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Emergency Decisions, Cultural-Selection Mechanics, and Group Selection¹

by Christopher Boehm

Emergency behaviors of nonliterate groups are taken as a useful starting point for demonstrating that decisions can be integrated more directly into cultural analysis and that the explanatory payoffs can be far-reaching. The methodological feasibility of studying group decisions directly is explored through three exceptional tribal ethnographies with a focus on emergency adaptive problem solving and its implications for both cultural- and gene-selection theory. Urgently discussed decision alternatives become apprehensible to fieldworkers through open group debate, while the reproductive effects of decisions are readily assessed whenever groups act in unison. Implications for the development of a more effective theory of cultural microselection and a truly processual definition of culture in its guided phase are suggested. With respect to long-term genetic evolution, the implications of emergency decision making are extended to foragers, exploring special possibilities that enable genetic group selection to become robust when groups are egalitarian and engage in consensual problem solving. Prehistorically, the verdict is that group-selection effects were amplified at the same time that individual effects were suppressed. On this basis it is hypothesized that the genetic evolution of human cooperative and altruistic tendencies can be explained in part by selection at the level of groups rather than inclusive fitness.

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1. In reaching the conclusions offered here I was assisted by a grant for the study of egalitarian political process from the H. F. Guggenheim Foundation. Over the almost two decades during which this

With over a century of ethnology behind us, we still have profound unanswered questions about the nature of culture and about how being cultural in a *Homo sapiens* manner has shaped a rather unusual evolutionary career. In addressing both problems I shall move from the ethnographic nuts-and-bolts of several consensual decisions analyzed as discrete cultural-selection events to questions about the immediate effect of group decisions on reproductive success and about their ultimate effect on natural selection itself. By placing three sets of well-described emergency decisions under an ethnographic microscope, I shall make the empirical case that foragers and tribesmen are in a position to modify their larger cultural patterns deliberately by acting as groups which anticipate large-scale problems and try to cope with them collectively. I shall also argue that such *guided* cultural selection can have a significant impact upon reproductive success because nonliterate people coping with perturbations in their natural, political, and social environments sometimes make highly realistic choices. I shall suggest, further, that the perennial genetic enigmas of altruism and group selection need to be seriously reconsidered in the light of egalitarian behaviors which significantly amplify the effective force of group selection.

Cultural Selection and Natural Selection

Cultural anthropology and evolutionary theory share a curiously chequered past. Over the past century and a half, their relationship has involved a few mad love affairs (e.g., Morgan 1877), a variety of individual involvements (e.g., Kroeber 1948, White 1959, Steward 1955, Goldschmidt 1959), and long periods of general indifference and sometimes protracted hostility. Steward's (1955) sensible and solid cultural ecology finally brought us something like a peasant marriage—a typological compromise theory that many could live with. However, even though the environment was quite decisively brought into cultural analysis, Steward and his immediate "offspring" exhibited little interest in the micro-mechanisms of cultural selection.

A key contribution from psychology has been Campbell's (1965) application to cultural phenomena of the

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biologist's blind-variation-and-selective-retention model, one important emphasis being the conservative force of cultural retention (Campbell 1975). More recent evolutionary approaches have tied culture to gene selection (e.g., Durham 1976, Chagnon and Irons 1979, Winterhalder and Smith 1992), but they depend heavily upon triangulation and model cultural phenomena far too directly upon biological systems that organize themselves. As a result, the microprocesses of cultural selection have been all but ignored. Boyd and Richerson (1985) and Durham (1991) have pointed out the serious difficulties with their study.

By settling for these and other useful compromises in which biocultural modeling too often tends to overwhelm the ethnographic data (e.g., Boyd and Richerson 1985, 1991; Durham 1991; Barkow, Cosmides, and Tooby 1992), anthropologists and others have remained far from emulating the impressive successes of biologists, who, after Mendel's critical discoveries about transmission units, advanced the study of selection mechanics and founded the field of evolutionary biology. Indeed, after a century of dependence upon the culture concept, we probably know as much about the precise details of cultural-selection process for provisioned and wild nonhuman primates (Nishida 1987, Goodall 1986, Hauser 1988) as we do for ourselves.

I believe this failure can be remedied, but only if we are willing to distance ourselves from the powerful models of biologists and strike out more on our own, with a similar goal of attaining ultimate explanations of human behavior. To do so, we must meet the challenge of studying a cultural-selection process which differs quite sharply from gene selection even though the two are causally connected. Emergency decisions are the place to start.

Guided Selection versus Self-Organization

Darwin identified the basic vehicles of biological selection in the form of individuals as inheritors and carriers of variable traits, while geneticists have isolated the well-bounded units of information that provide the variation. With recombinable genes as the units of transmission, biologists have been able to describe the mechanisms of a remarkably gradual, self-organizing gene-selection process and have done so precisely enough to replicate that process experimentally and model its workings (see E. O. Wilson 1975).

By contrast, cultural selection is complicated by apparently amorphous or ever-changing "units" of transmission and variation that present formidable problems for analysis (see Durham 1991). To compound our problems, anthropologists are gradually facing the fact that cultural processes are partly and significantly purposeful (see Goldschmidt 1959, 1971, 1976, 1993; Bennett 1976; Boehm 1976, 1978, 1982a, 1991; Campbell 1965, 1975, 1979; Vayda 1989; Knauft 1991, 1994a; Durham 1991). Indeed, humans sometimes make relatively far-reaching choices that are both deliberate and realistically in tune

with major problems perceived in the environment. To further complicate our task as builders of culture theory, nonliterate humans may select adaptively significant courses of action as entire groups (see Boehm 1978).

Fortunately, cultural selection is far more immediate than gene selection and therefore easier to investigate directly. Furthermore, group decisions provide a special arena for study. Using three unusually rich case histories, I shall demonstrate that immediacy and collectivity provide a substantial advantage for anthropologists interested in identifying specific mechanisms. In doing so I set aside the still quite mysterious self-organizing side of cultural microprocess to concentrate on purposeful decisions by which groups cope *realistically* with serious environmental problems.

An Evolutionary Definition of Decision Making

When decisions are made, the following variables and factors are assumed to be at work: *genotypic dispositions* (LeVine 1973, Ruyle 1973; see also Pulliam and Dunford 1980, Lumsden and Wilson 1981, Konner 1982, Boehm 1989) that set up behaviors readily learned by our species, *cultural values* (Kluckhohn 1952, Pugh 1977) that reflect attitudes about the desirability or undesirability of various behaviors, activities, qualities, or objects, and *cognitive assessments*—the perception of a *situational context* of problem solving, the creation of *strategic goals*, and the pondering of *decision alternatives*.

In attempting to describe and explain emergency decisions as instances of sophisticated, *guided* cultural selection, I shall set aside genotypic dispositions, even though as powerful causative factors (for example, hunger) they obviously underlie many important cultural values. I focus on values and strategic goals, on specific decision alternatives, and on environmental contexts as conceptualized by the evolutionary actors and by scientists. This analysis of cultural-selection mechanics will demonstrate (1) that as instances of realistic problem solving certain kinds of group decisions are readily susceptible of direct description; (2) that identification of the decision makers' intentions is feasible; (3) that competing alternatives can be discerned, along with choices being made among them; and (4) that the practical outcomes can be measured realistically as being useful, neutral, or detrimental in terms of satisfaction, survival, or overall reproductive success.

Problems of Approach and Method

Individual-decision modeling has long been part of cultural anthropology (Firth 1951, Barth 1959, Quinn 1975; see also Vincent 1978), and evolutionary anthropologists have increasingly emphasized the importance of decision-making behavior (e.g., Goldschmidt 1959, Prattis

1973, Bennett 1976, Britan and Denich 1976, Boehm 1976, Meggitt 1977, Rutz 1977, Chibnik 1980, Jochim 1981, Johnson 1983, MacLachlan 1983, Mithen 1989a, Vayda 1989, Durham 1991). Meanwhile, biologists such as Pulliam and Dunford (1980) and Lumsden and Wilson (1981) have identified individual decisions as a critical interface between genes and culture. However, the trail is merely blazed, because anthropologists who work intensively with decision models in ecological, economic, political, and social anthropology rarely investigate decision processes directly. Basically, they carefully observe the resulting behavior and then use a decision model inferentially to organize their explanations (e.g., Barlett 1980, Boster 1984, Smith 1991). Such studies are sophisticated and useful, but without effective *direct* investigation (see Mathews 1987) this critical component of cultural process remains mysterious.

One problem is that informants simply cannot answer questions about motives and contingencies that they work with intuitively (Ortiz 1967, Gladwin and Murtaugh 1980). However, our questions tend to be so unsophisticated (Western and Dunne 1981) or so clumsy (Briggs 1984) that we often fail to elicit responses that may well be there. Furthermore, much individual decision making is so routinized as to *appear* unthinking; as outsiders we fail to perceive the active problem solving that is inherent in normal daily activities (see Boehm 1978) and therefore fail to investigate it.

Fortunately, the collective decisions of small, locally autonomous nonliterate communities provide a special research arena in which decision process becomes unusually conscious and obvious. If one can get past the veiled rhetoric (Bloch 1975, Bailey 1981), the decision alternatives can be read with confidence (e.g., Boehm 1983). Here I examine three instances of collective decision making with regard to serious threats emanating from external politics, the natural environment, or the internal social environment. The immediate objective is to identify alternatives for choice as units of selection, to see how people select such units under emergency conditions, and to evaluate their common plans for action in terms of their realism and their efficacy.

The Advantage of Studying Emergency Decisions

Over the evolutionary long haul, epochs of unusual environmental stress are thought to produce relatively short-term selection pressures that may decisively modify a gene pool (see Gould and Eldredge 1977). In more immediate terms, according to Leibig's "law of the minimum" under ecologically stable conditions certain critical resources (such as water) set vital limits for natural selection of surviving populations (see Odum 1993). Obviously, cyclical dire shortages or unpredictable dips in such critical resources will greatly intensify selection. We are speaking here of self-organizing gene selection and the effects of very immediate ecological crises.

Such crises are also relevant to cultural selection of the purposeful or guided type. Hurricanes, locust swarms, droughts, and epidemics can have radical effects on human populations, as can predatory political behavior, and sometimes people manage to cope with readily identifiable emergencies by quickly modifying their patterns of behavior. The source of cultural guidance to be exemplified here is the emergency decision meeting, in which an entire local community recognizes a threat and assembles to discuss alternatives for common action, using a distinctive communication style that is decidedly urgent (see Williams 1957).

Decisions of egalitarians frequently involve private deals between power brokers or arm-twisting and the co-option of dissidents (e.g., Barth 1961); sometimes they end with absence of agreement (see Jones 1971) or even group fission. However, when people are faced with a serious emergency and think that they can best cope through cooperative action, they are likely to enter into a relatively open and comprehensive group negotiation process that approximates the idealized consensus models often elicited from natives (and sometimes taken too literally). Alternatives are first laid out and evaluated and then selected, rejected, modified, or combined to form a strategy the entire group can agree to.

This decision-making phase of the cultural problem-solving process yields a practical policy, and with open debate it is not difficult to identify the values, goals, and specific alternatives involved. It remains to observe whether the policy is actually followed and what are its practical effects. For anthropologists interested in whether nonliterate people are essentially proficient or clumsy in fending for themselves as evolutionary actors, this provides a special opportunity. In evaluating them as emergency problem solvers we can readily track their coping behavior in situations in which reproductive success is threatened very directly and group extinction is possible.

For Mursi pastoralists, the microcontent of a single decision debate is revealed verbatim, and we are able to see how this involves trade-offs between several clearly perceived problems with the natural and political environments. Similarly, the pattern of Mae Enga decision making with regard to warfare and problems with natural resources is described in detail. Finally, we learn how a series of problems identified and discussed in Tikopian *fonos* (public assemblies) after a very destructive hurricane were realistically resolved. These ethnographically rich case studies help make the case that we can identify specific mechanisms, embedded in group decision process, that are critical to the understanding of cultural-selection mechanics and their influence upon human biological evolution.

Three Descriptions of Ecological Decisions

WARFARE DECISIONS OF THE MAE ENGA

Describing Mae Enga raiding and warfare in highland New Guinea, Meggitt (1977) makes it clear that even

raiding parties of ten or fewer men must make their decisions in concert with the rest of their clan because they need that backing. His description reveals group meetings as the locus of a selection process in which various military alternatives are envisaged, debated, and chosen. He also makes it clear that individual decision making is largely overridden by that of the group through conscious manipulation of minorities by the majority (see also Sackschewsky 1970).

Meggitt (1977:76) states that it is only the men who meet, very quietly, and that anyone who has passed through the bachelor's association is eligible; it is taken for granted that everyone will choose to participate. Pooling of information is important (pp. 77–78):

The men who initiated the conference, or their spokesman, briefly indicate their view of the clan's position and the action they favor. Thus, they may argue that now is the time to launch a full-scale attack on the neighboring clan with the aim of occupying a specific section of its territory. The major Big Man then solicits responses from the audience. Ideally, everyone present has a voice and, being among his own clansmen, can speak with complete freedom. Moreover, anyone who possesses pertinent information has a moral obligation to contribute so that the group may reach the best possible decision in the circumstances. Most men . . . are ready to make their points at length and with elaborate oratorical flourishes. Only young bachelors and some very old men are likely to hold back and say little unless directly questioned. The task of the Big Man at this stage is to ensure that all have a chance to offer their opinions and facts in full, and . . . [to make] no attempt to cut off any but obviously irrelevant speeches.

Only in this way, it is believed, can each clansman truly ascertain the thoughts of his fellows and the evidence behind them. So instructed, he can cleave to or modify his own ideas, and his reactions in turn affect those of others. Naturally, the Big Men and fight leaders have their own opinions of an appropriate outcome of the discussion; but none of them, especially in the early sessions, reveals much of his hand or tries patently to push for the acceptance of his suggestions. Not until hours of argument have clarified the issues and carefully dissected the facts are these men likely to signal unequivocally their own positions, and even then those, including the major Big Man, who perceive that tide running strongly against them may well go along with the emerging majority view. Thus, step by step the slow process of constant feedback inches toward the possibility of general agreement on a correct course of action. Then, when the Big Man believes that consensus is close at hand and that further talk will add nothing of value, he incisively summarizes the main arguments, indicates which have been rejected, and finally announces the decision reached by the clan.

Sometimes, of course, given the gravity of the issues and the likelihood of deep differences over the interpretation of inherently ambiguous evidence, real consensus is impossible to achieve. For instance, although most of the assembly, including the Big Men, agree that, on the basis of available information, war is the only feasible choice, a significant minority may hold out against this view. When it is clear that no amount of exhortation will change their opinion, the Big Man announces that the pro-war majority will proceed with preparations for an attack; but he warns them that, having overruled the opposition, they must be ready to pay most of the costs—in particular, compensation for allied and enemy deaths will fall mainly on them. At the same time he reminds the cautious minority that those who do not fight in support of the clan's interests cannot expect to enjoy the fruits of victory—enemy land that the clan may seize or any homicide pigs coming to the clan. The dissidents acknowledge the force of the warning while emphasizing their own prerogative of contributing few or no pigs to the homicide compensation.

