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Power, Fairness, and Architecture: Modeling Early Chiefdom Development in the Central Andes

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ABSTRACT

This chapter models the development of complex architecture in simple chiefly societies in the Central Andes. We employ a theoretical framework that draws from evolutionary game theory, economic anthropology, evolutionary psychology, and comparative behavioral science. In this theoretical framework, the evolution of culture equates with the evolution of human cooperation in ever-larger groups. As "conditional cooperators," humans will create complex labor organizations under the appropriate conditions. Taking into account recent research in evolutionary game theory, we demonstrate how these conditions were met for the first time on the Peruvian coast and then spread to the highlands using examples from both the coast and the altiplano.

Keywords: **chiefdoms, cultural evolution, early architecture, Late Preceramic Period, Initial Period**

For several millennia, people lived in the central Andes as nonagriculturalists in small, politically egalitarian groups. Sometime at the beginning of the third millennium B.C.E. and throughout the second, a few groups on the Peruvian coast started to build permanent, centrally located corporate architecture in their communities.[1] Corporate architecture is that which is built and designed to be used and seen by the community as a whole (Moseley 1975).[2] In contrast to many of the architectural constructions in later state societies, corporate architecture is not designed for the exclusive use of a subgroup of people in a society (Flannery 1998). Rather, flat-topped pyramids, open plazas, and the like were designed to accommodate the entire community and to be seen and used by all members of the villages in which they were built.

From a long historical perspective, the relatively rapid emergence of corporate architecture demands explanation for a variety of reasons. First, there is no evolutionary biological explanation that can account for this phenomenon. The people of the tenth millennium B.C.E. were not intellectually or biologically different from those in the early third millennium B.C.E. The development of corporate architecture is a cultural phenomenon that must be explained in cultural terms. Second, once corporate architecture emerged, it spread rapidly over a large area in both the coastal areas and the highlands. In many cases, within perhaps a generation or in their living memory, people incorporated corporate architecture and adopted the cultural concomitants that went along with it. Third, there is a clear correlation between the emergence of corporate architecture and evidence of a more complex form of sociopolitical organization. Finally, and perhaps most important, this process occurred independently around the world in many places and among widely different cultures.

In this chapter, we refer to nonegalitarian, nonstate societies as chiefdoms, encompassing a number of other terms such as "bigman" societies, simple chiefdoms, nonstate ranked societies, intermediate societies, and so forth. In

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this sense, we partially agree with Hayden (1995), who categorizes transegalitarian societies as those between egalitarian and stratified ones in terms of sociopolitical complexity.[3] Definitions of chiefdoms vary, depending on whether one uses regional political organization or internal social rank as the primary variable. We base our definition of chiefdoms on the existence of an institutionalized group of leaders who exist at the behest of the group. In this sense, the power of chiefs is persuasive; there does not exist the capacity of elite to control, through force, the rest of society. Rather, the defining characteristic of a chiefdom is that the position of the elite is dependent on the capacity of that elite to persuade people to work together in a cooperative group that they perceive as in their own interest. States or stratified societies arise when persuasive power is converted into coercive power.

We argue that the emergence of corporate architecture is causally linked with the emergence of simple ranked society. Corporate architecture is one of the principal means through which power is exercised in simple chiefly societies such as those found in third millennium B.C.E. Peru. We maintain that the key to chiefdom emergence is exercise of persuasive power by a managerial elite that can keep a specialized labor organization working together.[4] Power, corporate architecture, and chiefly society represent causally interlinked phenomena that help explain the emergence of complex society in the Peruvian central Andes in the late third millennium B.C.E.

Our approach assumes that there is a particular "evolved psychology" with which some cultural practices resonate better than others. In particular, we focus on theory that suggests that humans are "conditional cooperators"—that is, humans will create evolutionarily stable and complex social arrangements under the appropriate material and cultural conditions of life. These social arrangements involve the negotiation between adaptive agents for material and nonmaterial needs and wants. As such, this approach privileges economics, understood in its broadest sense, as one of the key elements in modeling cultural evolution.

