

# MAN THE SHOWOFF? OR THE ASCENDANCE OF A JUST-SO-STORY: A COMMENT ON RECENT APPLICATIONS OF COSTLY SIGNALING THEORY IN AMERICAN ARCHAEOLOGY

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*In several recent, and highly provocative papers, McGuire and Hildebrandt (Hildebrandt and McGuire 2002, 2003; McGuire and Hildebrandt 2005) have helped introduce costly signaling theory into American archaeology. While their efforts are commendable, we feel that their reinterpretations of western North American prehistory overstate the likely influence of costly signaling on the archaeological record. Only by overlooking a considerable body of ethnographic literature that indicates a more limited role for signaling are they able to characterize Great Basin and California hunters as motivated more by the pursuit of prestige than provisioning. We offer three specific challenges to their models: (1) while McGuire and Hildebrandt treat the issue as decided, the relationships among foraging, provisioning, prestige, and fitness is still actively contested among researchers; (2) while ethnographic studies suggest that some types of hunting and low-return, high-risk activities may indeed represent attempts by males to signal costly behavior, these activities contribute very little to the faunal and other residues that accumulate in the archaeological record; and (3) the theoretical underpinnings of costly signaling explicitly preclude the type of runaway positive feedback loops that Hildebrandt and McGuire implicate as the driving force behind an apparent cultural collapse in the Great Basin at the end of the Middle Archaic.*

*En varios papeles, McGuire y Hildebrandt recientes y sumamente provocativos (Hildebrandt y McGuire 2002, 2003; McGuire y Hildebrandt 2005) ha ayudado a introducir señalar costoso la teoría en la arqueología Americana. Mientras sus esfuerzos son recomendables, nosotros nos sentimos que sus reinterpretaciones de prehistoria norteamericana occidental exagera la influencia probable de señalar costoso en el registro arqueológico. Sólo dejando pasar un cuerpo considerable de la literatura etnográfica que indica un papel más limitado para señalar es ellos capaz de caracterizar Gran Palangana y cazadores de California motivaron como más por el persecución del prestigio que provisioning. Ofrecemos tres desafíos específicos a sus modelos: (1) mientras McGuire y Hildebrandt tratan el asunto como decidido, las relaciones entre adentrarse, provisioning, el prestigio y la salud, todavía son refutados activamente entre investigadores; (2) mientras los estudios etnográficos sugieren que algunos tipos de cazar y el bajo-regreso, las actividades de alto riesgo pueden representar verdaderamente las tentativas por males para señalar la conducta costosa, estas actividades contribuyen muy poco al faunal y otros residuos de que acumulan en el registro arqueológico; (3) los apuntalamientos teóricos Señalar impide explícitamente el tipo de lazos de reacción que Hildebrandt positivos fugitivos y McGuire implican como la fuerza que maneja detrás de un desplome cultural aparente en la Gran Palangana a fines del Mediano Arcaico.*

In recent decades it has become increasingly common in American archaeology for conceptual advances to be made in a top-down fashion in which new theoretical perspectives spur on highly provocative interpretations of the past. The premise underlying this approach is that a greater good is ultimately served by the promotion of creative thinking even if the specifics of the case are unconvincing and empirical support is questionable. This epistemology distinguishes American archaeology from the

natural sciences where theoretical advances are taken seriously only when they are accompanied by compelling empirical evidence. While top-down approaches encourage much-needed creativity, it is important to recognize instances when creative license exceeds plausibility. For those archaeologists who operate under the assumption that there is an objective past that we work to unveil, the truth-value of new, theoretically guided interpretations remains of paramount importance.