To understand the decision-making process and the relation of words to deeds, it is important to examine not only the debate but the unanimity of action that follows (p. 79):

even as both parties are making clear their positions, everyone knows that, because the clan's survival may be at stake, once combat begins the doves will almost certainly be in their accustomed places fighting strenuously alongside the hawks. Moreover, many of them will probably join in the payments of homicide compensation, not merely to establish claims to whatever wealth the clan may secure but also, and equally important, to maintain their own reputations and that of the group.

If the majority feel very strongly about their "dove" position, they may warn the hotheads that they will even have to pay compensation for anyone slain. If a group of hotheads does go against majority opinion to escalate a conflict from raiding to an attack in force, the Big Men remind them that the compensation payments will be theirs alone; but when the counterattack comes the entire group will, in fact, back them.

Although these warfare decisions sometimes end in disagreement, the emergency nature of the problems militates toward a consensus (p. 80):

I should emphasize that such deep and irreconcilable divisions of opinion do not emerge often when clansmen assemble to determine whether or not they should go to war. Given the crowding of the compact clan territories along the narrow valleys, the men of any clan are usually quick to agree that the actions of an expanding adjacent group are a serious threat to their security. Only the few really obtuse men must have their attention drawn by Big Men

and fight leaders to the growing danger; the rest readily accept the need for a prompt defensive response, which may also be defined to include a pre-emptive attack on the potential aggressors.

Such decision meetings are by no means mere "rituals," for strategies, tactics, and timing are all at issue. Although individual decisions are largely preempted by group political process, the ideal of consensus is sometimes compromised because in a forager or tribal egalitarian society a subgroup is basically free to proceed on its own.

It is clear that going to war involves complicated values trade-offs among, for example, desire for personal honor or a dominant political position for the clan, concern for the physical safety of the group, individual concerns for physical survival, and desire to defend or expand territory as part of the subsistence quest. Such basic and often competing concerns structure a variety of specific decision dilemmas that are explored very deliberately by the group in question.

Meggitt's description makes it clear that Enga tribal assemblies were focusing their attention on territorial competition and that the decisions were made and implemented on what was usually a realistic basis. In effect, he has described a well-contextualized cultural-selection process at the group level, complete with sources of variation (decision alternatives in the form of specific strategies, goals, and tactics), values and ideas that structure the dilemmas and inform the process (love of heroism, fear of death, desire for territory, desire to dominate other groups), and a decisive selective-retention mechanism—a consensual decision that usually projects the entire group along a single behavioral trajectory.

A TIKOPIAN ECOLOGICAL CRISIS

Spillius's (1957) account of responses to a hurricane on Tikopia is complemented by Firth's (1959) observations as a returning ethnographer who understood what was taking place in the island's several public assemblies. Not only were crops damaged but soil was contaminated by salt spray. In Firth's description one can readily discern the division of labor between individual and collective decision making as people thought over alternatives. Many individuals were beginning to steal other people's seedlings to eat or were thinking of attempting economic migration, an unlikely possibility. In public assemblies the coping strategies discussed included harvesting and storing damaged foodstuffs, replanting first the more quickly maturing crops, upgrading reef fishing, manipulating the level of a lake to intensify fishing, trying to secure foreign aid, expelling thieves and commoner clans, who would have to embark on suicide voyages, identifying chiefs as the last to die, and reducing the population's reproductive rate.

These alternatives seem perfectly realistic, insofar as the environment was being accurately "cognized" (Rapaport 1968). The Tikopians had to understand two dif-

ferent systems: the ecological system that produced their predicament and their own social order. It is instructive that in a time of uncertainty and ecological crisis they did not turn to "supernatural controls" over nature (Malinowski 1948; but see Schneider 1957 for a counterexample under less critical conditions). Nor was there the near-total abandonment of collective problem solving that sometimes accompanies food shortages in other communities (e.g., Laughlin and Brady 1978), even though the chiefly redistribution of food quickly ceased. The Tikopians had previously experienced famines, and being on a small island they could reckon accurately the pressure their population placed on a well-known, finite subsistence potential. It was their accurate and predictive perception of scarcity (see Abernethy 1979) that enabled them to cope effectively with a dangerous situation by dealing with appropriate problems at the collective rather than at the individual level.

One specific practical policy that they arrived at in public assemblies was to send out patrols to prevent individualistic thieves from picking immature seedlings to eat, since from the collective perspective letting such plants come to maturity was the only hope for the long run. Firth explains the Tikopian understanding of this problem: "There was the recognition that whereas in times of relative abundance of food theft could be treated as an offense against individuals, in times of great scarcity theft imperiled not only individual relations but the whole basis of the social order. . . . it became then a matter of public policy" (1959:103–4). Another decision, potentially more far-reaching, was to admonish people to limit sexual intercourse to infrequent intervals to reduce the number of future mouths to feed (Spillius 1957); this involved accurate perception of long-term problems with carrying capacity.

Guided cultural selection in this Tikopian case was comprehensive and well planned. The decisions of the *fonos* qualify as guidance because they tend to be not only purposeful and far-reaching in intention but realistic (see Boehm 1978). They were also directly relevant to reproductive success: after the problem of theft was diagnosed, such behavior was decisively suppressed by special patrols, and this had demonstrable beneficial effects. Recognizing the need for fertility regulation required a comprehensive diagnosis, one that involved appreciation of the causal relation between sexual intercourse and giving birth, understanding that hedonic gratification and acquiring offspring provide two powerful individual incentives for the behavior, and prediction of continuing dire scarcity as a function of the relation between population size and carrying capacity as locally perceived. Relevant values included the desire to eat well (and, more basically, not to starve) over the long run and conflicting desires to achieve sexual gratification and have children. While the effects could not be evaluated, the policy was highly rational.

Because Firth does not provide detailed accounts of the decision meetings themselves, the raw cultural-selection process is not available for analysis. On the cognitive side, however, he has described practical alter-

natives identified by Tikopians and the values that guided decision making in the direction of policies and behaviors that were successful from the standpoint of nutrition, quality of social life, and long-term reproductive success. From the standpoint of cultural-selection process, each of the alternative policies pondered or chosen by Tikopians amounted to a rather large but cognitively integrated "unit" of variation—a complex of ideas and values that at one point in time, at least, were integrated in an attempt to cope with a special emergency.

A MURSI WARFARE DECISION WITH CONSEQUENCES FOR SUBSISTENCE

Turton's (1975, 1977) detailed presentation of decision-making process among East African pastoral warriors provides the raw data that can help us to identify the micromechanics of cultural selection. His analysis of a Mursi political crisis is based on verbatim records of a group's political debate and a detailed exegesis of this debate. They demonstrate that in both the political and the subsistence field present and future exigencies were being weighed simultaneously and that the issue was not simply decided by local power brokers before debate began.

The Mursi cling to pastoral pursuits even though they must depend heavily upon horticulture. They are expanding their territory slowly but, being in the lowlands, are subject to raiding from three sides. They are in a formal state of war with the adjacent Bodi, and drought is severe enough to threaten a famine as they work to get in a useful crop. The debate follows an atypical Mursi trip deep into Bodi territory with a police escort to receive grain as famine relief during which a highland Bodi tribesman from faraway Hana has killed a Mursi youth. The resulting problem involves competing political and ecological goals: the need to retaliate for a homicide while safely harvesting crops critical to subsistence. Politically the best target would be distant Hana, but because all the Mursi are already at war with all the Bodi, the local Mursi group can more safely attack either of two other, nearby Bodi settlements (Merkule and Gura). However, escalation of hostilities nearby would put an end to the undeclared accommodation that allows both sides to bring in their crops while merely taking potshots at one another. The dilemma is that a militarily much riskier attack on Hana would disrupt subsistence activities far less.

Back in their own territory, the Mursi gather under a debating tree. After a senior has initiated the debate, an eyewitness to the killing at Hana tells the details, points out that the Mursi have allowed five killings in a row to go unavenged, and emphasizes that when the Bodi formerly made truces with the Mursi it was Mursi retaliation that made them willing to do so (Turton 1977:206). At the end, he says:

Now you've heard the news, get up and speak. I've nothing else to say. It's a matter of raiding—of just going up and killing them. They are taking revenge

for all their people who died in the long grass here, and at Mara. If we wipe each other out, so be it.

But let those fat fools at Hana suffer. . . . They're so fat they can hardly walk, those people at Hana. May their dead bodies stretch from here to over there, and may their mothers and fathers tie string round their heads. Do you want to attack our Bodi at Gura? If we do that, those at Hana will never keep to any peace agreement later on. They will say, "If we attack the Mursi, they won't hit back at us but at the Gura people." That's what they'll be saying as they make peace with us.

This man has identified the basic political dilemma: taking some kind of revenge is politically imperative, but taking easy revenge close at hand has only limited political benefits. Three prospective behaviors may be isolated as competing sources of cultural variation because they have emerged as decision alternatives: doing nothing, making an easy attack on nearby Bodi at Gura or Merkule, and making the much more difficult attack on the faraway Bodi at Hana.

The next speaker, like the first a senior man in the junior age-grade, has special connections with the Bodi who live nearby at Merkule and Gura and therefore is in a delicate political position. He says (Turton 1977:206), "Get on with it then: I don't care if my crop is lost, along with that of Merkule—then both we and the Bodi will be hungry together!" He calls for immediate revenge on nearby Bodi, even though they did not do the killing. The rules of lethal retaliation-for-honor do allow any male Bodi to be killed under the circumstances, so this exhortation is both justifiable and practicable in that it can be accomplished without extreme military risk. In effect, to shore up his own political position he "idealistically" urges a revenge raid on his nearby friends. Turton makes it clear that at the same time he is pointing out the negative economic consequences of taking vengeance on the most accessible targets—who happen to be his friends; if cultivation areas are destroyed, both sides may experience privation.

The next speaker, once again a junior age-grade man of later middle age, chastises grown men for having gone into enemy territory to invite their own deaths for free grain. He points out that both sides already have moved their cattle back, so now it is human targets that they must go after. He urges that they not listen to the police, who formerly incarcerated killers, and speaking as a "hawk" explicitly attacks the "easy revenge" argument: "If hunger doesn't kill us, the spear will. So let's act now: it doesn't matter who goes, or how many—five one day, six the next, and so on. If it's bad for us, then it will be equally bad for them. If the vultures get one of us, then they will have to run from their settlements."

The next speaker—a member of the junior age-grade also—fills in the situational context to indicate that the killing was invited by careless behavior on the Mursi's part. He points out that the Bodi had warned the Mursi to send only women and old men into their territory for the grain. He more directly criticizes the youths who

went into Hana territory. In effect, he is arguing that one foolish risk doesn't justify another, but he is also reemphasizing the political-ecological dilemma and its serious consequences for the entire group. He goes on to agree that an attack on Hana should be made, but in his final words he combines ecological prudence and honorable aggressiveness: "Only don't attack their cultivation areas—anyone who does that hasn't any guts. This must be said clearly, so that even a half-wit will get the message. Tiolugu's quite right: follow the dead man's footsteps and avenge him at Hana. If we were men we would do it today. What's got into you? Let's get everyone together and start moving!"

Next, the first speaker argues that only men be killed (because the Hana had spared two Mursi women the day before) and that herd boys also be spared. An implication obvious to the Mursi is that women and herd boys, if kept exempt from the active feud with Hana, can carry on farming and pastoral activities as usual, as is the case between the Mursi and their closer Bodi neighbors. Next, the old man of the senior age-grade who opened the meeting rambles on a bit about the need for priestly blessing and recalls a successful raid. He makes a few strategic suggestions but does not side with either the "hawks" or the "doves." Next the man friendly with the Bodi speaks again, agreeing now without qualification that it is the distant Hana who should be attacked. Next a younger man hawkishly attacks the argument that hunger justifies caution and concludes:

Let's have less talk today and get going. We've been saying that we wouldn't attack while we were still hungry. We planted at Moizoi and got no crop. We planted at Mara—was there any crop there? And at Barte—where the cattle are coming now—did the sorghum ripen there? Where are you waiting to cultivate next? We are going to be wiped out. Let [the old man who initiated the debate] ask questions. All we have to do is follow the tracks of our man! Forget about saving your skins—today, let's go and die where our man died!

This heroic exhortation criticizes those who procrastinate because of food scarcity and argues for taking military risks immediately because the subsistence outcome is so unpredictable. As a practical matter, however, the man supports the attack on Hana which minimizes further risks to subsistence.

Up to this point, the group has been trying to arrive at both a workable policy and a specific decision. Feuding rules provide at least two legitimate options that will help the Mursi to maintain a reasonably strong dominance position: kill someone from Hana or, less opportunely, at least kill someone nearby. Dire ecological constraints also figure in the decision-making process as far more than a mere "excuse" favored by doves who would prefer to wait. There is also the politically risky alternative of doing nothing. The consensus is moving toward an attack on Hana but one designed in several ways to minimize subsistence risks.

It is the job of the priest now to give the last speech

and to catalyze action. As he begins he is interrupted by an elder, Mitatu, who mentions that not everyone has spoken and that other allies have yet to arrive. This opens the way for Mitatu to suggest a stratagem for making it clear to the Bodi neighbors that it is not they who are being targeted (Turton 1977:208):

If you are real men, get on your feet now and go up to Merkule—this evening. If they haven't yet heard the news, tell them:

"You people over there!"

"Eh?"

"Who was it who did the killing?"

"What killing?"

"Up there at Hana. Was it the Hana people or those at Gura?"

"It was nothing to do with us."

This culturally predictable conversation amounts to a "negotiated" settlement with the nearby Bodi neighbors, later documented by Turton (1977:209). In this preview, the Mursi seem to be maximizing their honor by implying that they want to take heroic revenge only on the actual killers. However, they also are making it clear that they prudently wish to avoid hostilities close at hand with a subsistence crisis to cope with. After reminding the assembly that he had opposed grown men's going to get the grain in the first place, Mitatu says: "Break this up now; spread the alarm, and find a cow to be eaten at tomorrow's debate. Meanwhile, go scouting—don't shirk this job as you usually do. That's what I have to say."

Then the debate ends with the endorsement by a former extreme hawk of this militarily risky but ecologically prudent compromise policy of attacking Hana while carefully sparing women and herd boys and agreement to continue the debate when everyone else arrives the next day. However, the others arrive later that same day, decked out for warfare, and after nine more speeches the debate is over. As the men encircle the priest and receive the blessings necessary to warfare, the final policy is exactly that arrived at above, and subsequently the hostile neighbors are able to bring in their (undamaged) harvests.