Thus, we believe that insights from economic anthropology, game theory, and experimental behavioral science provide insight for addressing the anthropological problem of chiefdom emergence. With this approach, we try to define the conditions that give rise to cooperation in politically autonomous family units in noncoercive contexts (before state societies). The development of permanently cooperative groups, in game theoretic terms, is equivalent to the evolution of ranked society in archaeological terms. We focus on how ideology and psychological dispositions interact to make large systems of reciprocal exchange possible. Emergent leaders can pull together larger groups of people to create permanent complex labor organizations. These organizations can produce much greater surplus per capita than that from individual households working in isolation. However, given the strong propensities for behaviors that can threaten cooperation (e.g., free riding, envy, or spiteful punishment) in such contexts, elites must create the conditions in which norms of "fairness" are rigidly and visibly followed. Adherence to these norms, by both leaders and followers, is an essential component to the success of any strategy of power in such a social context.

We assume that the architecture constructed by a group reflects the social and political context in which it is built. We also believe that the archaeological and ethnographic record reveals broad patterns of architectural change around the world (e.g., see Flannery 1998 and especially 2002). These patterns reflect shifting sociopolitical and economic relationships that parallel the shift from politically egalitarian to ranked societies. We draw on recent theoretical and empirical work in economic anthropology, game theory, and experimental behavioral science to model this shift. From our theoretical perspective, corporate architecture in nonstate contexts is the material manifestation of one component of the power strategies utilized in creating complex labor organizations. This architecture, we argue, is intentionally designed to foster ideologies of reciprocity and fairness, thereby serving to keep complex labor organizations functioning. Power, architecture, and chief-driven community labor organization are codeterminative and central to the origins of complex society.

Game Theory, Evolutionary Game Theory, and Anthropological Archaeology

Game theory remains the mainstay of most economic modeling. It assumes that people make strategic decisions in their own self-interest, that they are rational, and that they have access to a full suite of information. Classical game theory studies human interactions as two or more people compete for economic resources or some other social advantage. A game is a controlled experiment in which each player has control over his or her actions. Players adopt strategies to achieve a positive "payoff." Strategies are courses of actions and reactions to the parameters of the game and to other players' actions designed to maximize a player's payoff. Payoff is the result to the individuals of the game.

Game theory was originally confined to actors who were "rational" in the classic economic sense. That is, actors were assumed to have "unlimited information processing capacity" (Gintis 2000:xxiii). Where applicable, game theory provides for powerful predictions of human behavior in the very short term. However, real life is substantially more complex

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than allowed for in the assumptions that underlie classical game theory. As a result, new means of modeling human interaction have been refined and modified to better reflect actual social life.

A key assumption that has been challenged is the notion of economic rationality. As Michele Biggi and others have argued, there is a large body of "empirical evidence suggesting that real life situations rarely unfold in the non-cooperative way predicted by Game Theory" (Biggi n.d.). As a result, game theory has been modified by what is referred to as evolutionary game theory. To quote Biggi again, the major implication for historical research is that "evolutionary forces might have shaped our social nature so as to make us more cooperative than what is postulated by Game Theory" (n.d.). In effect, evolutionary game theory developed as a merger of biology and economics and made the assumption of rationality irrelevant (Gintis 2000:xxiii).

From this perspective, people are not rational in the classic economic sense. They are "adaptive" given the knowledge that they possess. People alter their behaviors over time based on an assessment of what has been effective or not in their memory. Adaptive individuals are "smart" individuals. As anthropologists, we know that there is usually more than one rational outcome to any social interaction, and people are capable of altering their strategies in response to new conditions, both cultural and natural. Cultural norms also alter the cost-benefit calculation of any strategy in any society. This observation is a cornerstone of cultural anthropology and, as we will see, is easily incorporated into the adaptive model presented below.