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In two recent and provocative papers, McGuire and Hildebrandt (Hildebrandt and McGuire 2002, 2003; McGuire and Hildebrandt 2005) have successfully introduced costly signaling theory<sup>1</sup> into western North American archaeology following the established protocols of the top-down approach. Embracing a somewhat narrow view of signaling theory, they develop narratives that incorporate limited data sets and argue for the value of this new perspective in interpreting the archaeological record. While the wholesale reinterpretations of western North American prehistory offered by McGuire and Hildebrandt (2005) and Hildebrandt and McGuire (2002) represent extremely important conceptual advances, we feel that it is also important to recognize and acknowledge hyperbole in their interpretations. We are not substantivists arguing against formalist interpretations, nor do we wish to supplement challenges to the empirical bases of the Hildebrandt and McGuire arguments already rendered (e.g., Broughton and Bayham 2003; Hockett 2005). Rather, we wish to point out that in attempting to advance the field theoretically, McGuire and Hildebrandt have overstated the likely effects of costly signaling on the archaeological record, and in so doing have missed an opportunity to present costly signaling in a more meaningful way. As such, the interpretations they develop verge on just-so-stories. Specifically, we argue the following points:

(1) McGuire and Hildebrandt (2005) oversimplify the variability among foraging groups and ignore a substantial body of literature when they assert that big-game hunting was undertaken primarily for prestige purposes and that it results in better hunters having higher reproductive success. Far from an established fact, the link between foraging and fitness is still an area of active research (see Smith 2004).

(2) While ethnographic studies show that some types of hunting and low-return, high-risk activities may indeed represent attempts by males to signal costly behavior (e.g., Bliege Bird and Smith 2005; Bliege Bird et al. 2001; Smith and Bliege Bird 2000; Smith et al. 2003; Sosis 2000), these activities are exceptional and contribute very little to the faunal and other residues that accumulate in the archaeological record. Only a small percentage of any population participates as active high-cost signalers (see Heath and Hadley 1998; Trivers

1972; Wood 2006), and even those participants pursue such activities during limited portions of their lives (Marlowe 2003; Trivers 1972; Wiessner 2002; Wood and Hill 2000).

(3) The theoretical underpinnings of costly signaling explicitly preclude the possibility of runaway positive feedback loops (e.g., Grafen 1990a, 1990b; Zahavi 1975) making it highly unlikely that signaling would act as the driving force underlying dramatic cultural changes including the rapid cultural transformations in the Great Basin at the end of the Middle Archaic<sup>2</sup> discussed by McGuire and Hildebrandt (2005).

### **From Optimal Foraging to Costly Signaling**

McGuire and Hildebrandt (2005) seem to have been at least partially motivated by a commendable attempt to move archaeological applications of human behavioral ecology beyond optimal foraging theory (OFT). This effort is in line with past critiques which argue that OFT is blind to sex/gender differences (Jochim 1988) and is also consistent with the recent critique by Bamforth (2002; see also Dawkins 1976:123–124), who argues that there is no direct link between individual foraging efficiency and reproductive success (although, see Smith 2004). Optimal foraging models are based on the premise that maximizing net energetic foraging efficiency is a generally adaptive strategy and that net caloric intake functions as a proxy for reproductive success (RS). Technically, foraging returns are linked only to somatic success, so demonstration of links between caloric returns and reproductive success requires evidence that higher energetic return rates have positive effects on fitness. Moreover, even if somatic success is accepted as a proxy for reproductive success, nutrient intake may be a better measure of somatic success than caloric intake. Some have argued that, because it has a stronger connection to fertility and mortality, nutrient intake may actually be a better indicator of long-term reproductive success (Hockett and Haws 2003, 2005). According to this view, dietary diversity may be of greater importance than caloric returns, yet micro- and macro-nutrients are not measured or examined by most foraging studies. As a result, calories are the current medium in which both efficiency and fitness are discussed, but not all researchers view the measurement of calo-

ries as an adequate proxy for reproductive success.

Recent empirical research and the incorporation of costly signaling theory has shown that male foraging decisions may extend beyond acquisition of calories and may result in differential fitness among foraging populations (e.g., Bliege Bird and Smith 2005; Bliege Bird et al. 2001; Hawkes 1990, 1991, 1993, 1996; Hawkes and Bliege Bird 2002; Hill et al. 1987; Kaplan and Hill 1985a, 1985b; Kaplan et al. 1990; Smith and Bliege Bird 2000; Smith 2004; Smith et al. 2003; Sosis 2000). Bird and O'Connell (2006) present three particular avenues of archaeological research that have the potential to show this behavior archaeologically: material displays, hunting strategies, and competitive feasting. McGuire and Hildebrandt (2005) attempt to illustrate how costly signaling is associated with prehistoric hunting strategies by linking prestige-oriented motivations to the activities surrounding the pursuit of large game.