These verbatim excerpts from Turton's (1977) published exegesis and his unpublished raw materials (1975) shed light on an emergency decision-making process that takes place publicly and collectively under conditions of stress that bring into relief the alternatives among which conscious selection is made. One notices immediately that in seeking consensus individuals may change their minds or positions. The man with Bodi in-laws changed his position outright, while an extreme hawk at least moderated his position. It is also clear that the ideas out of which a decision is built are used flexibly and may be combined; for example, several speakers decided to back the hawkish position that Hana should be attacked but wanted cultivation areas to be left alone and women and herd boys spared.

The analysis also clarifies how honor-based systems of lethal retaliation work when ecological consider-

ations compete with political objectives. In spite of predictably passionate military rhetoric, much weight is given to practical considerations governed by values other than honor. The Mursi, in debate, correctly assume that such considerations are operative also among their Bodi neighbors, and this makes possible a negotiated solution. Subsequently a young Mursi, to prove himself as a man, killed a nearby Bodi shepherd boy. The Bodi, presumably after a similar debate, chose to ignore this individualistic act of escalation, enabling both sides to bring in their harvests.²

It is worth emphasizing that as they sort through their perceived alternatives the Mursi warriors are dealing not only with immediate subsistence and political exigencies but with longer-term implications. The no-attack or delayed-attack strategy is summarily rejected because over the long run too much submissiveness invites aggression. The militarily prudent but ecologically inadvisable and politically less decisive attack on nearby Bodi settlements receives only limited support. The third alternative, attacking distant and inaccessible Hana, wins out with some judicious fine-tuning: the attack is to be carefully disciplined, with no gratuitous damage to crops or to women or herd boys. This is because retaliation in kind would endanger the Mursi's own subsistence activities.

The goal is a single intimidation killing with rapid retreat to reduce the chances of a counterkilling by the Hana; by feuding rules the latter would neutralize the political capital gained from a risky aggressive move. Thus, the final course of action is to raid the same local group that did the killing in order to maximize deterrence and minimize danger to subsistence, even though the raid itself is very risky. To me, as a political anthropologist who has studied the feuding mentality, such a strategy seems highly realistic given the exigencies of Mursi life.

It is obvious that the Mursi had a good grasp of both an ecological system and a competitive territorial political system that included a highly predictable approach to revenge killing. They clearly recognized the effects of

the political system on their subsistence predicament. Their quality of life and reproductive success were threatened in two areas: immediately, there was the pressing issue of subsistence, but in the long run they had to worry about continued use of resources without undue harassment from vendetta and raiding. They appear to have chosen the best alternative to enhance success in this area, and the long-term expansionist pattern of the Mursi at Bodi expense reported by Turton (1977) surely was supported by realistic decision making of this type. The nearby Bodi's decision to avoid escalation can also be judged realistic, given their need for crops.

This single decision of a Mursi local group constituted an immediate act of guided cultural selection. The Mursi's choice among alternatives resulted in all but unanimous behavior that had both identifiable short-term consequences for reproductive success and long-term territorial implications.

Methodological Lessons

Collective decisions oriented to consensus seeking and coordinated group action by entire communities have been well studied with respect to their political dynamics and discourse style (e.g., Richards and Kuper 1971; Bloch 1971, 1975; Strathern 1975; Moore 1985; see also Duranti 1981; Bailey 1965; Liberman 1980). Strictly enforced low-key leadership is prominent (see also Boehm 1993), along with freedom of individuals to speak in discussion or debate, a euphemized or indirect discourse style, and use of logical persuasion, exhortation, and direct social pressure to force a consensus. Unfortunately, relatively little attention has been devoted to verbatim texts or to the decisions and their consequences.

Meggitt demonstrates that recent collective decision processes can be studied retrospectively through interviews and that patterning of both content and style can be ethnographically summarized in such a way as to permit assessment of the values, cognitive judgments, goals, strategies, tactics, and group dynamics involved. His detailed analysis of decisions makes possible a theoretically important conclusion: Mae Enga intentions play a major role in warfare by timing effective actions and directing them toward specific territorial goals. Firth demonstrates that when nonliterate people make the effort to cope with their problems collectively under unusual emergency conditions, standard ethnographic descriptive techniques and a holistic treatment suffice to explain their coping behaviors. In debate the Tikopians chose among competing alternatives and consciously manipulated their predicament, relying on their own insight into a very complex socio-ecological problem situation. Turton's exceptionally detailed description provides the actual raw materials of debate, enhanced by an exegesis that clearly identifies values, cognitive assessments, and competing strategies. His account of subsequent behavior reveals problems posed by individualistic tendencies for "consensual" problem solving,

2. Strategic decisions of the Mursi and Bodi have broader implications for cultural-selection theory, for one group's political behavior can impinge on another's. Durham (1991), introducing the term "imposition" into our evolutionary vocabulary, seems to have in mind one-sided interactions involving manipulation or coercion of one group by another. Among territorial egalitarian societies, bilateral imposition and *negotiated* bilateral imposition are more important. When both "rules of war" (Todd 1977:219) and a decision-making process are shared by two hostile groups, one finds the kind of informal negotiation anticipated by the last Mursi speaker quoted, with similarly nonaggressive messages being shouted across by the Bodi (see Turton 1977:209). This amounts to a negotiated truce, and such behavior is widely associated with feuding systems (Boehm 1986). In intensive warfare, also, bilateral negotiation can be important to conducting campaigns (e.g., declarations of war, truces, peacemaking, prisoner exchange). Negotiated interactions between groups should be susceptible of further study as a more complicated, interactive form of group decision process that is also highly purposive.

but it is clear that basically the Mursi were controlling their own political destiny on a highly cooperative basis in a situation of uncertainty and immediate threat. Bilateral negotiations with nearby Bodi complicated the decision process and helped to make a stable compromise possible.

Taken in combination, the methodologies underlying these three detailed accounts provide an excellent general model for processual field investigation of collective decisions when anthropologists are fortunate enough to encounter them. Of further help will be Duranti's (1981, 1983) work on the sociolinguistics of group decision making (see also Bloch 1971, Brenneis and Myers 1984, Paine 1981), along with other works on consensus process (Bailey 1965, 1981; Richards and Kuper 1971). Duranti, while not really focusing on the content of decisions, outlines a useful methodology for understanding the dynamics of a decision meeting by recording and amplifying the content of verbal exchanges. We might learn something further from studies of decisions at the household level (e.g., Wilk 1989, 1991; Bentley 1989; Mukhopadhyay 1984; Karanja 1983; Bergman 1971). Also promising are special methods for examining and organizing the structure of decision making (Gladwin 1989) by use of decision-tree analysis.

I emphasize that while studying collective decisions is feasible, the more routine the collective problem solving is the more likely it is that full and active community participation will be lacking, that indirect language will make it difficult to follow the discussion, and that points obvious to everyone but the anthropologist will remain unspoken. Veiled language and omission of the obvious exacerbate the handicap of ethnographer naiveté identified by Western and Dunne (1981) when they repeatedly asked the Maasai how they chose sites for their camps. Answers were not forthcoming until the field-workers surveyed some old sites and came up with their own hypotheses, at which point the Maasai became talkative and confirmed their hunches.

Unless they are visiting groups known to be beset by ecological or political crises, anthropologists must be prepared to study emergency decisions as the opportunity arises. Turton's lead in opportunistically gathering and illuminating verbatim texts of observed group decisions can be enhanced by Duranti's methods, while Meggitt's interrogation of informants who had recently experienced warfare helped to get at past patterns. Ethnographers can model their analyses of observed or remembered emergencies on Firth's holistic treatment as they evaluate decisions for effect and "realism." Also of interest are other published descriptions of specific debates that inform collective decisions (e.g., Barth 1961, Boehm 1983, Howe 1986, Shertzer 1983, Merlan and Ramsey 1991) and surely many unpublished ones (e.g., Salzman 1972). As new data, particularly from foraging societies, accumulate, we will be in a better position to understand both the potential and limits of human problem solving and the precise mechanisms of cultural selection.

Direct Investigation of Adaptive Strategies

Anthropologists have recurrently attempted to develop better "processual" approaches (e.g., Kroeber 1948, Steward 1955, Service 1975, Goldschmidt 1993, Bohannan 1995). However, we seldom succeed in making such approaches work at the level of ethnographic microanalysis that uncovers the exigencies of decision making. A more direct focus on problem solving by nonliterate people could enhance such investigation and yield results quickly because there is a wealth of eminently successful problem solving that goes virtually unnoticed.

The lack of attention is readily explained. As ethnographers we face an all but overwhelming descriptive task in the field, and therefore we take theoretical short cuts that direct our focus away from problem solving. In addition to decision modeling, favored "crutches" include functional, structural, and symbolic analyses that foster holism. The drawback is that too often both failures and successes of human problem solvers are simply absorbed into such explanations. Edgerton (1992) has called attention to the underperception of behaviors that seem to be patently maladaptive; similarly, deliberate problem solving that has positive effects on satisfaction, survival, or reproductive success often becomes analytically invisible (see Boehm 1978). The problem is with the functionalist-inspired notion that culture just automatically organizes itself—for the best.

It is not surprising that this notion has prevailed in anthropology; for half a century we have been dependent upon biology for many of our models. Both biological cells and persevering gene-selection systems do appear to organize themselves "for the best" in the absence of supernatural overseers or consciously strategizing participants. Mayr (1974) has called such systems *teleonomic* because natural selection "solves problems" through processes that are entirely self-organizing. However, when humans solve large, complex problems as realistically and effectively as the Tikopia, Mursi, or Mae Enga do, their coping behavior is not just teleonomic but partly *teleological* because they are manipulating their cultural systems intelligently (Boehm 1978, Durham 1991:210). To a degree, this is true of other primates as well (Jolly 1988; see also Boehm 1978, 1991). Functionalism was borrowed from biology, and so were other short-cut approaches such as optimal foraging theory (e.g., Winterhalder and Smith 1981, 1992), risk assessment in behavioral ecology (e.g., Cashdan 1990), and ecological systems modeling (e.g., Lansing 1991). As with the decision-modeling approaches discussed earlier, the method of inference is to observe what people do and then make assumptions about the strategies they may be engaging in without directly and thoroughly investigating what they are thinking. As a result, ecological anthropologists have sometimes spoken of human adaptive strategies as though they were mechanically modeling the behavioral strategies of animals with small brains. This is, in part, unfortunate, for no other animal actively pools sophisticated environmental in-

formation, discusses its options in detail, and then pressures all group members to agree upon one emergency course of action as the Tikopians did in their *fonos*, as tribesmen do on the warpath, and as foragers do when the band has to change locations in a time of ecological stress (e.g., Lee 1976, Balikci 1970).

We owe it to the unusual species we study³ to investigate its active and flexible adaptive strategizing directly as well as by triangulation. One way to begin is to gain a fuller understanding of emergency collective decisions, and this can provide an entrée into the study of less obvious routine decisions, including those made by individuals.⁴ To study routinized problem solving as an important phase of cultural-selection process it will be necessary to adjust what ethnographers are looking for in the field, but this will expose important capacities of nonliterate people to which we usually pay lip service rather than studying them in action and evaluating their effects. There is also the challenge of adequately defining "culture," a process I believe to be far more closely tied to active problem solving than most definitions would suggest (e.g., Kroeber and Kluckhohn 1952).

How Sagacious Is the Native Mind?

Service (1975:17) states that purposeful actions are the motor that runs society, and to a significant extent this is true also of human cultural ecology. I have demonstrated that emergency decisions are readily investigated, even at second hand, so we can now take this motor apart a little to inspect its workings. A preliminary assessment is that emergency and routine deci-

sions, both collective and individual, guide a great deal of cultural-selection process—even though in many important respects the process does tend to organize itself (see, e.g., Kroeber 1948).

Not all anthropologists agree with Service about purposefulness. Possibly under the influence of the substantial philosophical literature on intentionality (e.g., Rosenberg 1980), a vociferous few denounce the weakness of "mentalist" approaches (e.g., Harris and Ross 1987) even as they promulgate highly simplified "materialist" hypotheses. The problem (see Boehm 1988) is that arbitrarily factoring out the minds of the people under study weakens anthropology as a science, while unduly weighting "mechanical" environmental variables leaves assessment of humans as problem solvers seriously incomplete. Fortunately, many materially oriented anthropologists are far from hostile to the human mind as an explanatory variable (e.g., Mithen 1989a, 1990; Cashdan 1990; Jochim 1981; Hill et al. 1987; Smith 1991), even though they employ systems approaches.

Most anthropological brands of systems theory hold that sociopolitical and environmental systems are causally connected, and even a cursory examination of our three case studies reveals that these nonliterate "ecologists" also are operating competently as "systems theorists." Mursi and Mae Enga perceived the relation between subsistence and warfare, while Tikopians recognized that the social sphere was critical to coping with pervasive subsistence problems. Such abilities provide no guarantee that a given emergency decision will be realistically conceived or effective in the desired direction, but on average the pooling of information and experience provides a powerful mechanism of cultural selection, one that is likely to have a direct impact on reproductive success.

In highlighting decisions that are realistically effective, I have brought into balance a traditional ethnographic coverage that has focused too much on desperate attempts of nonliterates to manipulate their situations supernaturally. Their emergency mass appeals are so obvious (and fascinating) that they are widely described and analyzed (e.g., Linton 1943, Wallace 1956). The realistic, practically effective side of problem solving is less obvious, more difficult to study, and all too easily taken for granted by scholars who depend upon the streamlining schemes listed above.

Long ago this misconception was adjusted by Malinowski (1948), who warned that heavy or exclusive reliance on ritual comes mainly with *uncontrollable* uncertainty—risk that eludes practical manipulation. Both he (1935) and others (Rappaport 1973, Condominas 1986, Sillitoe 1993, Schneider 1957, Lansing 1991) have called attention to the intertwining of realistic problem solving with ritual. I believe that further exploration of the division of labor between realistic practical problem solving and attempts at supernatural manipulation could significantly improve our understanding of nonliterate humans as potentially astute problem solvers who often mix their methods.

3. Certain animals do make emergency decisions that appear to be collective. Elsewhere (Boehm 1978) I have pointed to collective decision behavior of hamadryas baboon troops, whose leaders use body language to take them on alternative routes when the flooding of dry streams blocks normal access to resources (Kummer 1971). I have also described an apparent group "conference" by wild chimpanzees recorded by Yahaya Almasi on 8-mm videotape at Gombe National Park, in which a decision was made over some 50 seconds about whether or not to return the hostile calls of an enemy group (Boehm 1991, 1992). This information exchange was limited mainly to facial expressions, vocalizations, direction of attention, and body language.

