is important to remember (1) that the present functions of play may not be the same as past functions (Bernstein 1982), (2) that what appear to be present functions of play may not be the reasons for which play evolved (Burghardt 1998), and (3) that play may have evolved independently in different species (i.e., convergent evolution), possibly for the same reasons or for different reasons (Burghardt 1998)

The hypothesized functions of play noted above all involved natural selection as they are purportedly adaptive in some fashion or another. There are, however, alternate ways of looking at the functionality of play that do not involve the notion of adaptation as it relates to natural selection. In a section of his 1974 book, *The economy of nature and the evolution of sex*, titled “An Exemplary Puzzle in Evolutionary Psychology, Michael T. Ghiselin indicated that “We can sum up the literature in a few words: those who think that they know what play is ‘for’ have reasoned from false premises” (p. 259). He immediately rejected surplus energy, practice, and development theories for play. Instead, he hypothesized that the protection of members of social groups from competitive interactions may be the primary function of play. Ghiselin (1974) suggested that “Little boys playing soldier are not practicing to slaughter their fellow men, but furthering peaceful life within their own society. The way to make a killer out of a child is to put him into a genuinely competitive situation—such as Little League Baseball” (p. 261). Finally, he proposed the idea that human moral traits may not be due to natural selection at all but, instead the result of artificial selection. Though morals and play are not the same thing, the important point is that a mechanism other than natural selection might be involved in the ontogeny of both. Before exploring this possibility further, it would be prudent to review Darwin’s (1859, 1871) explication of the forces of evolution.

THE ENGINES OF EVOLUTION

Charles Darwin (1859) proposed that the prime mover in biological evolution is what he termed *natural selection*. Darwin based his theory of evolution by natural selection on two simple facts. First, individuals increase in number faster than do resources available to them. This he took from the work of Malthus (1803, orig. 1798). Second, members of any species vary among themselves. Darwin reasoned that since some offspring die while others survive, and individual members of species vary, those individuals who are best served by their inherited characters in local conditions will leave more offspring. And these offspring will tend to resemble their successful parents. This leads to the accumulation of valuable variations and, hence, to evolutionary change. Darwin put it as follows:

As many more individuals of each species are born than can possibly survive: and as, consequently, there is a frequently recurrent struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be *naturally selected*. (1859, p. 3)

But Darwin (1859) also recognized the importance of two other mechanisms for evolutionary change. The first, with which he became familiar from animal breeders, he termed *artificial selection*. He noted that “One of the most remarkable features in our domesticated races is that we see in them adaptation, not indeed to the animal’s or plant’s own good, but to man’s use or fancy” (p. 21). Further, Darwin suggested that artificial selection may be of two types. First, it may be “methodical” in that it is deliberate, as where bigger ears of corn with better tasting grain is kept for seed so that future generations of corn plants retain those characteristics. Artificial selection might also be unconscious, as where individual members of a species are bred preferentially but with no specific phenotypical goal in mind.

Darwin (1859) proposed *sexual selection* in *The Origin of Species* but treated it at much greater length in *The Descent of Man, and Selection in Relation to Sex* (1871). Like artificial selection, sexual selection comes in two varieties. The first, competition, is intrasexual and occurs mostly among males. One type of competition is where males fight for access to females, typically where dominant males gather harems of females. For their prowess, the victorious males enjoy nearly or totally exclusive sexual access to the females. Presumably the traits that made them dominant are passed on to offspring. Male-male competition can range from deadly combat to displays and bluffs. The other type of

competition involves a struggle for possession of a critical resource, typically either food or breeding locations, that females require. Darwin (1859) described competition as follows:

This form of selection depends, not on a struggle for existence in relation to other organic beings or to external conditions, but on a struggle between the individuals of one sex, generally the males, for the possession of the other sex. (1859, p. 65)

Choice, the second variety of sexual selection, is intersexual and most often the province of females. Female choice permitted Darwin to explain the often gaudy—and seemingly maladaptive—adornments often carried by males of many species, especially among birds. The showy feathers (not really tail feathers but feathers of the lower back) of the peacock is the canonical example. Darwin commented on choice in the following manner:

I can see no good reason to doubt that female birds, by selecting the during thousands of generations, the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect. (1859, p. 66)

Elegant research shows that females of various species do, in fact, mate preferentially with the most highly adorned males. Female choice was confirmed in classic experiments conducted in the 1980s. The African widowbird, a polygynous bird that nests in open grasslands in Kenya, was the subject of one such experiment (Andersson 1982). Widowbird males, with bodies about the size of the North American cardinal, have extremely long tail feathers, some 50 cm. Females, on the other hand, have 7 cm tails. Males attract females by flying low, slow maneuvers over their territories with tail feathers fanned. After mating, females nest in tall grass and the males take no part in rearing the young. Andersson (1982) hypothesized that the elongated tail plays a role in mate attraction. Hence, all of the males in an area were captured and treated in one of four ways. First, some were simply released as a control group to show that capture did not influence mating success. The second control group had their tails cut but then replaced (glued). The third, experimental, group had their tails shortened to about 14 cm. Their feathers were then used to extend the tails of the fourth group to about 75 cm. Andersson (1982) found that females preferred the newly longer tailed males by a ratio of 4-1 over their short tailed colleagues and about 3-1 over the control birds. It should be pointed out that the

longer tail feathers inhibited the flight of the one experimental group and would have likely put them at greater risk of predation. So there are some natural controls on the lengths (literally) to which males will go to attract females.

Haines and Gould (1994) conducted a second confirming experiment with guppies. In this case, female guppies preferred males with the largest tails (with an average tail area of 220 mm²) by a ratio of 4 to 1 over those with the smallest tails (average tail area of 16 mm²) and 3 to 1 over individuals with medium size tails (averaging 45 mm²). Those with average tails were preferred by a factor of 3 over those with the smallest tails. In this experiment, actual mating results counted and, of the females that became pregnant, 80% gave birth to large-tailed fry (Haines & Gould 1994). Finally, since the large tailed guppies also displayed more frequently, Haines and Gould (1994) heated the tanks of the smaller tailed fish, thereby increasing their display rates. Under this condition, the advantage of the large-tailed males dropped to 3 to 2 over those with smaller tails, meaning that about 2/3 of the variation in female choice was due to display frequency but 1/3 was still due to tail size.

Unlike natural selection, sexual selection is competition solely in the arena of reproduction. Hence, animals may develop characteristics under the influence of sexual selection that are otherwise adaptively neutral or even negative (Ghiselin 1989). The peacock's feathers are an example. Darwin, in *The Descent of Man and Selection in Relation to Sex* (1871), discussed many such features in terms of what he called primary and secondary sexual characteristics. For the most part, Darwin meant the sexual organs themselves when referring to primary sexual characteristics. Among secondary sexual characteristics, he included attributes that were of no value other than to confer a reproductive advantage for one individual over another of the same sex. These could be physical, such as antlers on male deer and glands for producing odors that occur among various species, or behavioral, such as bird songs or courage and aggressiveness. He claimed that:

Thus it is, as I believe, that when the males and females of any animal have the same general habits of life, but differ in structure, colour, or ornament, such differences have been mainly caused by sexual selection.

Darwin (1859, p. 66)

It is important to note that Darwin recognized that sexual selection could lead to change in both physical and behavioral characters in the competition for reproductive success. This is perhaps best displayed in the bowerbird. Males of the 18 species of bowerbird build and decorate edifices that are part of the displays used to attract females. There is a strong inverse correlation between the degree of male coloration (physical) and the elaborateness of the constructions (behavioral) for each of the species. Males of relatively unornamented species build the most elaborate and highly decorated bowers while brightly colored species construct simpler and less decorated bowers (Gould and Gould 1997). The most dominant males of each species are those with the best built, least-damaged (males raid each other's bowers both to damage them and to steal decorations), and most elaborately decorated bowers.

Artificial and Sexual Selection in Humans.