To convincingly demonstrate that prehistoric acquisition of large game can be explained by costly signaling theory requires (1) ethnographic data that clearly show high relative costs for big game; (2) unambiguous links between big game hunting success and higher reproductive success; (3) archaeological evidence for both the presence of large game prehistorically and dietary alternatives that provide better provisioning opportunities; and (4) data indicating that the alternative food sources were systematically passed up in favor of more costly resources, the acquisition of which (see Bliege Bird et al. 2001:10) would provide greater reproductive success for the hunter and valuable and honest information to others. McGuire and Hildebrandt (2005) do not present all of the links in the requisite evidentiary chain, but instead point to the "problematic efficiency" associated with big game hunting and assert that prehistoric foragers sought big game for "prestige purposes." To make this point, they rely almost exclusively on the interpretations of Hawkes (1990, 1991, 1993) who along with colleagues (e.g., Hawkes et al. 1991, 2001) has observed that Hadza males pass up smaller, more reliable meat packages in favor of larger, more variable, resources. While males who procure large game do have higher overall foraging returns when averaged over the long-term, this strategy is untenable in the short-term without sharing; large game is not only defined by the Hadza as a public good,

but sharing is also required to mitigate the high variability of hunting success. According to Hawkes and colleagues, the sharing of large acquired resources results in the following scenario: by choosing to pursue large game that is inevitably shared with others irrespective of relatedness, males pass up the opportunity to efficiently provision their immediate family members, which they could do by pursuing smaller game. It is argued that as foragers know the characteristics of the resources they pursue (i.e., they know whether or not a resource will be shared), males purposefully choose not to provision, and instead target large game. Within a costly signaling framework, successful pursuit of larger animals signals to others that one is a talented hunter, which is thought to invoke more respect from other males (e.g., deference in decision making) and is further correlated with greater RS in the form of better nourished children provisioned by harder-working wives.

While Hildebrandt and McGuire (2002) and McGuire and Hildebrandt (2005) treat these interpretations as the final word on the subject, this is far from the case. The issue of whether efficient foraging generates higher RS through family provisioning, status competition, or other processes is an area of active research (see Smith 2004). Many ethnographic groups whose behaviors have been characterized as excellent examples of signaling have been interpreted very differently by other researchers. Some have argued that the formulations of Hawkes and colleagues contain significant logical flaws (see Gurven et al. 2000:195; Hill and Kaplan 1993), while others (e.g., Marlowe 1999, 2003; Wood 2006) have re-examined the Hadza case and have arrived at very different conclusions. Three issues in particular bear on the assumptions made by McGuire and Hildebrandt (2005). First, it appears that the pursuit of large game by hunters is not necessarily undertaken to the exclusion of small game. Marlowe (2003) found that Hadza males will pursue *any* mammal or bird they felt they could acquire, but prefer big game as there is more meat for the hunter and others, suggesting that "as long as men are not targeting big game exclusively, taking big game when possible may not be such a bad strategy for household provisioning" (Marlowe 2003:224), as the high variation, or risk, associated with the acquisition of large game is countered by the more reliable acquisition of small game. Sec-