4. Merrill's (1959) treatise on the fine-tuning of decisions came less than a decade after Firth's (1951) landmark publication but went all but unnoticed because it remained unpublished. Merrill suggested that routine decisions underlie much of cultural behavior and that such decisions are not nearly so "automatic" as one might assume. He speaks of routine innovation—unobvious fine-tuning that keeps a well-established problem-solving process effective in the face of environmental microvariation. One finding is that making Hopi pottery in the "customary way" in fact involves careful assessments of microenvironmental factors such as fluctuations in humidity; there are deliberate adjustments, for example, in the amount of time allotted to drying greenware. To describe this active process of problem solving Merrill had to move down to the level of micro-observation and ask the right questions. On the basis of this work I have suggested a general approach for studying routinized decisions (Boehm 1978).

Cultural-Selection Mechanics

"Cultural selection" has been variously defined (e.g., Durham 1991:162n; Boehm 1982a; Richerson and Boyd 1985), but generally it refers to the winnowing of competing cultural "units" (vaguely specified) that determine manifest cultural content as embodied in behavior. Theorists have followed Campbell's (1965) lead in that they start with gene-selection models and adapt them as directly as possible to the study of culture or the coevolution of culture and genes. Recent models of coevolutionary process (e.g., Whiten and Byrne 1988; Durham 1976, 1982, 1991; Boyd and Richerson 1991; Barkow, Cosmides, and Tooby 1992; Winterhalder and Smith 1992) try to make allowances for culture as a far less "tidy" process (see also MacDonald 1989). However, such modeling has explained very little about cultural adaptations in terms of the exact micromechanisms involved in specific cases.

To understand cultural selection as precisely as biologists have understood gene selection, we will need to understand transmission and the units involved (see Durham 1991). In spite of some very imaginative pioneering work (Cavalli-Sforza and Feldman 1981, Wolcott 1984, Boyd and Richerson 1982, Goldschmidt 1993, Soltis, Boyd, and Richerson 1995) and critiques (e.g., Daly 1982, Richerson and Boyd 1978, Boyd and Richerson 1985, Hallpike 1986), the minimal units involved in human cultural transmission remain obscure and appear to be fuzzily bounded. Furthermore, we have no way of knowing whether the presumptive units of cultural transmission are the same as those that provide variation for cultural-selection process. Cavalli-Sforza and Feldman's (1981) assessment of the transmission of "values" is suggestive in this respect, but values are difficult to delimit as units of variation even though they obviously play an influential contextual role in the construction of decision alternatives described above.

There is also the issue of what Lewontin (1970) refers to as the "units of selection." In biology, there has been extensive debate about the *vehicles* of selection (see Wilson and Sober 1994)—whether they are the genes themselves, individuals as carriers of genes, individuals with close kin as small, essentially collective vehicles of selection, or larger groups not composed just of kinsmen. (At present, the majority favors individuals with their close kin as the effective vehicles.) With culture, we must ask whether the operative vehicles of selection are likely to be individuals, households, territorial groups, perhaps even putative cultural "atoms" or larger cultural "traits," local group traditions, or entire cultural traditions. Given that cultural units of transmission have defied precise description, this is a difficult area to explore.

Given these critical gaps, our tentative cultural modeling has not supported the kind of corroborative field and experimental studies that helped make the "new synthesis" so attractive a paradigm for biologists. There are good reasons for this. Originally, Mendel isolated

self-contained, unchangeable transmission units⁵ that were subject to recombination on a statistically predictable basis. It turned out that these units were permanently assigned to individual carriers through a single recombination event, immediately after fertilization. Parental variation combined with randomized recombination made for variation among individuals, including most siblings, and individual phenotypic variation within breeding groups provided the raw material that selection acted upon. Such classical conceptualizations made for a powerful, parsimonious theory of Darwinian natural selection. For cultural selection, the ethnographic data presented here suggest a rather different arrangement of vehicles, units, and mechanisms. If we focus first on the individual participant as a basic culture carrier, decision alternatives amount to units of variation that can be individually adopted or discarded virtually at will: the vehicle is fickle, be it an individual or a group. Furthermore, in debate we have seen that the competing individually proposed alternatives can be modified, that is *recombined*, with the possibility of innovation. This makes the functionally significant source of variation (i.e., a decision alternative) inherently unstable. Thus, within a local group's "culture pool" (see Bohannan 1973, Ruyle 1973, Durham 1991) there is continuous possibility for recombination of cultural elements. Furthermore, if the group manages to reach a unanimous decision, then all the individuals may change instantly to the same alternative, and the entire group becomes the vehicle. In short, there are several very serious problems for modeling cultural processes closely on gene selection, even though Campbell's variation-and-selective-retention analogy holds in general.

By dissecting emergency decisions as problem-solving events, I have shown that natural units of variation appear as large decision alternatives that include nested hierarchies, for example, "attack" versus "do not attack" or, following the Mursi decision tree down to the next level, "attack either Gura or Merkule" versus "attack only Hana." At yet another level down there is the option of attacking Hana indiscriminately versus making certain areas or people off-limits. At all three levels these competing options amount to "clusters" of cultural content that have been cognitively integrated as people imagine their alternatives and try to sort through them.

Such alternatives are not just the product of self-organizing "cultural mutation" or blind cultural recombination but are being integrated by a powerful problem-solving mind (Boehm 1978) which could be rather specialized (see Tooby and Cosmides 1992) but is amazingly flexible. That mind is capable of purposefully sifting through past or imagined behavior strategies to se-

5. The absolute, Mendelian fixity of genes as transmission units has been called into question (see Durham 1991:24), but the degree of flexibility would still appear to be far less than with cultural transmission (e.g., Cavalli-Sforza and Feldman 1981).

lect among them or to create useful recombinations or even novel modifications. This introduces an element of "lower-level teleology" into cultural evolutionary process (Boehm 1991), for at least some of the sources of cultural variation are reshaped (sometimes created) because the evolutionary actors realistically understand the natural systems they are embedded in.

Decision alternatives can be highly unstable, so I shall refer to them as "*elements of variation*" rather than "units of variation." It is noteworthy that smaller cultural elements may be independently added to or subtracted from larger ones, as when the basic decision to attack Hana was amended twice—one warrior proposing that women and herd boys be spared and another that cultivated areas be exempted from attack. Fuller examination of Turton's detailed texts in their entirety would reveal further examples.

In discussing decision alternatives as conscious elements of variation that contain subelements, I have avoided the term "memes" as defined by Dawkins (1976) and employed by Durham (1991).⁶ Memes are the structural counterparts of genes, of course, and, if we wish to compare the blind, *self-organizing* side of cultural selection with genetic selection it will obviously be important to identify such well-bounded units—if they exist. However, in identifying sources of variation that feed into *guided* selection I have avoided forcing the characterization into a geneticist's mold.

This inductive exploration suggests that we may be stuck with rather volatile "elements," decision alternatives that lack permanent boundaries and seem to behave unpredictably when we examine specific selection episodes. However, certain elements (or subelements) may be quite durable in the group's culture pool over time. It is by studying this durable aspect that we are likely to discern any tendencies toward stable boundaries that might justify the use of the term "unit."

In considering cultural-selection mechanics I have focused on the conscious, purposive aspect of selection, which accounts for a great deal of human cultural selection overall (Boehm 1978, Campbell 1979, Durham 1991). In studying such guided selection, we already have a head start. Long ago Radin (1927) demonstrated the power of the nonliterate mind, and Goldschmidt (1959) suggested that decisions be incorporated into the study of cultural ecology (see also Meggitt 1977, Jochim 1981, Vayda 1989). The way to do this is to investigate adaptively critical decision processes directly (e.g., Firth 1959, Meggitt 1977, Turton 1977, Boehm 1983; see also D. S. Wilson n.d.) rather than subsuming them under other kinds of analysis that obscure their importance and lead us to avoid dealing with them directly.

6. Durham (1991:189–210) considers a meme to be "the functional unit of cultural transmission" and coins further terms such as "homomeme" and "allomeme" to conceptualize cultural selection in terms of competing homologous units. He sees possibilities for meme selection at both individual and group levels and through both conscious choice and operant conditioning.

Do Foragers' Decisions Affect Reproductive Success?

As local communities, hunter-gatherers seem to have been making adaptively relevant decisions for many millennia. I say this because extant foragers are so predictably egalitarian and oriented to seeking a consensus (see Knauf 1991, Gardner 1991, Mithen 1990), because they make frequent decisions about where to relocate, and because they did so prehistorically (Mithen 1990). Sometimes extant foragers move as a band, sometimes they change from band to band as households or, rarely, as individuals, and sometimes the band actually disintegrates for a time, but there is always the impetus to stay together in order to socialize and cooperate. Mithen (1990) suggests also that a band can process and retain a great deal more environmental information than a few households, which makes it a more potent organization for adaptation. Foragers have managed to proliferate on that basis, and their consensual style of decision making was handed down to egalitarian tribesmen such as the Mursi and Mae Enga as sedentarization arrived; certain chiefdoms such as Tikopia also retain this style.⁷

One must ask whether, on the whole, such decisions affect reproductive success positively or negatively. Given Edgerton's (1992) analysis, it would appear that the conscious-selection approach of egalitarians can be quite fallible, as can natural selection itself. However, I have argued that on balance conscious, guided selection has contributed to reproductive success (Boehm 1978; see also Mithen 1990). Indeed, if realistic attempts at reproductively relevant long-range decision making were hurting us badly, we should have developed much smaller—or differently structured—brains.

The outsized human brain has remained far from a "loose cannon" because adaptively significant decisions are not determined merely by "cognition." What orients most of our problem solving is a search for "satisfactions" that are deeply ingrained in human nature, ones geared to sex, comfort, nutrition, nurturance of offspring, and dispositions to adult sociality (see Ryle 1973, E. O. Wilson 1975, Konner 1982), along with social dominance, submission, and avoidance of domination (Boehm 1984, 1989, n.d.)—all factors that influence behavior within and between groups. As part of the primate heritage these factors oriented the decisions of foragers as they put some important finishing touches on the evolution of our genes, and they continue to orient our problem solving today.

7. Even with political centralization tendencies, collective decision making based on consensus seeking does not immediately disappear. The Tikopia provide us with an intermediate example in which the *fonos* operated in conjunction with chiefly leadership. With the development of stronger chiefdoms and kingdoms, the political basis of group decision making changes, but guided selection by the entire group continues. The same is true of nations: a strong leader can ensure unanimity of strategy and action even more effectively than a consensus group that may remain divided or even disintegrate.

Such dispositions influence our cultural values, and they orient specific emergency decisions like those treated above. Questions of hunger, territory as a source of resources, and political intimidation of other groups entered into the conscious calculations of two of our three exemplified groups. Questions of sheer survival and reproductive success also surfaced. The Mursi mentioned dying off, while the Tikopians actually tried to manipulate their own rate of reproduction in relation to carrying capacity—behavior that is documented on various continents (Abernethy 1979, Boehm 1982a). Because this group ability to meddle in processes germane to reproductive success is ancient, we need to assess its effect on the overall natural selection of our species.

Emergency Decisions and Group Selection

In evolutionary biology, obvious power attends the *individual* level of selection because genes are so discrete, because they are assigned permanently to individuals who serve as self-contained, short-lived vehicles of selection, and because indirect individual genetic competition within breeding groups acts on them so directly and powerfully (E. O. Wilson 1975). Once Wynne-Edwards's (1962) hypotheses about the self-regulation functions of populations were rejected, individual-selectionist approaches (e.g., Williams 1966) decisively predominated in evolutionary biology and anthropology.

Given this repudiation of excess adaptationism (see Campbell 1994), it is not surprising that group selection, with its assumed modest effects on gene pools, is just emerging as a potentially respectable theory (e.g., D. S. Wilson 1975, 1980, 1983; Boehm 1978, 1981; Boyd and Richerson 1991; Wilson and Sober 1994; Knauf 1994a). The very serious problem remains, however, that *specific mechanisms* must be discovered (see Campbell and Gatewood 1994) that permit robust selection of behaviors by which individuals compromise their inclusive-fitness prerogatives to provide group benefits. While the effects of cultural variables such as conformist transmission in groups have been explored by Boyd and Richerson (1991), I now turn to some aspects of forager political egalitarianism and decision making that deserve special attention.

Decisive mechanisms favorable to genetic group selection can be discerned in the above analysis of egalitarian-style decisions, but first let us define the problem precisely. For any highly social species, the mechanical obstacle to group-selection theory, as Campbell (1991:100) has phrased it, is "genetic competition among the cooperators." The problem is that when an individual makes a self-sacrificial contribution to the group, weak group-selection effects will support the genes involved, but powerful individual effects will drive them to a very low frequency because nonaltruists (free-riders and other cheaters) gain individual reproductive advantages over altruists. As a result, unrealistically high group extinction rates will be necessary for group

effects to hold their own against powerful individual ones (E. O. Wilson 1975, Wade 1978; see also Boyd and Richerson 1991).

For the biological evolution of humans, warfare with the frequent group extinctions it provides (Soltis, Boyd, and Richerson 1995) has been held out as a special and unique reason to rely upon genetic group-selection models (Alexander 1974; see also Durham 1991),⁸ and we have seen in two of our case histories that warfare decisions do mobilize entire tribes (see also Boehm 1978, 1983). The problem is that among the simpler foragers who evolved our genes, the existence of *intensive* warfare (with frequent band extinctions) remains open to question (e.g., Knauf 1991). Thus, warfare by itself does not seem likely to have driven group selection prehistorically.

The analysis I make here will drastically reduce the theoretical need for group extinctions to support cooperative or altruistic behaviors. With gene selection a basic modeling premise is that any reduction of individual genetic variation within the group will result in increased opportunity for group-selection effects (see Wilson and Sober 1994, D. S. Wilson n.d.). Obviously this assessment holds also for *phenotypic* variation, for it is on the phenotype that natural selection operates. There are, in fact, various general factors that make for cultural conformity in human groups (see Waddington 1960; Campbell 1975; Boyd and Richerson 1985, 1991; Alexander 1987; Wilson and Sober 1994). I focus instead upon two highly specific forces that act powerfully in this direction: active political leveling and the consensus seeking that characterizes egalitarian people everywhere. Both patterns are evident in all extant foragers (see Knauf 1991) and surely prevailed prehistorically.

Genetically those earlier foragers varied individually like any primate. However, as egalitarians they deliberately employed social control to "homogenize" their within-group behavior.⁹ People in such groups appear to be quite "individualistic" because they believe so deeply in personal autonomy (see Gardner 1991), but as egalitarians they collectively see to it that serious power differences among heads of households are substantially leveled. In effect, an ever-vigilant rank and file keeps alpha-male types from gaining a seriously disproportionate share of political influence, breeding opportunities, or large-game meat (Boehm 1993, 1994; Erdal and Whiten 1994). What Erdal and Whiten (1994:177) call "counter-dominant" behavior and Knauf (1994a:182) calls "aversion to submission" sharply reduces phenotypic variability among the group's adult individuals and

8. Soltis, Richerson, and Boyd (1995) have discussed the possibilities for *cultural* group selection under conditions of group decimation and extinction through warfare; mechanically, the problems for explaining cultural group selection will be quite different from problems with explaining gene selection at the group level.