Only momentary reflection is required to make it clear that humans engage in both intrasex competition and intersex displays to attract mates. Both men and women resort to everything from gossip and hostile stares to murder in the competition for potential mates. Your own experiences in high school should confirm this (excepting the murder part, we hope). Similarly, both males and females engage in elaborate displays that include both behavioral and material components, sometimes using the latter to compensate for presumed physical shortcomings. Displays of wealth and status (e.g., elegant clothes, homes, cars, gifts, etc.) are used both in intrasexual competition and to influence intersexual choice.

David Buss is among the foremost mate choice researchers. He has found, in particular, that men and women differ in terms of what they look for in a potential mate. Male and female preferences are shown in Table 1 below.

Table 1. Ranking of Characteristics Sought in Mates by Men and Women (from Buss [1985]).

Rank	Male Preferences	Female Preferences
1.	Kindness & Understanding	Kindness & Understanding
2.	Intelligence	Intelligence
3.	<i>Physical Attractiveness</i>	Exciting Personality

4.	Exciting Personality	Good Health
5.	Good Health	Adaptability
6.	Adaptability	<i>Physical Attractiveness</i>
7.	Creativity	Creativity
8.	Desire for Children	<i>Good Earning Capacity</i>
9.	College Graduate	College Graduate
10.	Good Heredity	Desire for Children
11.	<i>Good Earning Capacity</i>	Good Heredity
12.	Good Housekeeper	Good Housekeeper

Although the rank ordering for male and females are largely concordant, I have highlighted the differences (physical attractiveness, good earning capacity) that have attracted the most interest from researchers. Men seem to be much more interested in the physical attractiveness of their mates than in their earning capacity and more interested in physical attractiveness, in general, than are females. Females, on the other hand, indicate that they are also more interested in physical attractiveness than earning capacity but not by the margin shown by males. Cross-cultural research by Buss (1989) showed that, in 36 of 37 cultural samples, females placed higher value on the prospective earning capacity of mates than do males. Males in each of the 37 samples preferred mates who are younger than themselves while females prefer males who are older than themselves. In fact, females appeared to prefer a larger age difference between themselves and their mates (3.42 years) than was true for males (2.66 years) (Buss 1989). Males rated physical attractiveness higher than did females in each of the 37 samples, though three of the observed differences were not statistically significant.

These results accord with predictions made by Buss (1989) on the basis of evolutionary theory, specifically parental investment and sexual selection theory. Trivers (1972) hypothesized that sexual selection is partly driven by the different levels of investment that males and females contribute to their offspring. Among mammals, including humans, females tend to have significantly more parental investment in offspring than do males, though males may invest in their progeny in ways other than direct care. They may provide mates with food, defend territories, or defend both the female and the young against aggressors (Trivers 1972). Trivers (1972) hypothesized that the sex that has the greater parental investment will also be the one that is the choosier in terms of mate

selection. Again, this would be most characteristic of females because greater reproductive costs accrue to the sex with the heavier investment and choice leads to better benefits.

Why do females typically invest more in offspring? The answer is clear from reproductive physiology. Sperm is cheap and plentiful while eggs are costly and rare by comparison. While most females in mammalian species manage to reproduce, their total reproductive capacity is sharply limited. Males lack similar physical limitations, though among social species where dominant males collect harems of females, many males may never reproduce at all. It is in the best interest of females to mate with the highest quality males (genetically speaking) and then to invest heavily in their offspring. The same is not necessarily true for males though cultural rules about monogamy, premarital chastity, and so on, place restrictions on the procreative capacities of human males that bring them more in line with human female capacities, though recent public evidence suggests that high ranking males may break these cultural rules with substantial frequency and relative impunity.