ond, while McGuire and Hildebrandt (2005:705, 706, 708) highlight the prestige motives of males and argue that this behavior was underwritten by the provisioning efforts by women, Marlowe (2003:218; see also Hawkes 1990:161 and Hawkes et al. 2001:694) found that "even if a woman subsidizes her husband most of the time, she might still benefit if he subsidizes her during the period when she is nursing and has reduced foraging efficiency." Indeed, ethnographic observations found that Hadza males accounted for 69 percent of daily kilocalories among couples with an offspring under one year old (Marlowe 2003:221). Moreover, hunters with the most biological children at home had higher hourly meat returns overall, not just during times of reduced foraging efficiency by women, which suggests that males with the highest stake in living offspring are more motivated by provisioning than prestige garnering (Marlowe 1999:401). Further, provisioning behavior may have fitness consequences for males, which leads to the third point: McGuire and Hildebrandt (2005:697) propose a link between hunting success and RS, whereby better hunters receive greater prestige, which ultimately translates into higher RS. While this has been demonstrated with the Hadza (e.g., Hawkes et al. 2001, see above) so has the opposite, whereby males with the best hunting reputations bring more food into the household and have higher RS, with more children born and more surviving children (Marlowe 1999:400–402). When compared with these provisioning males, males with more wives bear more children, but fewer of these children survive. In essence, this implies that some males have higher RS due to their provisioning contributions, rather than their prestige garnering efforts.

While these issues are certainly very complex, our main point is that the relationships between hunting success, prestige, provisioning, and RS are inconclusive. Even with observations from a single ethnographic group, there remains considerable disagreement among researchers regarding (1) whether or not males systematically pass up more reliable resources for large game, (2) the degree to which males provision, and (3) whether or not better hunters receive higher RS as a result of prestige or provisioning. This last point is particularly relevant to McGuire and Hildebrandt's models as it speaks directly to the key assumptions underlying their arguments. In order for costly signaling to be

tied to the hunting of large game prehistorically, there needs to be some sort of link between the signal (in this case, big game hunting success) and higher RS, yet ethnographic observations seem to contradict such a link. Among many well-studied groups there does seem to be a correlation between hunting success and RS; however, the exact mechanisms underlying these observations are still not agreed upon (Smith 2004). While CST certainly explains some instances of this correlation (e.g., with the Meriam; see Bliege Bird and Bird 1997; Bliege Bird and Smith 2005; Bliege Bird et al. 2001; Smith and Bliege Bird 2000; Smith et al. 2003), "it seems likely that explaining why better hunters have higher RS will require a synthesis of several hypotheses" (Smith 2004:356). At least for the time being, the ethnographic record does not provide unequivocal support for the claims made by McGuire and Hildebrandt (2005) regarding big game hunting and prestige.

### Man the Show-off?

Ethnographic studies that examine the reproductive consequences of costly behavior usually look at a strategy set (a list of possible behavioral phenotypes) and establish a rule for determining the success of each strategy, usually measured in terms of reproductive success (see Grafen 1984; Maynard Smith 1978). In this way, studies compare the relative RS of individuals with a certain behavior to the RS of individuals who do not express such behavior (i.e., studies compare the RS of signalers versus non-signalers). Archaeological studies, however, do not have this sort of resolution; rather, they must look at a totality of activities, and cannot compare the actions of one set of individuals to another. This has profound implications for viewing costly signaling in the archaeological record since archaeological studies cannot discriminate between signalers and non-signalers, or between "show-off" and provisioning behavior. Relating this to McGuire and Hildebrandt's (2005) proposals, even if males in the Great Basin were hunting largely for prestige during the Middle Archaic, archaeological deposits would reflect the activities of both successful signalers and non-signalers; moreover, these deposits should be dominated by residues from the latter.

The percentage of males pursuing a high-cost high-benefit signaling strategy to the exclusion of