9. Wilson and Sober (1994) point out the selection implications of social control among literate Mennonites in this context of egalitarian social leveling, and the political dynamics seem very much like those of nonliterate (e.g., Boehm 1993).

surely among the males in particular.¹⁰ The result is an inverted dominance hierarchy (Boehm 1993) in which the group's political actors unite to keep potential dominators under their thumb. Although individuals of exceptional ability do receive respect, privileged routes to decisive reproductive advantage are largely blocked, and the power of individual selection is seriously compromised (see also Boehm n.d.).

In addition, groups of "individualistic-but-equalized" foragers regularly arrive at consensual decisions. The nomads' recurrent dilemma is an often stressful decision about where to move next (e.g., Lee 1976), and frequently there is a serious trade-off between the desire to disperse and possibly be better nourished and the desire to keep the band in one place. Rather than rushing to split into isolated households, the group pools its information, imagines alternative relocation strategies, tries to select the best alternative, and, if it is successful in persuading or pressuring individualistic dissenters, acts with considerable unanimity. That is how bands (or core members of bands) cope with recurrent minicrises in which the advantages of cooperation and sociality must be weighed against the subsistence advantages of fission. Again, at the level of phenotype this tendency to set aside individualistic adaptive strategies and pursue a common one reduces behavioral variation among the people who tend to live in a given location, the band. By further reducing individual differences, this further boosts the relative power of group-selection forces acting on the genotype. At this point I am not suggesting that weak group effects, having been so favored, will now swamp lessened individual effects. Rather, group effects now constitute a counterforce that must be taken more seriously because the enormous power of individual effects has been seriously diluted.

There is still more to the story. As with emergencies coming out of warfare, a hurricane (or drought or invasion by insects) can bring immediate and obvious possibilities of decimation or extinction, as can disease. There may be serious consequences for members of groups that fail to act collectively and merely disband or that do nothing or make maladroit decisions or rely too heavily on supernatural help. It seems logical that there will be genetic group-selection effects simply through decimation of loser groups and natural increase and fission of winners.

One must keep in mind that the decision alternatives

10. Ellis (1995) demonstrates that male nonprimates tend to gain more reproductive advantage from high rank than females, while among primates middle- to high-ranking males have at least a slight reproductive advantage over others. He suggests that where resources are in dense clumps or where shortages occur, rank is likely to make more of a difference. Thus, where humans in bands depend on large-game meat and sometimes encounter scarcity, rank could make a very serious difference—for males and their households—were it not for egalitarian leveling and behavioral homogenization through collective decision making. The fact that egalitarian leveling sanctions are directed mainly at overambitious males (see Boehm 1993, Knauf 1994a) is worth noting in this context.

which inform the decisions of bands are not exactly random sources of variation. Rather, they are the product of remembered or verbally related experience that has been processed by an imaginative, problem-solving mind. We have seen above that this mind deals in a systems-theory type of analysis and sometimes anticipates and copes with large problems "pre-selectively" (Boehm 1978), that is, on a comprehensive and relatively long-range basis. This can result in sharp genetic competition among whole communities on the basis of which groups devise realistic strategies, or better realistic strategies, at times when reproductive stakes are high. The competition can be "Darwinian" and indirect, as in decisions about coping with drought or hurricanes, or direct and even interactive, as with the raiding for females that occurs among certain foragers and, possibly, warfare. Thus, realistic decision making at the band level can seriously amplify phenotypic variation between groups (Boehm 1978; see also Campbell 1983) and thereby significantly augment the absolute power of group selection at the level of genotype.

This is not so, of course, if two bands make precisely the same decision and implement it similarly, and humans do tend to be cultural copycats (Kroeber 1948, Richerson and Boyd 1985). For bands in the same area, it may therefore be during times of environmental instability or change (as they urgently experiment without having time to compare results and "borrow") that greater variation arises at close range. However, if genetically competing bands are more distant, then the short-term cultural diffusion effects become less relevant as a leveling force between groups, and emergency behaviors can vary more freely. When two bands select and implement realistic emergency strategies that differ significantly, this can make for dramatic and immediate differences in reproductive consequences. Group-selection effects may also be amplified if one group acts upon a realistic consensus but another's members react with mixed individual strategies that are of varying efficacy or if the second group unanimously commits to a "supernatural" solution that hamstrings its ability to cope or simply remains passive. I have concentrated on bands here, but whenever smaller clusters of households fend for themselves, as they may during emergencies, similar group effects may result at lower levels.

For hunter-gatherers, the emergency decisions I have in mind result chiefly from serious meteorological perturbations, unpredictable shifts in migratory patterns of prey, or conflicts with other groups. Routine decisions also play a part, for bands must relocate whenever resource availability shifts because of normal exploitation or seasonal changes. Relocation decisions of foragers tend to be made rather regularly, between two and eight times per year (e.g., Tanaka 1976), and such less urgent decisions also are important in amplifying genetic group-selection effects. Again, significant variations are more likely to arise among groups that are sufficiently distant that diffusion effects are mitigated.

To summarize, there are several highly specific ways

in which phenotypic (i.e., cultural) forces may be acting strongly to shift the balance of power in natural selection from individuals or small kin networks in the direction of the entire foraging band as a group vehicle. Both the outlawing of reproductively relevant dominance behavior and consensus seeking by band members continuously suppress individual variation, while the execution of band-level emergency decisions directly augments group effects just when reproductive threats are maximal. No other species exhibits such an overall pattern, and this is critical to thinking about human group-selection possibilities, particularly if explanations are sought for patently self-sacrificial behaviors or cooperative giving without direct reciprocation. However, I emphasize that this same culturally augmented level of group selection will be acting upon *any* behavior that is relevant to group growth or decline, including behaviors with negligible or no cost to individuals or ones involving gains to both individual and group.

While a single emergency such as drought does allow group selection to operate on imperiled bands of decision makers at one point in time, such effects would be stronger still if precisely the same bounded group made its decisions over many generations. Group boundaries among prehistoric foragers pose a complicated problem for ethnologists, for both ethnographers and nonliterates are given to reification when they label groups: both tend to overperceive the integrity of entities categorized as "bands" (see Palmer, Fredrickson, and Tilley n.d.). Compared with the stability implied by labels, band membership tends to be quite volatile both in terms of annual cycles and over generations. In spite of all the movement, however, there do sometimes appear to be what might be called "core groups" of close relatives who associate themselves proprietarily with locales harboring critical resources (e.g., Lee 1976). Thus, when an emergency decision is made, the group that undertakes concerted action is likely to consist of a relatively stable core and additional families that have kin connections with core individuals. In the long term, if we are considering indirect genetic competition between adjacent groups, it is the core groups that are the primary vehicles for selection; transient households tend to be less significant insofar as their members divide themselves among competing core groups. However, when geographic and social distance between groups increases a little, such neutralizing effects are eliminated. Then the logical focal vehicles for group selection will be culture-sharing clusters of bands that are mutually isolated, even though bands within the clusters may vary as well.

Soltis, Richerson, and Boyd (1995) have used empirical data on warring tribesmen to suggest that frequent group extinctions justify considering *cultural* selection at the group level. However, cultural group selection (e.g., Boyd and Richerson 1965, 1991) is very different mechanically from genetic group selection because the cultural "elements" I have discussed are so different from genes. Since 1975 we have been thinking of *genetic* group selection as though frequent group extinctions

were necessary to support people's helping nonrelatives, but this may well be misleading. The complete answer will require extensive modeling, but I suggest that when prehistoric foragers became egalitarian the evolutionary situation was radically altered because group effects were in a better position to compete with individual effects. First, with individual selection reduced and group effects amplified, *nonsacrificial cooperative behaviors*—ones that reproductively compensate individual cooperators over their entire life cycles sufficiently that there is no net loss—could now be supported quite robustly. Second, *group-helpful behaviors that involve extremely modest net reproductive losses to the inclusive fitness of cooperators* could be supported at a fairly high equilibrium, simply because groups harboring the underlying genes would have proliferated much more rapidly than has been thought. Finally, with regard to the *more heavily sacrificial behaviors* that have driven population geneticists to insist upon frequent-extinction group-selection models (e.g., E. O. Wilson 1975), the suggested realignment of selection forces should have substantially reduced the need for very frequent group extinctions to keep them in place. In addition, social control entered the picture very powerfully: in spite of some tolerance for free-loading, forager communities actively manipulate or punish radical nonaltruists (Boehm 1993, Hamilton 1975) and thus reduce their reproductive success.

The effect of all these mechanisms on human nature was profound. Amplified group effects favored genes that fostered an individual social capacity to fit into moralistic, militantly egalitarian bands whose members, vigilant in working for group prerogatives, came to rely increasingly upon cooperation. It is worth emphasizing that morality and social control were absolutely essential to an egalitarian political lifestyle (see Boehm 1982b, 1984, 1993, n.d.) and that they permitted individuals who identified with group interests and believed in altruistic behavior to work together in cracking down on serious cheats, free-loaders, and bullies, making them pay reproductively precisely when resources became critically scarce.

With this moralistic, hypercooperative, egalitarian-leveling approach to group life in place for at least 50–100 millennia, it becomes far easier to explain the biological evolution of certain human tendencies. Prominent was the ability to form aggressive moral communities which vigilantly presided over valued cooperative activities and strictly controlled those who acted as leaders. There was also the tendency to elicit "altruistic" behavior from others by force if necessary (see Campbell 1972, Trivers 1971, Peterson 1993, Erdal and Whiten 1994). More generally, there was the salient ability to assess and cope with increasingly complex environmental and political problems and to do so collectively by pooling highly specific information. It was these behaviors, in combination, that provided the mechanical basis for gene selection at the group level to operate as decisively as it did in human evolution.

Conclusions

The "grand" and middle levels of cultural-selection theory have been rather well explored (e.g., Sumner and Keller 1927, Hoebel 1954, Murdock 1956, Goldschmidt 1959, Campbell 1965, Boehm 1978, Boyd and Richerson 1985, Durham 1991), but much of the theorizing is so speculative or tentatively documented that the edifice has remained top-heavy. I have proposed studying group decisions because they directly reveal cultural-selection micromechanics at work, but I have not stopped with processual methodology and definition of culture elements. Rather, I have suggested that sophisticated, realistic emergency decisions provide an important entrée for investigating the lower-level teleology that helps to shape human behavior. The argument that group decisions can significantly guide cultural-selection process has been extended from postdomestication nonliterates whose behavior has been so well exemplified here to prehistoric foragers who made similar decisions as bands. I believe that this approach could have important implications for understanding culture and its place in human evolution.

Our conceptualizations of human culture must be friendly to the self-organizing, teleonomic aspect of culture, which ranges from automatic microprocesses of transmission or selection (see Richerson and Boyd 1985, Durham 1991) to larger dynamics such as growth, change, and diffusion (e.g., Kroeber 1948, White 1959). However, they must be equally friendly to purposeful, guided selection, which ranges from dramatic emergency decisions of entire communities to the relatively inconspicuous routine innovations of individuals and includes transmission-by-teaching (see Goldschmidt 1993). The latter is a purposeful behavior that deserves further exploration with a view to identifying cultural "elements" that assume similar shapes in conscious transmission and conscious selection. Such study would help anthropologists to assess the durability and stability of cultural elements as I have defined them here both within and between groups.

Finally, I have argued that the *guided* cultural selection that is so apparent in our three case studies has important implications for understanding gene selection prehistorically. Undoubtedly, foragers have operated for many millennia under the double impact of intentional egalitarian leveling mechanisms and consensus-seeking group-decision behaviors that fuse social assemblages into potent instruments of communal problem solving. Both change the balance of power, as it were, between individual and group levels of gene selection. The shift in favor of group effects is relevant not only to the evolution of altruistic or cooperative tendencies but to the selection of human social tendencies in general.

It has been a long reach from microethnographic investigation of cultural-selection episodes to an understanding of the ultimate basis of some important and distinctive components of human social behavior through selection mechanics that include significant group effects. However, if we are to do justice to the

broadly integrative natural-history approach that has made anthropology's reputation, these are precisely the kinds of problems that anthropologists must deal with. In trying to take apart the cultural engine, we must continue to look to evolutionary biology for inspiration. At the same time, however, we must build models to our own specifications, models suited to the special exigencies of guided cultural selection and the group decisions that provide critical guidance in times of stress.

Comments

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This piece is both theoretically important and deliberately limited in such a way as to be empirically fruitful. Boehm's strength lies in his knowledge of bioevolutionary theory and primatology combined with ethnographic experience. My comments are primarily directed to the issue of cultural selection, to the question of the representativeness of his cases as regards human decision making, and to empirical methods. I conclude with some proposals for building on Boehm's suggestions in order to further studies towards a truly Darwinian resp. evolutionary theory of transgenerational change (cf. Blute 1979; Antweiler 1991a, b; Antweiler and Adams 1992). Boehm's diagnosis of the current status of research on cultural selection is accurate. Indeed, its mechanisms have not been successfully investigated empirically. His summary account of some other work on coevolution "in which biocultural modeling too often tends to overwhelm the ethnographic data" is a bit harsh with regard to the work of Barkow, Cosmides, and Tooby (1992) and especially Durham (1991), who analyzes a wealth of accumulated data in his long case chapters. Boehm's clou as regards methods is that he focuses on group decisions that were immediate and readily susceptible to observation by ethnographers. He reanalyzes published cases of group decision making and selects very specific situations in which groups decide (1) uniformly, (2) purposefully, and (3) with considerable and measurable effects regarding survival and reproductive success. It seems beyond doubt that this kind of decision making represents a common situation in prehistoric human groups. Thus this should be an element of any realistic general theory on cultural evolution, apart from elements of individual and blind selection, which we should not forget. But the question arises to what degree such uniform and purposeful and materially effective decisions are typical for the era of the ethnographic present implied by Boehm's remark on nations. I think that this is a question which should and could be answered empirically.

How could we build on Boehm's in many ways pioneering work? Only a few suggestions follow: First,

through collaboration of anthropologists with historians and political scientists we should look for more group decisions of the specific kind Boehm has in mind. We could compare their salience synchronically and diachronically with other types of individual, household, and other group decisions. Secondly, evolutionary ecological theory might be useful to identify situations in which the conditions of such specific group decisions are given in an ideal manner. Living conditions on islands or in other culturally or ecologically circumscribed environments would be likely candidates (see Antweiler 1991b). Thirdly, as regards ethnographic comparison's being very important for these issues, we should develop guidelines to systematize the ethnographic description of decision-making on the group level and the levels below whole groups in order to have really comparable data bases. The problem is that currently there are not many more well-described cases in the ethnographic literature than those Boehm uses. It is especially important to document not only decisions as inferred (through observable behaviour or decision consequences) but also decisions as explained by informants (*revealed vs. reported decisions*). Boehm has made a good step in this direction, and a closer reading of some of the older literature on *natural decision-making* (e.g., Fjellman 1976a, b) could improve research in this area. Lastly, a further step might be the incorporation of such specific forms of group decision and resulting group selection into simulation models of transgenerational change in human societies, a promising area of research currently not very well known among anthropologists interested in cultural evolution.