Evolutionary game theory can take these modifications into account and provide data on human behavior through the use of experimental games. There are three major categories of games. One is that of zero-sum games, in which the payoff to one or more players results in an equivalent loss to other players. These involve a "limited pie" situation in which what is advantageous to some is equivalently disadvantageous to others. A second kind comprises constant-sum games. In this instance, players compete for a finite amount of resources where losses and gains may not be equivalent. The third type is nonconstant-sum games, in which the payoff depends on the strategies used by the players. Crosscutting these three types are two other categories of games. Cooperative games are those in which players benefit by cooperating, and non-cooperative ones are those that preclude cooperation. Although these latter two categories may superficially appear to be self-evident, the theoretical implications of this distinction are enormous, particularly when the games are repeated numerous times. Additional modifications of the games include adding coalitions such that people can form groups to compete against each other, not providing complete information to all players, beginning games with unequal initial conditions, iterating or repeating the games over time such that players develop personalities, and so forth. Therefore, evolutionary game theory provides much more complexity to the experiments and adds a historical dimension. Taken in their totality, these modifications help approximate real-life social interactions. Thus, this work allows us to model how a population of self-interested and cognizant actors will change strategies over time.

In short, classical economics assumed utility-maximizing rationality and perfect information. Developments in evolutionary game theory take seriously the more realistic social contexts and information access and processing capacities of humans. Humans have an evolutionary history in family and larger social groups in which interactions in these groups between relatives or repeat partners provided payoffs to cooperation. Human decision-making and behavior have evolved to be adaptive in the broad sense, such that individuals pursue strategies that have personal payoffs, within the constraints of the sociocultural context and information available to them. Focusing on this last bit allows us to foreshadow nicely the point that, given that cooperation can be a profitable strategy for groups of individuals who interact repeatedly and find a way to avoid exploitation, the quality and breadth of information that individuals have about the nature of the cooperative context and the behavior of other individuals who may be participating is likely to be a fundamental determinant of the success or failure of any given cooperative system.

The goal for archaeological theory is to explain how a creature that recognizes the personal payoffs of cooperation—in non-zero-sum games—can create contexts in which cooperative systems can be sustained without exploitation strategies causing things to collapse. The evolution of such cooperation among family groups is essentially the evolution of ranked or simple chiefly societies as articulated by a generation of neoevolutionary theorists.

Power

The concept of power remains widely defined throughout the anthropological literature and is essential to archaeological theory. Indeed, Michael Mann opens his now-canonical work with the argument that "a history and theory of power relations…[is] virtually synonymous with a history and theory of human society" (1986:1). For Allen Johnson and Timothy Earle (2000:134) power resides in the ability of elites to control access to labor, goods, and resources. In such political economic models, power simply defined is the

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ability to influence or control others for a leader's economic and social gain (Earle 1997:3; Mann 1986). Power derives from a number of sources—ideological, material, social, and so forth—but ultimately it is measured in terms of economic control and social status.

Power is defined here as the ability of a person or group to coerce or persuade other people or groups to behave in ways that they otherwise would not in the absence of that coercion or persuasion. This broad definition of power does not imply that the new behavior is either positive or negative for either the person or group in power or those who alter their behavior. Likewise, power need not be explicitly coercive. Rather, power can be manifest in many ways. It is critical to restate the anthropological understanding that the nature of power must be understood in its social context—it is not a constant throughout history and society.

The distinction between coercive and persuasive power is not as simple as it first appears. Of course, there is the most blatant kind of coercive policing power exercised in state societies. However, as anthropology teaches us, most kinds of social coercion are much less obvious. Ideologies of power, for instance, permeate many levels in complex societies. These ideologies act to inculcate social hierarchies in both elite and nonelite alike. Many social constraints act to mold people's behavior as well. Likewise, persuasive power implies that individuals who alter their behavior at the behest of others do so voluntarily. In a number of cases this is indeed the case. However, there are numerous social contexts in which the distinction between persuasion and coercion is not clear. It is best to view these two categories as opposites on a continuum. In state societies, power is virtually synonymous with coercion, both direct and indirect. In nonstate societies, in contrast, we argue that social power by an elite is largely persuasive, executed in a competitive environment in which the elite has to compete for followers and posture against other elites to maintain that power. We base this on both theoretical grounds and empirical observations.

It is important to emphasize that conflict between chiefly societies is a widespread phenomenon. The existence of conflict *between* societies does not in any way imply coercive organizational mechanisms *within* a society. Rather, the organizing of a raiding party is an example of a cooperative labor organization that provides a huge payoff for all who successfully participate. Internally, it is the group, mediated through a chief, that organizes the raiding party. Participation is largely voluntary. The exercise of force against others does not alter the internal social relationships within that society.