significant caloric returns is always low relative to population. Trivers (1972) acknowledged that the degree to which an individual male's RS will be higher than another's depends on whether or not the individual can out-compete others. This competition can have extremely high stakes and may leave unsuccessful males with a net RS of zero. Therefore, it would be expected that only the highest-quality males would or could participate in a high-stakes signaling strategy, as lower-quality males lack the necessary skills and would have little if any chance of success. Subsequently, lower-quality males would benefit from adopting a strategy other than signaling, such as provisioning (although see Hawkes 2000 regarding the erosion of hierarchies). Heath and Hadley (1998) supported this prediction by determining that males in polygynous societies should follow one of two dichotomous reproductive strategies; high-quality males should maximize by obtaining the highest number of mates, while low-quality males should maximize (given their constraints) by following a provisioning strategy. Heath and Hadley (1998) show that among the population at large, only a small fraction (2.08 percent) was deemed high-quality. As a consequence, only a small number of individuals would be capable of participating in high-cost signaling. This point holds even when examining "altruistic" signaling strategies (see Hawkes and Bliege Bird 2002) among egalitarian groups where the stakes are not extremely high (i.e., an activity in which individuals may signal and bring in returns simultaneously). Recent research with the Hadza showed that, irrespective of dependents, a majority of males (76 percent or 26 of 34) would choose to provision, even when given an ideal opportunity to participate in signaling (Wood 2006; see also Marlowe 2003).

Not only are there a limited number of high-quality, signaling-oriented males in any given population, but it is not in the interest of high-quality males to pursue a costly signaling strategy for the duration of their lives. Trivers (1972) recognized that when the chance of producing additional offspring decreases below a given point, males can increase further reproductive success by provisioning for their children already born. In other words, males may shift their strategy to provisioning when it would provide higher reproductive success than attempting to gain more mates (Trivers

1972; see also Volland 1998). Ethnographic examples among the Aché and !Kung provide support for this theoretical assertion.

Among the Aché, Wood and Hill (2000) showed that individual hunters who would benefit more from prestige hunting actually position themselves in different social situations than hunters who would reap greater benefit from provisioning. Specifically, their study showed that six of seven single Aché males would choose to join hunting bands in which the other males were poor hunters, thus providing the best opportunities for them to stand out to an audience. On the other hand, 16 of 17 males who had dependent offspring chose to join a group in which the other males were good hunters as the total amount of meat acquired per day would be higher. Essentially, when Aché males choose to switch to a provisioning strategy, they do not alter the targets of their foraging, but alter foraging behavior by switching their social position in relation to other males.

Among the !Kung, Wiessner (2002) found that hunting is driven by three separate motivations throughout a male's life. First, males are required to successfully acquire large game as a precondition for marriage. Better hunters do enter the marriage market earlier and as result, tend to have more surviving offspring than poor hunters. However, the motives driving male hunting changes after marriage, hunting is then motivated by social obligations to fulfill bride service and to establish bonds between newly united families. After the birth of the second or third child, males are no longer held by bride service obligations, yet males continue to hunt despite the extremely limited opportunities for polygamous marriages and extramarital affairs (Wiessner 2002:421). While males between 30 and 50 years old may not have been motivated by signaling, they had the highest success rates (Lee 1979:243–245) and thus contributed more to what would become archaeological faunal assemblages than younger individuals.<sup>3</sup> While initial hunting by young males seems to signal information to others, the continued hunting by males can be better explained by a desire to maintain tight social ties with close kin for the maintenance of territorial resources (Wiessner 2002).

Hunting success may still be linked to RS, but whether the pathway is signaling or provisioning appears to differ between individuals in a single

population and even among individuals during different periods of their life. This has significant implications for archaeologists seeking to view costly signaling in the archaeological record as the switch from signaling to provisioning would be invisible, yet the faunal remains derived from a man's "show-off" hunting would wind up commingled with the remains of animals acquired for provisioning purposes. Furthermore, it appears that the remains of provisioning would tend to be numerically more important in the archaeological record.

### *The Trouble with Turtles*

An example of the likely archaeological importance of signaling comes from Meriam Island turtle hunting that McGuire and Hildebrandt (2005:699) attempt to use as an example of high-cost big game hunting. Meriam turtle hunting indeed provides an unequivocal example of a high-stakes signaling strategy (see Bliege Bird and Bird 1997; Bliege Bird and Smith 2005; Bliege Bird et al. 2001; Smith and Bliege Bird 2000; Smith et al. 2003), but in our view, it is also a testament to the difficulties associated with detecting costly signaling in the archaeological record.