In sum, this is a fine example of how fruitful evolutionarily inspired anthropological research can be for core questions of the ethnographic endeavour. Boehm successfully brings together evolutionary theory and ethnographic fieldwork data. The most important effect of such work, to my mind, is that it makes theoretically relevant questions of cultural evolution amenable to study in the field.

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A journalist once asked Konrad Lorenz whether human beings ever behaved like animals. Lorenz replied: "Actually never. Man is comparable with animals only subject to qualifications. He is certainly not distinguished from them by having nothing whatever in common with them, . . . but by his having acquired something essential over and above those things that he shares with them that results in a fundamental change in his behavior; and that is his intellectual function, his thought, his vocabulary, and above all his moral concerns and inhibitions" (quoted by R. J. Humm in *Die Weltwoche* [Zürich], February 3, 1958).

In particular, humans' intellectual ability to set them-

selves goals and to choose strategies in pursuit of them, partly by weighing arguments in discussion, is a unique achievement. Boehm's three examples illustrate this approach to decision making in emergency situations. His contribution is timely indeed, since the concept of the "blind watchmaker" has blurred the vision of many evolutionary scientists. For most of the history of life on earth, evolution was indeed the result of blind trial and error. But in humans, at least in theory, things have changed. Certainly, many of the cultural practices and inventions are passed on without any insight into their functioning and might even have developed and been carried on by the self-organizing process of selection simply by virtue of their proving adaptive, as has been emphasized by, amongst others, the economist von Hayek (1979). However, it should not be forgotten that human beings are also capable of adopting insightful strategies on the basis of some knowledge of cause and effect. Quoting Boehm: We must be friendly not only to the self-organizing, teleonomic aspects of culture but equally to purposeful, guided selection.

The term "cultural selection" could, I think, add to the confusion evident in much of the discourse on cultural evolution. "Culture" employed as a general term refers to a set of characteristics acquired by a society in the course of cultural evolution and passed on by tradition. Each individual characteristic certainly contributes in one way or another to fitness. Selection operated on the phenotypes as bearers of characteristics, be it morphological, physiological, psychological, or cultural. When we speak of units of selection we must always clearly define what we mean. Are we talking about the phenotypes upon which selection operates and defining the traits selected, or are we speaking about the genes as replicators? Selection does not directly operate on them. They are only indirectly selected when they are responsible for an advantageous characteristic of the phenotype. Despite their behind-the-scenes role, genes are concrete entities, and I agree that memes are a construct not to be compared with them. A pot, a knife, and an ideology, all products of cultural evolution, possess characteristics into which very different forms of experiences entered as precursors, and any tool can be compared to an organ.

The phenomenon of group selection in humans has as a prerequisite a number of characteristics which evolved by individual and kin selection in the service of parent-child nurture and bonding. They proved to be so effective in bonding individuals in quasi-familial individualized groups that they finally became units of selection. With the evolution of nurturant motivations and behaviors a set of "preadaptations" for adult bonding came into being. These included family defense, the ability for individual recognition and bonding, and neonate signals triggering nurturant responses and the motivation to seek nurturance (Eibl-Eibesfeldt 1972, 1982, 1995). In human beings the small-group ethos of face-to-face-communities is basically nurturant, expressions of repressive dominance such as boasting being counteracted by active leveling consisting of interpersonal tac-

tics such as shunning and ridicule (Wiessner and Schieffelin n.d.). It is also diverted toward out-group-members. Boehm refers to the homogenizing social controls in such societies.

With the evolution of larger, anonymous societies the individualized small-group ethos was extended to the larger group through the action of cultural institutions, which tap the phylogenetically evolved nurturant and group-defensive dispositions. As societies increased in size and extrafamilial and finally anonymous interactions increased in frequency, such institutions became increasingly important for engineering cohesion where once, in the evolutionary past, it had been a self-organizing outcome of living in small groups. In this regard ideologies and symbol identification have come to be of paramount importance (Eibl-Eibesfeldt and Salter n.d.).

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Sometimes it is as enlightening to examine why two researchers disagree as it is to focus on the issues provoking the disagreement. Beyond our obvious theoretical differences, noted below, a major difference between Boehm and me stems from the disparate societies we have studied. As my own fieldwork and publications show, I am definitely an advocate of cross-cultural studies. For example, I have conducted intensive fieldwork among societies with diverse economies, mobility patterns, social and political organizations, amounts of egalitarianism, and more. Because I have worked in such varied societies, I am able to recognize that researchers who have had direct field experience with only one or two types of societies and rely on the cross-cultural literature for their models sometimes overgeneralize.

I have studied societies that range from highly egalitarian to highly nonegalitarian and include (1) the Central Kalahari Basarwa (Bushmen or San), who are highly egalitarian hunter-gatherers; (2) the Navajos, who are less egalitarian tribal pastoralist/farmers; (3) Northwest Coast Indians, who are [were traditionally] hierarchical and ranked chiefdom-level hunter-gatherers; and (4) Euroamericans, who are a highly *inegalitarian*, complex state-level society. As a result, I seriously question Boehm's generalization that "extant foragers are so predictably egalitarian." Northwest Coast Indians and the Kalahari Basarwa are both foragers, but the former are a stratified, ranked society while the Basarwa are a nonhierarchical, acephalous one. These two groups have little in common other than relying primarily on wild plants and animals for subsistence. In decision-making, social, political, and other respects, Northwest Coast Indians are much more like socially and politically stratified farmers, such as the Tikopians, than they are like tribal Australian Aborigines hunter-gatherers or band-level Basarwa hunter-gatherers. Boehm's uncritical use of terms such as "egalitarian" masks the very diversity anthro-

pologists are interested in studying and understanding. To imply that the chiefdom-level Tikopians are egalitarian, despite their stratified society and hierarchical political system, is misleading. Tikopians are more egalitarian than Westerners but are categorically unlike highly egalitarian Basarwa, Inuit, or Malaysian Batek. Boehm's categorizing as "egalitarian" any society that is more egalitarian than highly stratified, hierarchical state-level societies, such as Western ones, renders the term meaningless. Such overgeneralizing and collapsing of categories also obscure important differences between societies that are important to take into account when conducting cross-cultural research.

Boehm is vague with other terms essential to his discussion. He frequently evaluates whether specific behavior is "realistic" and "rational." In almost every use of each term, it appears that what he means is what is realistic and rational to Western culture. Boehm does not see these terms as culturally relative or culturally sensitive. Is it valid to apply Western views of what is or is not "realistic" or "rational" to non-Western societies? An evolutionary/biological/genetic view of culture is definitely a 19th- and 20th-century-sensitive concept that Western society would have rejected as irrational or unrealistic merely a few hundred years before.

In addition, does Boehm assume that consensus and collective action always result in "winners" in contrast to all others who are the "losers"? He states, "There may be serious consequences for members of groups that fail to act collectively and merely disband, or that do nothing or make maladroit decisions or rely too heavily on supernatural help. It seems logical that there will be genetic group-selection effects, simply through decimation of loser groups and natural increase and fission of the winners." Assumptions are most convincing when backed by empirical data. For example, Boehm apparently believes that supernatural responses or solutions are invariably harmful to the survival and success of a group. In agreement, other anthropologists interpret meat taboos, often the result of supernatural beliefs, as nutritionally maladaptive for a segment of the population, often reproductively active women. For instance, Aunger (1992:199) writes that among some Ituri Forest villagers "for some individuals. . . (and particularly women) food avoidances are biologically maladaptive." However, medical data demonstrate that in areas where malaria is endemic, such as the Ituri, supernaturally inspired meat taboos can help reduce the risk of acquiring malaria (e.g., Kent et al. 1994). Furthermore, some supernatural responses might be instrumental in preserving a particular culture among a few individuals or groups within a society even if detrimental to the successful reproduction of a large number of people in that society. Such responses might or might not be viewed as beneficial, using Western definitions.

It also is not clear whether Boehm assumes that successful individual physical (i.e., genetic) reproduction and individual selection coincide with successful group or cultural reproduction. People may reproduce physically without also reproducing culturally and vice versa;

examples occur in the literature, particularly in societies undergoing acculturation. Does this, then, alter Boehm's conclusions?

The last difficulty I have with this article is not specific to it but relates to his and other cultural evolutionists/ecologists' theoretical orientation. Boehm presents a compelling argument against using individual selection as the basis of cultural evolution. However, he and other researchers use jargon from evolutionary biology to discuss how culture changes. These two processes—culture change and physical or biological change—are very different. It is misleading to use the same terminology for dissimilar processes. People think, they manipulate and deceive, they change their minds, and they make decisions on the basis of a wide variety of factors that are sometimes quite unrelated to the decision being made; genotypes and phenotypes do none of this. Genes do not behave like people or people like genes; genes and physical evolution, therefore, are not appropriate analogs for human behavior. Boehm's reference to individual effects as genes and to group selection as phenotype only confuses the issues and misleads people into thinking that there are commonalities between individual change and genotypic change or between culture change and phenotypic change. Calling a body of cultural knowledge a "culture pool" implies similarity to a gene pool, whence the term is derived.

From my perspective, evolutionary analogies and models are potentially deceptive in that they imply that reproductive success is as responsible and rigid for cultural evolution as it is for physical evolution. While the two may be equivalent on the abstract, theoretical level, they are not equal on the operative level (also see Hallpike 1986). The evolutionary terminology should not be identical unless the processes are themselves identical, particularly since using the same term implies extreme similarity, if not actual synonymy (Kent 1996). It is much easier and less time-consuming to apply highly successful theoretical models and jargon from a well-respected and established discipline, such as biology, than to grapple with developing models directly relevant to how culture operates and is reproduced or passed on to succeeding generations. This is particularly true now that the discipline of anthropology appears to be experiencing an identity crisis. However, it is not necessarily valid, appropriate, or illuminating to do so. Forcing non-genetic behavior and processes into genetic-appropriate categories and jargon is detrimental to the entire study of human behavior, particularly in an article devoted to showing the uniqueness of cultural evolution.

Like Boehm's previous publications, this one is stimulating and provocative. My difficulty with it is that the argument relies too heavily on untested assumptions, many of which seem to be based in Western concepts and perceptions, the uncritical use of terms such as egalitarianism, and the appropriation of biological evolutionary models and jargon for nonbiological, culturally inspired behavior. Here, as with most fundamental theoretical differences, Boehm and I must be content with simply agreeing to disagree.

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Boehm's insightful and stimulating contribution draws attention to the benefits of collective decision making in human evolution. In most simple human societies such decision-making is indeed the norm and has high *prima facie* value in promoting survival on both an individual and a collective level. This is a key arena in which the cultural bias for conservatism and imitation—which may otherwise impede instrumental learning (see Boyd and Richerson 1985)—is counteracted. Novel situations of stress or threat commonly entrain human responses that are at once intentional, creative, and—most important—collective. As such, they help generate the variation upon which group selection can operate.

The processes of collective decision making described by Boehm are highly general in simple societies and resonate with what I know of Gebusi longhouse dynamics in interior New Guinea (Knauft 1985; cf. Marshall 1976, Lee 1979, Turnbull 1961, Woodburn 1979). This pattern raises several important issues. First, collective decision making presumes accurate sharing of information; it assumes trust that the information provided is correct and not a product of lying or deceit. It is striking that small-scale societies tend to presume honesty rather than doubt or disbelief under conditions of existential threat or emergency (cf. Rappaport 1971). This is consistent with experimental results: controlled studies in social psychology document the power of face-to-face human collectivity to entrain cooperation and altruism even in the absence of dependable payoffs (Capra et al. 1989). Evidently, sociality has been strongly selected for as a rule-of-thumb behavior in humans. This may be an evolutionary outgrowth of the solace-seeking and alliance behavior that intensifies during times of stress among nonhuman primates (de Waal 1982; 1989a, b).

Second, the social and cultural dynamics of "emergency" are amenable to more refined analysis. The emergency circumstances considered by Boehm are stressors or catastrophes that threaten the group as a whole and not just selected members within it. Physical threats or difficulties that affect only particular individuals are less likely to produce the benefits of collective decision making. In cases such as intergroup conflict, what constitutes an "emergency" is in part a cultural construction; threats or grievances may pertain most directly to selected individuals while being defined as a threat to the group as a whole. The cultural construction of stress and threat is underscored by phenomena that are perceived as spiritually or cosmologically threatening even though their threat to physical survival may seem limited from an analytic perspective. Among Gebusi, some of the greatest threats—and those demanding the most decisive, collective, and violent decisions to protect the group as a whole—are believed to derive from sorcery or spiritual malevolence (Knauft 1985,

1989a). Boehm's argument thus opens the question of how the group-level construal of "emergency" articulates with intersubjective processes of communication and legitimization. His argument is tautologous (though productive) insofar as phenomena that are group-constructed as "emergencies" are "naturally" subject to group-level decision making and counteraction.

Third, focusing on collective decision making in emergency situations begs the question of the dynamics of decision making in more informal and everyday circumstances. Among Gebusi (and in other simple human societies), a communal period of sharing information, opinions, and possible actions is an everyday occurrence—for instance, in communal conversation before or after an evening meal (Knauf 1985:chap. 3; cf. Marshall 1976). The adaptive potential of collective decision making during recognized emergencies typically builds upon and presumes trust built up through daily sharing of information in simple, small-scale societies (see Boehm 1993). The potentials afforded by collective information sharing and decision making on a daily basis likely provided a key group-selective advantage for simple human societies—and for the evolution of displaced communication and language—in conditions of human evolution where resources were dispersed and patchy (see Kurland and Beckerman 1985). A number of reinforcing features in the evolution of *Homo*, and *H. sapiens* in particular, are consistent with this pattern: increased home range, increased group size, increased encephalization, adaptation to diverse ecozones, and increased pressure for complex communicative and linguistic means to facilitate social bonding (Aiello and Dunbar 1993, Dunbar 1993, Knauf 1996).

Fourth, though Boehm does not allude to it, collective decision making has a strongly gendered component in many simple societies. In all of the cases Boehm discusses, as well as among Gebusi, collective decision making is largely controlled by men in formal or public terms. Whether the public awareness or construction of "emergencies" is also a male phenomenon is an important and unresolved question. Boehm's argument thus overlooks the more informal communication processes whereby public collective decision making is influenced by—or shut off from—women and others in more private communication.