Early architecture in the Andes represents a manifestation of some kind of persuasive power that forged the long-term cooperation between economically self-sufficient households. The corporate constructions were too large and complex to be built by domestic units alone. Therefore, some kind of cooperation between households was necessary to create these buildings. The questions to be asked are, what was the kind of power manifest in maintaining the cooperative labor organizations to build these constructions and how was that power used to create these complex architectural features? Another way to ask these questions is, why and how did complex society develop in the central Andes and create sufficient levels of supra-household cooperation to construct and maintain these buildings?

Surplus, Power, and Hierarchy: Why Do People Cooperate?

Economic surplus is central to the evolution of complex political economies. As a number of the classic evolutionary archaeologists and anthropologists have pointed out, surplus production is intimately linked to the development of complex society. Ethnography is very clear on this point: corporate architecture of the kind seen between the third and late second millennia B.C.E. is not built without some kind of economic surplus production beyond the household. The vast majority of hunter-gatherer societies do not build such architecture, even though the people are physically capable of such constructions. It occurs only in a context in which surplus is naturally available (e.g., complex hunter-gatherers such as the Chumash, Calusa, and others) or where settled village societies create surplus beyond household needs. While it is theoretically possible that a single extended household and its descendants could build such constructions, such behavior is virtually nonexistent in the historical and ethnographic record. Cooperation of a number of families over an extended period of time is necessary. Cooperation of this type—beyond the household—requires some kind of persuasive or coercive social mechanism.

Surplus and rank are therefore at the very least correlative, if not codeterminative. How this process of surplus production and rank emergence occurs in societies in which each social unit of production and consumption was more or less equal is one of the primary questions of anthropological archaeology. Over the past few decades, there have been a number of theoretical frameworks to explain this phenomenon, most notably cultural ecology and other functionalist models (see Feinman 2000 for a review).

Cultural ecology is a powerful way to explain broad patterns in prehistory. However, some of us who view

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ourselves as comparative social scientists have become dissatisfied with selectionist theory that cannot incorporate human agency into evolutionary models. We do not want to give up the "process" or the evolution in processual archaeology, but we do want to incorporate the variable of human choice into such models (e.g., see Flannery 1995). A model that incorporates human decision-making is agent-based, reducing causality to the level of individual choices based upon perceived costs and benefits. We contend that such an agent-based approach not only is *not* inconsistent with an evolutionary model but in fact is the theoretical underpinning for a new generation of cultural evolutionary theory.

The major problem in the history of archaeological theory has been the belief that any agent-based theory would inevitably become historically contingent and nonprocessual. Game theory and evolutionary game theory, as described above, overcome this problem. As "smart," adaptive, and cognizant beings, people can invent new behaviors in the face of social and physical challenges and emulate successful strategies for obtaining goals that they want and need. We endorse the view that humans have a psychology adapted to living in potentially cooperative social groups and that this psychology causes their behavior to deviate from purely self-interested behavior in the classic economic sense, but that behavior must nonetheless be rational under some set of assumptions about the actual structure of the social context. We will cite evidence from experimental studies that reveals contingently cooperative and punitive behavior that appears "irrational" by classical economic game theory standards but that reflects a psychology that makes cooperative systems possible in real social groups as well as in stylized laboratory contexts.

Perhaps one of the most exciting discoveries in evolutionary game theory is that complexity (rank, for comparative social scientists) can emerge in a group of individual actors behaving in their own self-interest under the right conditions. Other theories argue that because of a selective history in which cooperative behavior could have positive fitness consequences under certain conditions, humans are predisposed to be cooperative in particular contexts and may seek out cooperative opportunities. These perspectives provide stunning implications for modeling the origins of rank for archaeologists. That is, humans will create cooperative organizations, including hierarchies, under the appropriate external and social conditions.

These implications are stunning because most selectionist and functionalist theory assumes that the development of rank carries a significant cost to the nonelite and that rank would not develop unless those nonelite were forced by circumstances or other people to accept conditions of social inequality. The adoption of higher levels of sociopolitical complexity by a group is therefore viewed as a necessary adaptation for the group, but also one that entails social and economic costs to the nonelite.