The Meriam procure turtle meat in two seasonally and geographically different contexts: turtles are hunted at sea during the feeding/mating season for feasting events, and they are collected on a large-scale basis during the nesting season. Hunting turtles at sea is a high risk, male-only event that "involves long travel times, high-speed pursuits in motorized craft, and dangerous hand-capture methods, all of which combined with the narrow-spectrum nature of the hunting patch (only a single prey type with shared search time) make for an expensive and risky foraging activity" (Bliege Bird and Bird 1997:54). Caloric expenditures are so excessive for this activity and returns so low that it results in a net caloric loss (Bliege Bird and Bird 1997). Exploitation of turtles at their nesting sites, on the other hand, is a low risk/low cost activity, as these large, slow, highly visible animals are extremely vulnerable when on land. Not surprisingly, the exploitation of turtles in nesting sites is pursued by males, females, and even children who collect them in large numbers for the purposes of subsistence. Ninety percent of the turtles obtained during the year are taken in this manner. Hilde-

brandt and McGuire did not recognize the nature of this type of resource procurement despite the fact that Hildebrandt has argued repeatedly that the same type of exploitation was efficient for the pursuit of pinnipeds along the Pacific coast of North America (Hildebrandt and Jones 1992, 2002; Jones and Hildebrandt 1995). If anything, sea turtle nesting sites would be even more attractive than sea lion rookeries, and should be subject to the same type of predatory pressure that resulted in the suppression of seal and sea lion populations along the California and Oregon coasts during the Holocene (see Lyman 2003). While hunting turtles at sea is indeed a costly activity that provides opportunities for signaling, collecting turtles from their nesting sites is an activity with little signaling potential, in which the benefits seem to lie primarily in provisioning (Bliege Bird et al. 2001:11). However, the two types of turtle hunting engaged in by the Meriam would result in the same type of archaeological remains—with those representing provisioning completely overwhelming those associated with the pursuit of prestige.

Moreover, McGuire and Hildebrandt's attempt to liken the pursuit of big game in the Great Basin to the hunting of turtles at sea seems somewhat hyperbolic in that the two activities share very few characteristics. Swordfish hunting, on the other hand, pursued by the Chumash off the southern California coast after A.D. 500 and proposed by Hildebrandt and McGuire (2002) as an example of prehistoric pursuit of prestige, indeed seems directly analogous to turtle hunting. Recent analyses of fish remains from late Holocene middens on San Miguel and Santa Rosa Islands, however, shows that the remains of this difficult-to-pursue, pelagic species never constitute more than 1.1 percent of the fish NISP in middens (Rick 2004:445–471). We interpret this figure as both empirical and analogous evidence for the relative importance of signaling versus provisioning in the archaeological record.

### **Costly Signaling and Culture Change**

While archaeologists are prone to look for cultural change in the past, it is the evolutionary stability of costly signaling that is most often emphasized (e.g., Smith 2004; Grafen 1990a, 1990b; Zahavi 1975). McGuire and Hildebrandt (2005) suggest

that inefficiencies associated with signaling played a significant if not primary role in dramatic cultural changes about 1,000 years ago in the Great Basin. They characterize males in the Great Basin during Middle Archaic as "prestige hunters," and suggest that "the single-minded devotion of these travelers (prestige hunters) to the oftentimes less than productive pursuit of large game may have sown the seeds of their eventual collapse and replacement by Numic peoples at the close of the Middle Archaic" (McGuire and Hildebrandt 2005:697). The problem with this hypothesis is that it runs counter to the basic premises underlying costly signaling theory.