In theoretical terms, collective decision making resonates with many other features of linguistic and social cooperation that take place despite diurnal dispersal of individuals in simple human societies—and presumably in prehistoric populations of *H. sapiens* (Knauf 1989b, 1994a, b, n.d. a; cf. Rodseth et al. 1991). These include features such as food sharing, affinal or fictive-kin affiliation, gift exchange, and rule-of-thumb trust in the accuracy of reported events and information (see Leacock and Lee 1982). These form the larger social context of group living and group-level adaptation within which emergency decision making occurs.

The competing viewpoint, of course, is that collective behavior is self-interested rather than altruistic—that what appears as collective advantage is only the sum of

individual strategies and egoistic cost-benefit assessments (e.g., Axelrod and Hamilton 1981; Trivers 1971, 1985). What this viewpoint neglects, however, is the presumed trustworthiness of information, opinions, and intended solutions found in the conditions of stress or crisis that Boehm describes. It is exactly under such conditions that narrower self-interest would predict competitive breakdown and disintegration of social order rather than the collective decision making that is the norm in responses to adversity in simple human societies. Emergency decision making is thus an especially strong example of the importance of group selection in human evolution (Wilson and Sober 1989, 1994; Knauf 1994b, 1996; Soltis, Boyd, and Richerson 1995; Richerson and Boyd 1989; Boyd 1988; Boyd and Richerson 1985, 1990a, b).

One productive way to mediate these opposed perspectives while keeping them empirically engaged is to consider new dimensions of practice and agency (Knauf n.d.b: chap. 4; cf. Bourdieu 1977, 1990; Giddens 1979, 1984; Ortner 1984). Agency can promote self-interest, albeit as culturally defined and constructed. At the same time, communal decision making is a prominent and tangible means by which agency is established and promoted on a collective level. Collective agency is not the nominal sum of individual attitudes and decisions in simple societies—as is obvious to anyone who has witnessed the sudden emergence of consensus from an evening of seemingly haphazard palaver. Collective creativity and innovation take root in response to the perception of intruding stressors and problems. This is theoretically important because it shows how variation is generated and maintained at a collective level among groups. Further, the social and discursive process through which decision makers are seen to "speak for the group" defines its normative action and provides the means by which innovations spread through a larger social universe. Conscious agency on the part of some has its counterpart in practical acceptance by others. Decision making thus reflects and encodes the dynamics of cultural inequality, whereby the discourse of some becomes the dominant social as well as the symbolic reality of a group (e.g., Brenneis and Myers 1984). In simple human societies, this collectivity may be relatively egalitarian among men even though it potentiates other forms of inequity based on age or sex.

In important ways, then, the collective features of making and legitimating emergency decisions as illuminated by Boehm point to the dynamics of agency as well as revealing key processes of group-level selection.

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I am in considerable sympathy with Boehm's thesis. If anthropologists wish to explain the course of culture change—whether during the millennia of prehistory or within the few days of an ethnographic study—they

have no choice but to get to grips with the nitty-gritty of human decision making. This requires that our explanations be mentalistic in character (Mithen 1990). Whether human behaviour is approached from the perspective of the social or the natural sciences, we are inevitably drawn towards the individual as our unit of study (Mithen 1989b).

Boehm performs an excellent service in pointing to the weaknesses of what he describes as the "grand" and middle levels of cultural-selection theory, such as the models of Boyd and Richerson (1985). These models, largely developed by biologists, provide few, if any, means for connecting theory with data. As a consequence they are limited in their usefulness (although see Lake 1994 for an important use of Boyd and Richerson's theory and models for exploring Plio/Pleistocene hominid behaviour).

Boehm quite rightly stresses that the analogy between gene and cultural selection is weak; in fact, it has so many problems that one must question its usefulness. As he notes, there is no unit of culture equivalent to the gene; competing cultural units can only ever be vaguely defined; decision alternatives are highly unstable, and they do not constitute a random source of variation. I am relieved that Boehm has avoided using the notion of the "meme," invoked as the cultural equivalent to the gene (Dawkins 1976). Memes and related "cultural virus" theories (Cullen 1993) are ideas of very limited value, although they continue to receive serious discussion (e.g., Dennett 1995).

There are several fundamental differences between cultural and biological evolution, the two most important of which are the role of intentionality in cultural evolution, as opposed to "blind" natural selection, and the fact that inherited genes are for life, whereas inherited cultural traits may last for no more than an instant—in fact, there is no such thing as an inherited cultural trait, as these are continually transformed within the mind of each individual. Of these problems that of intentionality is the more serious. Not only do people make decisions with clearly defined goals which they strive to achieve but often they have multiple goals, which sometimes appear to us as contradictory. For instance, hunter-gatherers are expert natural historians, often having a profound understanding of ecology, and are "realists" when they make their foraging decisions. As a consequence, models derived from optimal foraging theory have considerable success at explaining their economic behaviour. Yet at the very same time the same hunter-gatherers may conceive of their environments as controlled by supernatural forces. To us these appear as contradictory viewpoints, but no contradiction is apparent within their minds. As Ernest Gellner once wrote, for traditional non-Western societies "the conflation and confusion of functions, aims and criteria, is the normal, original condition of mankind" (1988:45; elsewhere [Mithen 1996] I attempt to address when and how this thinking could have arisen during the course of human evolution). And of course a further complicating factor is that whereas intentional goals may be present,

any single decision that is made always has myriad unanticipated and/or unintended consequences.

I applaud Boehm's demand that anthropologists distance themselves from the models of biologists or at least make very substantial modifications to these. Those models may be important for defining how certain predispositions arise within the human mind but can tell us little about how those predispositions lead to the pattern of cultural variation we observe in the ethnographic and archaeological records. It is a more profound understanding of human decision making that our discipline requires, not further abstract models for cultural-selection processes. Boehm demonstrates very effectively that ethnographic reports contain considerable information for pursuing this study.

One question that obviously arises from Boehm's paper is the significance of the group, consensual-type decisions he describes relative to the routinized, individual decision making which is the stuff of everyday life. I assume that the latter is of far more significance. How often do the "emergency decisions" which might favour group selection arise? If not very often, then the group selection effects that might derive from these are of little significance for culture change. Related to this is the problem of group membership. How often does the same group make consensual decisions? Boehm notes that this is a potential source of difficulty for his argument, acknowledging the volatility of band membership, but I feel that he rather inadequately addresses it. The problem of identifying "groups" in the ethnographic and archaeological records has received insufficient attention from those favouring group selection (Mithen 1993).

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Boehm makes two important points in this paper, one substantive and the other methodological. The substantive argument is that human collective decision making in egalitarian societies is evidence for some form of group selection. The methodological argument is that cultural-selection mechanics are processes that are accessible to ethnographic investigation. A few caveats are in order, but the main thrust of my commentary is to underline these two points.

The most important caveat is that the collective decisions Boehm describes are not unambiguously examples of cultural evolution. In each case, the emergency situation described appears to be one that occurs repeatedly, if relatively infrequently. For example, the Mursi are locked in a running conflict with the Bodi, and the decision to make active war on them or not occurs perhaps several times per generation. The decision alternatives in the focal case in the paper may be well within historical experience and demand no innovation except adjustment to the unique circumstances of that particular case. The group decision in this case may reflect no

more than the application of a contingent strategy, which itself is unmodified by the particular decision. That said, it is plausible enough that collective decisions sometimes do result in cultural evolution. In the case of picking from among known strategies, the success or failure of a strategy may be remembered and enter into future debates. Strategies that fail repeatedly may be modified or abandoned. Collective decisions may also generate new variations. Perhaps the strategy of seeking foreign aid in the Tikopian case was such a novelty. Similarly, decisions about accepting innovations from outside sources, such as decisions of Latin Americans to convert to Protestant faiths, may often be community-level ones.

The caveat underlines the methodological point Boehm makes. A certain opportunism is important in studying phenomena like cultural evolution. Typical cases include many difficult-to-measure processes of approximately equal importance. Emergency decisions are interesting because their importance tends to produce the fullest expression of collective decision-making institutions. Routine decisions affected by the same processes may be made in the course of casual conversations, by the tacit approval of the most respected members of the community, and so forth. The deepest insight into processes often comes in unusual limiting instances, when the process of interest is easiest to study. One set of cases of interest in this regard is behavior in complex societies. Modern societies are very different from those under which our psychology evolved, but for just this reason they are likely to throw into relief dispositions evolved for very different sorts of social environments. For example, advice books for junior officers in modern armies (e.g., Malone 1983) sound suspiciously as if they could be meant for aspiring leading figures in egalitarian societies, notwithstanding the junior officer's role in one of the most deeply hierarchical forms of social organization ever created. Collective decision making is much more differentiated in modern complex societies than in egalitarian ones but has the advantage that the existence of written records and the opportunity to use questionnaires make available a great deal more information than is typically possible to acquire through ethnographic research.

Sabatier and Jenkins-Smith's (1993) "policy learning" hypothesis about how policy evolves in the United States demonstrates the power of using quantitative data to dissect quite complex policy evolution on the decadal time scale. As with military leadership, there is an uncanny similarity between Boehm's depiction of emergency decision making in small-scale societies and the behavior of participants in the elementary "policy subsystem advocacy coalitions" that are at the core of Sabatier and Jenkins-Smith's model.

The paper raises the central issues of the articulation of individual and group decision making and of genes and culture. What decisions groups will make depends critically on the attitudes and predispositions that people bring to the collective decision-making process. Boehm gives evidence that participants in the three

cases have prosocial inclinations. People seem to be prepared to consider the collective well-being of the group, treat the decision-making process as fair and legitimate, and act according to the results of the collective decision. He alludes to evidence that in other cases cooperative decision making fails, suggesting that there is cultural variation in such attitudes. His proposal that egalitarianism reduced the scope for individual selection while collective decision making enhanced the role of group selection during a long stretch of our evolutionary past is quite plausible. It is also plausible that group-selected cultural rules can drive genetic evolution on such time scales, as theoretical investigations show in the abstract (Richerson and Boyd 1989:214 ff.; Kumm, Laland, and Feldman 1994) and empirical cases such as adult lactose absorption illustrate more concretely (Durham 1991:228 ff.). Batson (1991) reviews a complex series of psychological experiments showing that humans might indeed bring altruistic motivations to a collective decision-making forum.

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Boehm's article makes two important points. First, cultural evolution is not always a matter of blind variation and selective retention but can be directed by adaptive decision-making processes. This point may appear mundane against some intellectual backgrounds (e.g., economics), but it is new and insightful against the background of cultural evolution models, which usually assume that cultural variants arise as arbitrary "mutations" and succeed or fail as the result of their consequences. Boehm's second point is that adaptive decision making is often a group-level process, in which a large proportion of the community discusses the issues and attempts to reach a consensus. Some readers may be surprised at Boehm's sympathetic treatment of group selection, which was rejected by evolutionary biologists as a viable theory during the 1960s. However, the status of group selection is rapidly changing in evolutionary biology, and Boehm's analysis is fully consistent with the emerging view (reviewed by Wilson and Sober 1994; Sober and Wilson 1997).

In this commentary I will expand upon Boehm's theme of human cognition as a group-level process. Cooperation and altruism are usually studied in the context of physical activities such as hunting, predator defense, and aggression. However, cooperation and altruism can also be studied in the context of cognitive activities such as learning, memory, and decision making. For each of these activities, groups of individuals working together in a coordinated fashion might outperform single individuals acting as self-contained units. In fact, the benefits of cognitive cooperation might even surpass the benefits of physical cooperation, since the

former often do not need to be divided (in contrast to food sharing) and the process of coordinated thought does not necessarily require extreme self-sacrifice (in contrast to bravery in battle). For example, everyone can benefit from a good decision, and the mental coordination required to make a good decision as a group need not be costly for any particular member.

Although cognitive cooperation need not be *costly*, it does need to be *coordinated*. Individuals must interact in the right way, just as neurons must interact in the right way for effective cognition to take place at the individual level. For example, decision making is a sequential process that involves the generation, evaluation, and selection of alternatives. When individuals are asked to generate alternative solutions to a problem in psychology experiments, they usually list a very small subset of the possibilities. Groups of individuals can collectively generate many more alternatives than any single individual but only if they do not inhibit each other. Pressures to conform are dysfunctional during the early stages of the decision-making process, although they become essential during the final stages, when a single alternative is chosen. Controlled psychological experiments have shown that better decisions are made when leaders encourage group members to disagree and withhold their own opinions until others have spoken (Anderson and Balzer 1991). Effective leaders do not act as the "brains" for the group but rather moderate the group-level decision-making process (Hogan, Curphy, and Hogan 1994). Overbearing leaders who impose their own decisions merely shrink the effective size of the cognitive unit to $N = 1$, often with disastrous outcomes (Janis 1972, 1982).

I have recently reviewed the psychological literature on group decision making from an evolutionary perspective (Wilson n.d.). Against this background, Boehm's account of decision making in tribal society appears remarkably well-adapted. Especially notable are the absence of overbearing leadership, the freedom and even encouragement to disagree during the early stages of the decision-making process, and the regulation of costs and benefits of alternative behaviors when a consensus cannot be reached. It appears that the problems of exploitation and free-riding that dominate theoretical discussions of cooperation and altruism are largely excluded by the social norms surrounding the decision-making process in tribal societies.

In my opinion, Boehm's paper reveals only the tip of the iceberg of human cognition as a group-level process. In addition to decision making, a similar story can probably be told for memory (Wegner 1986), learning, and other cognitive activities (Hutchins 1995). A single human mind is an impressive organ, but it is feeble compared with a network of human minds that interact in a coordinated fashion. It is fascinating to contemplate that the human mind evolved not only to function as an independent cognitive unit but also to play a role in mental processes that are deeply communal.

Group-level cognition, like the role of decision making in cultural evolution, can appear mundane or novel

depending on one's intellectual background. Our own political and judicial institutions are explicitly designed as group-level decision-making machines, so why should we be surprised to find similar arrangements in tribal societies? At the same time, psychologists and evolutionary biologists have adopted such an individualistic perspective over the past few decades that the concept of a "group mind" appears heretical. Recent developments in evolutionary biology are making group-level adaptations respectable again, and Boehm's paper provides a glimpse of unexplored vistas in the form of group-level cognition.

Reply

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Over time, major shortcomings have become apparent in anthropological attempts to explain the human condition. One is a distortive tendency to overlook the implications of maladaptive behaviors of nonliterate people (see Edgerton 1994), yet we also err in precisely the opposite direction. In streamlining ethnographic presentations for publication, we tend to take the impressive everyday and emergency strategizing achievements of nonliterates for granted. I addressed the latter issue, and the largely very supportive comments reflect the virtues of good ethnography and the interdisciplinary strengths of ethnology but also the crossroads at which our discipline is poised. The above-mentioned problems pose an interesting challenge for those in search of a cure for anthropology's divisive malaise. My suggestion, in an era of methodological introspection, is that studying the cultural microprocesses involved in active coping behavior is a goal worthy of our best efforts and one that could lead to an effective, processually oriented definition of culture and a more useful combination of cultural and biological approaches.