While this (i.e., costs to nonelite) is true in state societies where coercive powers are accumulated by an elite class, it is not true for nonstate simple chiefdoms or bigman societies. Ethnography teaches us that in these instances it is actually the group that encourages and permits the existence of social rank markers, as long as that status does not interfere in their household economy or social life. That is, in simple ranked societies, people create and permit hierarchies only insofar as these serve their interests. Appropriate examples here are simple chiefdoms (bigman societies, in other terminologies) such as the Tikopia (Firth 1963, 1967), Maori (Firth 1929, 1965), Trobriand Islanders (Malinowski 1966), and Kwakiutl (Boas 1966), among others. (In states, in contrast, these political structures are co-opted by an elite that institutionalizes coercive power, a theoretical issue for another paper.)

For selectionist and functionalist theory, this is counterintuitive. Sahlins (1972:82) articulates the classic anthropological position regarding the creation of surplus. He argues that there are only two ways to create the increased production necessary for surplus: you have to get either "people to work more or more people to work." Both of these choices assume that people would not voluntarily give up economic and political autonomy. In this logic, complexity (hierarchy) could only develop if the bulk of individuals in any society were compelled to act against their own self-interest (economic autonomy) and accept higher levels of sociopolitical integration. Coercive theories of cultural evolution, from either internal or external factors, were the only viable ones under the theoretical constraint presented by the problems of human will and self-interest.

We argue that this position, from an economic anthropological analysis, is wrong. The creation of surplus does not require more work from the same group of people, nor does it require more people to work (although these strategies work as well, but they are highly unstable and are rarely maintained in nonstate contexts). Rather, it simply requires people to work differently—in specialized labor organizations. These specialized labor organizations require some kind of coordination and leadership created and fostered by the entire group. The economics of this process are rather simple: rudimentary economies of scale and economic efficiencies from specialized production create substantially more surplus per capita from the same amount of labor than can be created from household-level production alone (Stanish 2003, 2004). Groups that adopt these more complex labor organizations will produce more surplus than egalitarian

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organizations and, over time, will tend to dominate the cultural landscape in any one area.

The Problem of Cooperation

As defined here, the development of simple chiefly societies out of politically egalitarian groups can be restated in evolutionary game theory terms as the evolution of more complex cooperative groups. By complexity we mean that these groups are larger in the number of people interacting on a regular basis and are characterized by greater levels of task specialization by those individuals. Explaining the large-scale cooperation necessary for complex labor organizations in chiefly societies represents a fundamental challenge to social scientists. Researchers and theorists in evolutionary psychology, evolutionary anthropology, and economics have devoted considerable attention to this topic. Unlike more traditional theories that posit environmental circumscription, forced participation by elites, or other coercive elements, current approaches in these fields largely assume that participation in potentially cooperative interactions results from the voluntary decisions of participants. We believe that this is the appropriate perspective for shedding light on the appearance of large-scale social systems and related public architecture in the archaeological record.

These approaches have two main goals: (1) identifying the behavioral preferences of individuals in potentially cooperative situations and (2) investigating the developmental processes and evolutionary conditions that allow cooperative behavioral strategies to have fitness payoffs that allow them to increase in frequency in a population.

Approaches that treat individuals as self-interested agents assume that something makes voluntary cooperative behavior more profitable for individuals (or groups) than noncooperative behavior. If humans working together are able to achieve payoffs that exceed the costs of contributions to the cooperative effort, and that are greater than what is possible working independently, then cooperation can pay for self-interested individuals (making coercive elements unnecessary). Indeed, the majority of subjects in potentially cooperative behavioral economics games show a willingness to behave cooperatively when doing so can have higher payoffs than uncooperative behavior (Andreoni 1995; Fischbacher et al. 2001). However, while the payoffs to the group as a whole may be greater when individuals behave cooperatively, in many situations each individual may have an interest in withholding contributions when it is possible to receive the benefits of a collective action without personally incurring the costs of participation. So, even if cooperation can be profitable for a group as a whole, if each potential cooperator were to follow the self-interested logic of free riding on the efforts of others, any cooperative system would break down. Thus, since cooperation may benefit the group at a cost to the individual, cooperation in the context of public goods is altruistic and the puzzle of large-scale cooperation essentially reduces to the biologist's or game theoretician's problem of altruism.