Costly signaling theory (CST) was originally derived from Zahavi's (1975) handicap principal that builds upon Darwin's (1998 [1874]) theory of sexual selection. Zahavi's (1975) principle along with the mathematical supplements by Grafen (1990a, 1990b) indicate that costly signaling cannot follow a positive feedback loop leading to greater costs with little benefit. In contrast to Zahavi's principle, Fisher (1958) thought that once a trait became favored by females in a population, the female preference itself caused the trait to become exaggerated beyond any implication of male quality (i.e., the signal is no longer honest and thus no benefit is conferred to observers). In a system of costly signaling, the only way a positive feedback loop can occur is if Zahavi's process is underwritten by Fisher's; however, such self-reinforcing preferences play no role in modern formulations of costly signaling theory (Grafen 1990a:477). While McGuire and Hildebrandt (2005:708) cite Bettinger's (1991:196–201) discussion of indirectly biased cultural transmission to support their interpretation of runaway social displays, they ignore the fact that indirectly biased cultural transmission operates analogously to Fisher's principal, while CST is based on Zahavi's. Perhaps McGuire and Hildebrandt (2005) are implying that theorists should base interpretations of costly displays on Fisher's principle rather than Zahavi's, but this seems beyond the theoretical implications of their analysis. Based on Zahavi's principle, if the cost of a signal conferred little or no information regarding underlying qualities to observers as a result of receiving the signal, it would not persist in the population (i.e., it would not follow a runaway feedback loop) as individuals perceiving the signal as hon-

est (which it no longer is) would ultimately have lower reproductive success (Zahavi 1975:206). In claiming that "prestige hunting" during the Great Basin Middle Archaic ultimately led to "a cultural landscape on the verge of collapse," McGuire and Hildebrandt (2005:708) extend costly signaling theory beyond its intended explanatory purpose.

## Discussion

The importance of continuing to search for new theories to explain poorly understood archaeological phenomena cannot be underestimated. As Trigger (1989:372) observed, "if archaeologists are to learn more about human behavior and cultural change in the past, they must seek new and convincing ways to infer such behavior from archaeological data." General agreement on the value of such pursuits underlies the emphasis on top down approaches in American archaeology. However, if the explanation of poorly understood phenomena is truly the objective, then the truth-value and testability of new theories is equally important. Hildebrandt and McGuire (2002, 2003) and McGuire and Hildebrandt (2005) have done a commendable job of introducing a powerful and complex body of new theory into American archeology, the viability of which has been demonstrated among living populations. Costly signaling shows great promise in helping to explain seemingly unexplainable energetic expenditures among living foragers; however, other less-provocative explanations (e.g., provisioning) remain viable for some if not the majority of behavior reflected in the archaeological record. Costly signaling has explanatory value, but only within certain limits—the definition of which remains an issue of research and debate.

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## Notes

1. McGuire and Hildebrandt (2005) rely on costly signaling theory while Hildebrandt and McGuire (2002) placed a greater emphasis on Hawkes's (1990, 1991) "show-off" hypothesis. While these represent two theoretically distinct explanations for human behavior (see Smith and Bliege Bird 2000), McGuire and Hildebrandt (2005) and Hildebrandt and McGuire (2002) use both for basically the same purpose: to emphasize the prestige-oriented motivations behind prehistoric male foraging. In this paper, we follow Hawkes and Bliege Bird's (2002; see also Bliege Bird et al. 2001:10) use of the term "show-off" as a reference not to the specifics of Hawkes's (1990, 1991) model, but to an individual engaged in a costly signaling strategy.

2. McGuire and Hildebrandt (2005) discuss the rise of big game hunting during the Middle Archaic, which they define as the period from ca. 4500 to 1000 B.P. Further, following Bettinger and Baumhoff (1982), they discuss cultural changes associated with the expansion of Numic speaking populations. It is important to realize that the Numic expansion did not occur at exactly 1000 B.P. throughout the entire Great Basin, something even Bettinger and Baumhoff (1982; see also Bettinger 1994) recognized; however, McGuire and Hildebrandt's (2005) were less concerned with the chronology of this expansion than in attributing its cause to the pervasiveness of inefficient foraging among Middle Archaic males. According to McGuire and Hildebrandt (2005), when and wherever Numic-speaking populations showed up, they came upon a "cultural landscape on the verge of collapse" (McGuire and Hildebrandt 2005:709).

3. There also appears to be seasonal variation in the degree to which big game hunting is used for provisioning purposes; during rainy seasons when individuals are widely dispersed, a hunter's family received between 40–60 percent of the acquired meat (Wiessner 2002).

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