The focus on emergency decisions made it easier to discern the basis of nonliterate people's decisions, but two commentators point to the group decision behavior of literate moderns as a present and future concern. Wilson demonstrates that psychological studies of decisions in modern society are already quite sophisticated and points out that nonliterates have developed some very useful techniques in their consensual approach as they create a constructive interplay between individualistic and communally oriented behaviors. Richerson believes that if the suggested methodology were extended to modern society, with its convenient tendency to document its decisions, this would prove a boon to ethnographic research.

Mithen and Knauft question the overall importance of emergency decisions for nonliterates. Mithen suggests that routinized individual decisions may be the real "stuff of everyday life," while Knauft draws from his

Gebusi experience to suggest that the group's ability to deal with emergencies derives from a continuous mulling over of routine problems. I would agree that routine decisions are basic. The main patterns of culture are surely formed by individual and group decisions that are well-routinized; indeed, virtually every decision is made in the light of previous decision making (Howard and Ortiz 1971). Furthermore, as Richerson suggests, even the emergency decisions I treated may be seen as routinized: the Tikopia had experienced a previous hurricane, while the Mursi had a long-term pattern of feuding, raiding, warfare, and pacification with their neighbors. Furthermore, Meggitt (1977) basically treats Mae Enga warfare decisions as routinized emergencies. I also agree with Knauft that the trust built up during routine problem solving provides a social capital which makes possible smooth collaboration in times of emergency. I believe some terminological improvement is needed, contrasting dimensions such as individual versus group, routine versus novel, and low-stress versus emergency would be useful. However, I focused directly upon collective emergency decisions (not necessarily novel) because of their very significant methodological advantage, because they illustrate so clearly human intentions in action, and because they have the most immediate and discoverable impact on reproductive success. They also may provide a special stimulus to cultural innovation.

Antweiler emphasizes the general benefits of connecting ethnography more directly with evolutionary anthropology and calls attention to Fjellman's (1976a, b) cogent (but difficult to implement) emphasis on "natural decision making." The incorporation of decision data directly into studies of transgenerational change as he suggests might help with difficulties in the substantive study of transmission at the cultural level. However, his call for methodological standardization may not be practical in the short term; I hope that at least a few ethnographers may be inspired to put to use the very potent (and inexpensive) audiovisual technology available today to record nonliterate group decision meetings (be they routine or novel, low-stress or emergency) while such groups still have significant local autonomy. Fortunately, there are still some untapped published data for nonliterates (e.g., Biocca 1970:36–37; Mead 1966:36–44; Boehm 1983; McNabb 1991) and also many rough descriptions in the unpublished field notes of anthropologists which would help us to evaluate nonliterates' decision-making acumen. In this connection Mithen points out that in the case of foragers the widespread anthropological use of optimal foraging theory has resulted in what amounts to an ex post facto testing of their decision-making acumen: actual behaviors have correlated quite well with theoretical predictions. With richer data on the content of decision meetings it should be possible to contrast not just their observed behavior patterns but also their practical choice criteria with those predicted by our theories.

Knauft raises the question of gender. Who contributes to "communal" decisions is obviously important, and

one can safely say that normally children and the mentally retarded or insane tend to be out of the running, but what about females? Problems with the *internal social environment* invite social distancing and manipulative social control, and it is the moral community as a whole that decides who is deviant; women are full participants. With the *natural environment* it is logical that decisions tend to involve men or women to the degree that each sex is involved in the subsistence activities directly at issue; this will differ radically between, say, the Eskimo, where men are so directly active in subsistence, and the Iroquois, where women basically carry subsistence through farming. Problems with the *political environment* usually are debated by men as active warriors, but women may have important decision input as well, as when Yanomamo women encourage their men to go raiding so that other villages will be too intimidated to raid *their* village for women (Chagnon 1983). Further direct study of decisions could help to clarify remaining questions about the division of labor—and power—between males and females.

Mithen explicitly applauds the mentalistic interests of researchers who try to study active indigenous strategizing, while as a cultural anthropologist Knauft sees such realistic strategizing as being of reproductive importance. As a human ethologist Eibl-Eibesfeldt underlines the unique human capacity to share communicatively in strategizing, and he criticizes current tendencies to ignore human interactions under the influence of "blind-watchmaker" models. As a biologist Wilson agrees and suggests that studying cultural guidance of adaptive processes is newer to cultural evolutionists than to economists. Antweiler, a cultural anthropologist, observes that the capacity of nonliterates to make coping decisions at the group level extends back into prehistory, a point well-elaborated by Mithen (1990) as an archeologist.

Basically, my heavily psychological approach was not criticized by this varied group of commentators. In spite of some vehement "antimentalism" in anthropology, there are many cultural materialists who would take indigenous cognitive strategizing into account if only they could access it ethnographically. The challenge is to determine the degree to which nonliterates equipped with brains identical to ours can function as competent systems theorists in problem areas in which absence of formal scientific apparatus does not prevent realistic causal inferences. In this context, I disagree with Kent that I have been vague or inappropriately ethnocentric in evaluating nonliterates' decisions as "realistic" or "rational." If foragers face drought and migrate to a place where water holes tend not to dry up and game is likely to congregate—and if they do so because they are aware of the situation as described and wish to be better-nourished—then their practical action is "realistic" by my commonsense yardstick. Migration is likely to bring material advantages in the real world—as they (and we) perceive such advantages—and the causal reasoning about observable needs of plants, people, and animals for water is also quite similar to ours. If I can understand

their decision debate, I can ascertain that they are not using some radically alternative system of causal reasoning, such as a supernatural one, that happens to prompt similar behavioral results. One reason for the good match between our predictions surely is that people can starve to death as a result of droughts. Foragers have a serious need to be realistic.

One still might argue that foragers are enacting culturally habitual patterns of behavior which are held in place by self-organizing cultural mechanisms—so long as people survive. I explicitly set aside this *teleonomic* aspect of cultural tradition because it is so difficult to study at the level of microprocess, but Eibl-Eibesfeldt and others have mentioned it. On the basis of tradition, the apparently useful taboos cited by Kent may be held in place “automatically,” and Durham (1991) has developed a detailed hypothesis about West African taboos on yam consumption as an unrealized mechanism that ameliorates cell-sickling effects. The advantage of studying decisions directly and in detail is that we can at least begin to describe the deliberately organized, *guided* phase of cultural process, identify indigenous practical reason in action, and evaluate its realistic effects. Supernatural reasoning does have its place, even in the formation and execution of realistically conceived decisions. To survive and prosper, the Mursi certainly had to understand their rather complicated problems on a realistic basis—but then the priest had to bless their military expedition. With all these considerations in mind, I think it is ethnologically useful to “apply Western views of what is or is not ‘realistic’ or ‘rational’ to non-Western societies,” particularly when it comes to emergency decisions that clearly involve serious threats to reproductive success.

Mithen agrees that hunter-gatherers are “realists” with a profound (realistic) understanding of cultural ecology and suggests that nonliterates themselves have no problem about the distinction between “realistic” and “supernatural”; they mix their methods very nicely. He also points out a problem with my analysis: I do not deal with the unintended consequences of decisions. I dodged that bullet here but have covered it previously (Boehm 1978). I suggest that as decision making continues over time, trials are made and errors corrected if possible; unintended consequences are one important type of “error.”

Anthropologists appear to be increasingly open to taking into account the intentions of nonliterates (e.g., MacLaughlan 1983; Boehm 1983, 1986; Mithen 1989, 1990; Durham 1991), and I hope that the methodology presented will stimulate further attempts. However, an obstacle to bringing human intentions into human behavioral ecology has been the enthusiastic and productive anthropological cannibalization of self-organizing biological models. Indeed, it is biologists interested in culture as a process who have come up with not only “memes” (Dawkins 1976; see also Durham 1991) but, more apt, “culturgens” (Lumsden and Wilson 1981). From other “outsiders” there are dual-inheritance models that relate the mechanisms of cultural and natural

selection (Richerson and Boyd 1985) and empirically tested models of cultural transmission (Cavalli-Sforza and Feldman 1984). It is our job as ethnographers to discern what, if any, basic “units” of culture may be present on the ground and as ethnologists to define culture. The attempt to describe the fuzzily bounded, changeable cultural “elements” involved in decision debates was a preliminary effort in these directions, and it is gratifying that Eibl-Eibesfeldt and Mithen agree the meme is not a very useful concept while no one objects to my preliminary treatment of cultural “elements.”

Kent overlooks my criticism of overly rigid extensions of biological concepts to accuse me—in effect—of doing very much what I was attacking. Her argument is not entirely clear to me, but it seems to be that genes don’t behave like people or people like genes and this is an obstacle to drawing analogies between biological and cultural evolution. It has been cultural anthropologists who set culture off by itself, overlooking the fact that people (and also groups) are the *vehicles* which carry genes, that the reproductive fates of individuals and the demographic fates of groups govern the frequencies of genes in a gene pool, and that we depend on genes which channel our behavioral potential in certain directions such as hunger and sociality. Thus, we are speaking of an interlocking set of processes and not a mere “analogy.” Given our tremendous anthropological difficulties with trying to study cultural stability and change, I have found it natural to look for cues in the already well-understood process of genetic variation and selective retention and to search for forces that select or eliminate aspects of culture. Human choice is a prominent selective agency, and in explaining its action it is reasonable to get theoretical help from any quarter that seems promising. Indeed, it may well be our reluctance to make analogical connections with biology that has prevented our getting a better general purchase on “culture” as anthropology’s key concept. Kent’s difficulties with my interpretation of “egalitarianism” seem to be generic, so I shall simply point out that what I mean by “egalitarianism” is a political situation in which the subordinates remain firmly in control and are guided by an egalitarian ethos; this can be applied to various types of society (see Boehm 1993, 1994). If Kent thinks I was including Tikopia as a typical egalitarian society she has seriously misread my argument, but the Tikopians *did* use public assemblies to debate their possibilities and make decisions.

Kent’s criticisms aside, members of this “panel” of anthropologists and biologists who share an interest in culture as a process seems to agree that culture, with its strong intentional component, must be studied on its own terms—even though analogies from biology may be useful. The circle of anthropologists willing to engage in such discourse about human behavior and its organization appears to be growing, and this may be propitious for a discipline which—I quite agree with Kent—is facing an identity crisis. The crisis has many causes, but one may be the past half-century’s tendency toward “fashions” that have made the growth of explanatory

power in cultural anthropology rather sporadic. Close investigation of the guided aspect of cultural problem-solving process may provide anthropological theory building with a chance to regain its holistic vitality and also a possibility for more *cumulative* growth in explanatory power.

With respect to paleoanthropological implications, Knauf and Antweiler seem to agree that extant foragers' decisions can be projected backwards, a position that Mithen (1990) is already on record as favoring, and Knauf agrees that such group decisions had implications for *group selection*. Not everyone addresses this anthropologically controversial issue, but Wilson—as biology's foremost and most insistent advocate of that particular heresy—is predictably favorable. He correctly points out that something like a substantial paradigm shift may be in the works in his own discipline and concentrates here on the psychology of decision making (advantages go to groups over individuals) and the nuances of group decision process as studied in modern society. He points out major similarities between the decision-making dynamics of modern decision groups (those found to operate most effectively) and the behavior of egalitarian nonliterate in their councils. In an era of methodological individualism, Wilson's thoughts on "group mind" are refreshing. I believe that a small dose of "methodological collectivism" would do anthropology some real good—if the emphasis were placed directly on cohesive, cooperative, action-oriented groups and how they try to cope directly with common problems.

Richerson's substantive forays into group selection theory have been primarily at the level of *cultural* group selection and specifically warfare as a factor that raises group extinction rates (Soltis, Boyd, and Richerson 1995; see also Boyd and Richerson 1991). By contrast, I have focused on the intentional selection of behavioral strategies and the long-term effects of group decisions on basic Darwinian selection mechanisms. Richerson deems plausible my hypothesis that the egalitarian approach to life reduced the power of individual selection and at the same time enhanced group effects. To paraphrase Richerson, this means that egalitarian cultural patterns arrived at by forager groups could have affected natural-selection mechanics over the long run; Knauf concurs. The effect was to promote group selection and provide a better basis for explaining altruistic and cooperative behaviors.

I must treat separately Kent's favorable comment that "Boehm presents a compelling argument against using individual selection as the basis of cultural evolution." My argument was not against the uses of inclusive-fitness theory—a very powerful theory indeed, and one that is relevant to cultural selection through decisions made at the family and individual levels. My argument was that sometimes group selection theory is more appropriate and that group effects have been seriously underestimated. My assumption is that inclusive fitness remains the more powerful level of selection but that group effects may be strong enough to support altruistic

traits if they are not too costly. This has implications for human nature itself, for it provides a selection basis for genuine (as opposed to socially enforced) altruism.

Eibl-Eibesfeldt emphasizes parental investment, which makes families very important as vehicles of selection (see also Wilson and Sober 1994). For example, when a forager band temporarily atomizes in the face of hardship, its individual families formulate their own varying strategies. Eibl-Eibesfeldt also suggests that certain altruistic behaviors may be extensions of maternal or paternal behaviors that have worked well reproductively at the family level and are extended to the group. This directly parallels my own analysis of altruistic conflict interventions in nonhuman primates (Boehm 1981), and Eibl-Eibesfeldt is correct in suggesting that in humans ideologies and symbolic identification greatly intensify such extensions of parental behavior from close kin to the entire group. This "pleiotropic" type of argument offers yet another avenue for explaining altruism (see Boehm 1996).

This discussion has focused on an empirical processual analysis of decisions made by nonliterate groups but also on a number of theoretical ramifications. I argued for a methodology that could provide important leverage in getting at culture as a microprocess, using group decisions as a "natural laboratory." The comments, while diverse, seemed quite favorable to such an enterprise and to extending it to less stressful small-group decisions, including those in modern society. By extrapolating the findings to prehistory I have made a case for group selection's operating more robustly with humans than is currently thought to be possible, and I am gratified that this position was attacked by none and supported by some.

The discussion suggests that the methodology underlying the arguments I have made is sound and that there is continuing interest in the study of cultural-selection mechanics in their teleological aspect. I am convinced that in the future traditional theoretical and methodological biases need not obscure from us the problem-solving accomplishments of nonliterate, as well as their sometimes grievous adaptive missteps. With respect to ethnology and its more integrated and cumulative future, I hope that whatever mileage has been gained here from putting decision processes under an ethnographic microscope may interest other anthropologists in actively exploring research possibilities in this direction.

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