What sort of mate characteristics should human females and males prefer based on the above considerations? Females should choose mates who afford the best opportunity for survival for the relatively limited number of offspring that they can produce. So these characteristics would include good health and the other personal characteristics shown in Table 1 but, since human males do typically contribute to the welfare of their offspring, females should seek mates who would also provide resources, such as nourishment, shelter, and protection (Buss 1989). In the modern world, such resources translate into earning capacity. Not surprisingly, earning capacity is a trait that is more highly valued in male by females than in females by males. Reproduction by males, however, is not particularly limited by the resources controlled by females. Moreover, since their reproductive capacity is far higher than that of females, males can afford to invest less in offspring. Hence, male reproduction is limited only by access to fertile females.³ Therefore, males should preferentially seek fertile females and fertility in females is powerfully connoted by age (Buss 1989). According to Buss (1989):

Features of physical appearance associate with youth—such as smooth skin, good muscle tone, lustrous hair, and full lips—and behavioral indicators of youth—such as high energy and a sprightly gait—have been hypothesized to provide the strongest cues to female reproductive capacity (Symons 1979; Williams 1975). Sexual attraction and standard

of beauty are hypothesized to have evolved to correspond to these features. On this account males *failing* to prefer females possessing attributes that signal high reproductive capacity would, on average, leave fewer offspring than would males who do prefer to mate with females displaying these attributes. (p. 2)

Male fertility, on the other hand, is less sharply age-graded and, hence, more difficult to assess on the basis of physical appearance (Buss 1989). For females, therefore, the physical appearance of their mates should be less important than it is for males. As Buss (1989) notes, however, standards for beauty (e.g., slim versus plump, light skin versus dark skin, etc.) are heavily influenced by culture. Nevertheless, lack of symmetry in features or features that may suggest either advanced age or disease are rarely, if ever, regarded as signs of beauty. Buss (1989) felt that the sex differences in mate preference that he predicted would transcend cultural differences. As indicated in Table 1 above and in the results that he reported from his cross-cultural study (Buss 1989), his predictions received substantial support.

However, what does any of this have to do with play? First, playfulness is conspicuous by its absence in the research cited above (see also, e.g., Ellis 1992). Yet, play is overwhelmingly reported as a behavioral characteristic of young animals and surely signals youthfulness.⁴ Second, play may be part of what respondents meant when they indicated preferences for several of the characteristics indicated in Table 1. For example, playfulness is more characteristic of healthy than sick animals. It could also be part of an “exciting personality,” or even “intelligence” and “creativity.” Who knows where “playfulness” would have been ranked had Buss (1985) chosen to include it as a potentially desirable characteristic in mates? My guess is that it would have ranked relatively high.

There may also be a darker side to all of this, however. Infanticide by males is common in many mammalian species.⁵ Male lions, for example, typically kill all of the suckling cubs in the pride when they depose the previously dominant male. Their purpose is to insure that the females come into estrus as quickly as possible so that they can then sire offspring. Since males rarely can hold on to their dominant position for long, they must reproduce as quickly as possible in order to insure that their genes are passed to the next generation. Female lions may try to hide their cubs but typically do not attempt to defend them otherwise. To do so would not be to their advantage in the face of a larger, more powerful, and determined male (Wrangham & Peterson 1996). Among lion prides in

the Serengeti, approximately one-fourth of all infants are lost to infanticide (Packer & Pusey 1983). Similarly, infanticide has been observed among various monkey species and, among apes, various combinations of infanticide, as well as the rape and/or battering of females has been observed. There is no evidence of infanticide among orangutans, generally thought to be the great ape most distantly related to humans, probably because these animals are solitary and only assemble to mate. On the other hand, Wrangham and Peterson (1996) indicate that “Most female orangutans are raped regularly” (p. 151). Moreover, “Every female chimpanzee gets battered, some are raped, and a few have their infants killed. Many or even most gorilla mothers experience infanticide—but they aren’t battered” (Wrangham and Peterson 1996, p. 151). In humans, biological fathers kill their children much less often than is the case for stepfathers (Buss 1989). But what does *this* have to do with play?

Play as a Signal.

Playfulness, as suggested above, may be a clear cue to youthfulness and health, both of which indicate reproductive value, especially in females. But playfulness may signal other things, as well. As noted by Ghiselin (1974), “A possible function for play is therefore clear: it protects the members of the society by preventing competitive interactions” (p. 261). To reinforce the point, Ghiselin (1974) claimed that “So long as everyone continues playing, nobody gets hurt” (p. 261) and “we seek out the company of persons with a good sense of humor, not just because they are amusing, but because they are innocuous. Those who are always serious pose a threat” (p. 262). Ghiselin (1982) later argued that “People do less harm to one another when they are telling jokes or playing games than when they are fighting. People who play are not much of a threat to us, and we seek their company and cherish them, and this may be reasonably be expected to increase their Darwinian fitness.” (p. 165).