The above logic illustrates why accounts that depend on factors like environmental circumscription do not solve the problem of cooperation, since free riders can cause a cooperative system to break down, even in the face of greater payoffs for joint cooperation or the apparent necessity of teamwork. Environmental pressures may lead to conditions under which collective efforts are the only way to achieve particular fitness-relevant goals, but they do not solve the problem of cooperation itself. For example, in Chinimpi, Ecuador, one of us (KJH) observed the failure of a cooperative cane-sugar processing operation, despite perceptions among villagers about the absolute importance of local economic development. The ethnographic and historical record of chiefly societies is likewise replete with cases in which chiefs lose power as their factions dissolve, in spite of the fact that cooperation would benefit the group as a whole (e.g., see Andersen 1994 for the historical period U.S. Southeast; Petersen 1982 for Micronesia; and Byock 2001 for the case of state "devolution" to chiefdoms in Iceland, to name a few). The phenomenon of political cycling in chiefdoms and archaic states is well established in the literature (e.g., Andersen 1994; Marcus 1993, 1998) and is directly attributable to factional competition and the organizational breakdown of complex cooperative units.

It is virtually an anthropological truism that cooperative groups are unstable and require either coercion, as seen in states, or other forms of persuasive measures to be sustained. More formally, subjects that demonstrate eagerness to willingly cooperate when it is profitable for the group appear to quickly discontinue cooperative strategies in response to evidence that others are shirking or trying to take advantage of them. In game theory terms, they are *conditional* cooperators (see Andreoni 1995).

Thus, the existence of self-interested shirkers who free ride on the cooperative efforts of other individuals (or, in other terms, the economic rationality of such selfish strategies) appears to be the real stumbling block to sustaining cooperative systems. Indeed, casual observations of real-life events illustrate that not all individuals conform equally to cooperative and charitable group norms or contribute equally to community projects. Data from behavioral economics games consistently reveal that some 20 to 30 percent of individuals play selfishly in potentially cooperative situations (see Fischbacher et al. 2001). How then can cooperation ever be sustained?

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Recently, theorists have turned their attention to the role that punishment might play in changing payoff incentives for those who might free ride on the cooperation of others. Both experimental data and theoretical models suggest the importance of punishment as a way to stabilize cooperative systems of social interaction (Fehr and Gächter 2002; Henrich and Boyd 2001; Richerson and Boyd 1998; Yamagishi and Sato 1986). For example, in behavioral economics games in which subjects have an opportunity to behave either generously/cooperatively or selfishly, cooperative behavior increases when opportunities for other subjects to punish low contributors are made available as part of the game (Andreoni et al. 2003; Fehr and Gächter 2002), and some subjects cite the anticipation of angry reactions (presumably related to punishment behaviors) as an incentive for playing cooperatively (Fehr and Gächter 2000). Other subjects in such games demonstrate a willingness to incur costs to punish individuals who fail to cooperate (Andreoni 1995; Bosman et al. n.d.; Fehr and Gächter 2000; Yamagishi and Sato 1986). In addition to motivating would-be free riders to behave cooperatively, punishment can promote cooperation more indirectly. While evidence of free riders appears to lead many otherwise cooperative subjects to cease cooperative play when punishment is unavailable in economic games (Andreoni 1995; see also Schnake 1991), other studies have shown that the visible existence of punishment appears to "boost the morale" of potentially cooperative participants and ameliorate the effects caused by perceptions of the existence of exploitative individuals (Schnake and Dumler 1991).

Thus, punishment appears to allow self-interested individuals to achieve the cooperative outcomes that provide greater benefits than working independently. However, punishment as a solution to the problem of cooperation simply pushes the explanation back a step. This is because punishment itself can be a form of public good—and hence altruistic—since individuals who punish incur a cost (it is typically assumed), yet nonpunishing individuals bear none of the costs of punishing while enjoying the benefits of increased cooperation that result from the efforts of punishers. Thus, if each individual in an otherwise cooperative group shirks on the costs of enforcing cooperation, nothing prevents the exploitation that leads to the subsequent collapse of a cooperative enterprise.