We know, of course, that there are signals for play. But can play itself be a signal? Adult male lions occasionally play with cubs. Among other playful species, including chimpanzees, gorillas, and humans, adult males sometimes play with infants and juveniles, as well. Such episodes involve typical play signals, such as the play bow and the play face, and, as Ghiselin has suggested, harm and threats of harm are minimized by the play context. Is it not therefore possible that females are more likely to select playful males (among species where intrasexual choice occurs) inasmuch as such males may be less

likely to harm either the females or their offspring? Further, is playfulness itself not a communication of the intent to do no harm?

We have clearly bred extended periods of playfulness into certain domestic animals, especially dogs and cats. As suggested by Sigmund (1993):

Did we possibly breed ourselves into playmates? ... If peacock females can breed for the long tails of peacock males, why should humans not breed for a strong play-urge in their children, by caring more for those who are fun to play with? (p. 207)

While differential care for children based on their playfulness is possible, I doubt that it is where selection for play takes place. I think that it is much more likely that both females and males choose playfulness in potential mates because it is a relatively unambiguous signal of reproductively important information. For females, I hypothesize that playfulness signals a lower likelihood of doing harm. It is simply that playful males are less dangerous than serious males. For males, female playfulness signals something entirely different. It indicates youth and health, both of which are important for reproductive success.

SUMMARY: SO WHAT IS PLAY FOR?

It is difficult to believe that play is not good for *something*, that it did not evolve for *some* good reason. Yet, Ghiselin (1974) was able to assert that “The literature on play, whatever its position on evolution, abounds in unfounded hypotheses and teleological posits” (p. 258). Moreover, the numerous hypotheses, regarding the functional consequences of play have only limited support in animals (Martin & Caro 1985) and possibly even less in humans (Smith 1995). As Burghardt (1998) noted, “In most areas of behavior, the functional approach has yielded great rewards rather quickly once adaptive explanations have been carefully stated and explored. Unfortunately this has not been the case with play” (p. 3). So, was Smith (1982) right? Does play provide practice for future skills? Or, is Sutton-Smith correct? Does play merely prepare humans and other animals for more play? Or, is it somehow possible for both of them to be correct?⁷

I believe that adaptive, evolutionary, or functional explanations for the ultimate causes of play in animals and humans has not been as successful as expected because we

have failed to seriously consider artificial and, especially, sexual selection as either complements or alternatives to natural selection. Explanations based on natural selection essentially revolve around the argument that play has long term consequences, such as skill practice or physical and cognitive development, that outweigh immediate costs. Sutton-Smith's assertion makes little sense if natural selection is the engine behind the evolution of play. On the other hand, it makes a great deal of sense if either or both artificial and sexual selection are considered with respect to play.

Sexual selection theory has only recently begun to receive the attention that it deserves. Darwin himself did not regard sexual selection to be as efficacious as natural selection because he felt that it involved only the number of offspring produced, rather than survival itself. But this means that Darwin ignored the fact that a long life span is irrelevant unless it leads to a high quantity of high quality offspring (Gould and Gould 1997). In addition, sexual selection was ignored—or efforts were made to discredit it—because the very thought that choice exerted by females could have any effect on evolution simply did not sit well with a sexist scientific community. Sexual selection is rarely mentioned in research and theorizing on the evolution of play (e.g., Burkhardt 1998; Caro 1988; Fagen 1981, 1995) and, in turn, play is rarely mentioned in research and theorizing on sexual selection (e.g., Buss 1989, 1994; Low 1979; Ridley 1993). But, only a glance at the peacock is enough to appreciate the potency of sexual selection as an evolutionary force.

My purpose here is not to attempt to replace the consideration of play in terms of natural selection with artificial and/or sexual selection⁶ but to suggest that the latter may further our understanding. Play *may* afford humans and other animals practice for future skills. But the principle skill to be practiced may be play itself. Play may prepare us for future play because playfulness is a signal worth retaining, though it may mean very different things to men and to women. The epigraphs of Smith (1982) and Sutton-Smith may *both* be true.

The play as a signal theory leads to several obvious hypotheses. First, playful men should be preferred over dour men as potential mates by women. Playful adult men should have, on average (as mitigated by cultural standards for family size, etc.) more children than dour men, cross-culturally. Playful adult men should be less apt to engage in both wife battering and infanticide. Similarly, playful women should be preferred, cross-culturally, over dour women as potential mates by men. Playful women should have, on average, (again mitigated by cultural standards) more children than dour women.

Unfortunately, these hypotheses suffer from the same difficulty as many of the other conjectures about the origins and functions of play: some measure of logic, but little in the way of evidence. Further, even if play now serves as a signal for both men and women (and male and female animals), there is no guarantee that it evolved for that reason. Nevertheless, I feel that research in this area is worthwhile and that testable hypotheses are available. And, frankly, the theorizing and speculating on natural selection and play, given their modest results, get pretty boring after a while. Sexual selection theory, with visions of men competing for women with fancy clothes, sleek cars, and gifts that betoken boundless resources while women lure men with perfumes, figure-enhancing clothes, and makeup that promise both fecundity and eternal youth, seems like a lot more fun. It is the stuff cheap novels are made of. It might even be true.

Notes:

¹ To be fair, Smith (1995) has more recently expressed some doubts about the functions of play, especially in humans.

² Human brain size remains an enigma. The brain is an energetically costly and relatively fragile organ. The brain size of present day humans is essentially no different from that of archaic humans of 50,000 to 150,000 years ago. Since, so far as we know, all humans subsisted by food collection up until 12 or 15 thousand years ago, the adaptive significance and the evolution of the big brain is difficult to explain. To assume that bigger brains must have been adaptive since they obviously did evolve is not very helpful. We simply do not know the nature of the selective pressures that resulted in big brains.

³ As noted by Buss (1989), there is a difference between *reproductive value* and *fertility*. A 13 year old female has greater reproductive value than a 23 year old, simply because she has, more or less, 10 years longer to be reproductively active. On the other hand, since fertility peaks in the early 20s, the 23 year old is more likely to conceive and is, therefore, more fertile. Nevertheless, both reproductive value and fertility are age dependent so age provides a clear indicator of female reproductive capability. But since the distinction between reproductive value and fertility is not critical to my argument, I will use the term fertility to refer to both.

⁴ Of course, it could signal too much youthfulness. That is, since play is characteristic of juveniles, it might signal sexual immaturity, rather than fertility (though that might simply

suggest a preference for reproductive value over fertility (see Note 3 above). Further, given the reasoning presented, it should be more important among females than males.

⁵ It is apparently common among certain species in every major animal group, including insects, fish, reptiles, birds, and mammals (Wrangham & Peterson 1996).

⁶ Ghiselin (1982) claimed that “Artificial selection is closely akin to sexual selection” (p. 165). This is true to the extent that neither has much to do with selecting for survivability, Darwin’s primary interest in *Origin of Species* (1859). On the other hand, artificial selection has little to do with survival or reproduction *per se* except that we humans either consciously or unconsciously choose which individuals from certain species are permitted to survive and reproduce. In artificial selection, we are most interested in either physical or behavioral characteristics (i.e., large cereal grains, meaty pigs, birds that cannot fly but can produce prodigious numbers of eggs, or playful dogs). In many cases, we artificially breed varieties of organisms that cannot, without human intervention, successfully breed at all. But sexual selection, as Ghiselin (1989) himself pointed out, is all about reproduction. Moreover, I am predicting that females select playful males for reasons different from the ones for which males select playful females. Finally, since artificial selection typically refers to human intervention in breeding, by definition, it is excluded as an explanation for play among non-domesticated animals. While I do not discount the possible roles of either natural or artificial selection in the ontogeny of play, my bet is that the evolution of play has more to do with sexual than artificial selection.

⁷ The other logical possibility is that both are wrong, an alternative that also must be considered.

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