Reputation as a Way to Solve Higher-Order Free-Rider Problems

To avoid the problems associated with higher-order free riders, theorists have proposed a number of potential solutions that allow cooperation to be maintained as a profitable strategy. Explanations of the selective processes that may have operated to design human prosocial behavior—including punitive behavior—and related motivational mechanisms have tended to be of two types. First, individual-level selection approaches focus on psychological mechanisms crafted by natural selection in a world of reciprocity, reputation, and signaling in social settings where the dissemination of information about behavior is widespread and has indirect effects on individual fitness[5] (see Alexander 1987; Panchanathan and Boyd n.d.; Trivers 1971; see also Boyd and Richerson 1992; Fessler and Haley 2003; Gintis et al. 2001 for an extension of these ideas to the case of punishment). Second, group selection approaches focus on some form of group selection process (genetic or cultural) that selected for prosocial behavior and related motivational mechanisms without reliance on instrumental factors (see Gintis et al. 2003; Henrich and Boyd 2001; Sober and Wilson 1998). At some level, these approaches are not incompatible and both individual-level selective processes and group-level ones have likely worked together in shaping the cooperative and "moral" systems of human social groups. A full treatment of the theoretical issues and the relative merits of each of these positions is beyond the goals of this chapter. Instead, we find that a focus on recent theoretical and empirical work investigating the role that "reputational" factors—information about others' behavior—may play in sustaining cooperation allows us to consider how these processes may have worked together to shape cooperative systems, the correlates of which are visible in the archaeological record.

A number of theoretical models of cooperation deal with free-rider problems in groups by assuming that punishment can be costless when it takes the form of avoidance or passive ostracism. In such "indirect reciprocity" models, information about the behavior of others (reputation) is visible to individuals who use it to make decisions about future interactions with one another (see Nowak and Sigmund 1998; Panchanathan and Boyd n.d.; Sigmund et al. 2001). Indeed, a significant body of empirical research demonstrates that reputational factors and the visibility of one's behavior appear to play a major role in motivating cooperative behavior, without the need for formal costly sanctions (Andreoni and Petrie n.d.; Milinski et al. 2002).

While indirect punishment such as avoidance may play a role in maintaining cooperative systems, the assumption of costless punishment may not hold in all contexts. Moreover, there is good experimental evidence demonstrating that individuals are willing to punish uncooperative individuals at a cost to themselves in experimental economics games, even when doing so does not provide optimal payoffs within the parameters of the situation (Andreoni 1995; Fehr and

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Gächter 2000, 2002). While the interpretation of such behavior in stylized contexts complicates our efforts to account for costly punishment that stabilizes cooperation, reputational factors may play a role in motivating costly punishment as well. Recent theoretical work shows that contribution to a collective action (which could be costly, collective punishment) can be sustained by reputations when information about the behavior of individuals in a social network is broadcast to others (Panchanathan and Boyd n.d.). Empirical evidence suggests that reputation management may underlie, in part, the moralistic and punitive reactions of individuals who respond to norm violations.

While a large body of evidence demonstrates that increased publicity and information exchange can allow reciprocal and cooperative systems to be maintained, such results apply most reasonably to small groups of individuals, since they depend on the extent to which individuals have ready access to information about the likely behavior of other potential cooperators. The remaining question, then, involves how to take a psychology for cooperation in small groups in which reciprocity and reputation sustain cooperative behavior and ratchet up to a large system with hundreds or thousands of unrelated participants. While we do not appeal to group selection to account for the basis of cooperative psychology in general, we do endorse a cultural group selection account to explain the existence of large-scale cooperative systems. That is, institutional practices that allow large-scale systems of reciprocity or cooperation to function efficiently by tapping into and resonating with a reputation-and-reciprocity-based social psychology will allow some groups to be more productive and to more effectively reproduce their cultural systems (see Richerson and Boyd 1998 for a discussion of how "cultural work arounds" can allow large institutions to function efficiently).

We argue that large-scale public architecture and related ritual practices represented cultural innovations that did in fact effectively tap into human cooperative psychology by allowing the efficient broadcasting of information about participants' behavior and by allowing greater opportunities to demonstrate to a large audience of potentially willing cooperators (conditional cooperators) that a reciprocity system was operating according to local norms of fairness and free-rider punishment, thus making possible large and productive systems of reciprocity and labor organization.

Chiefdoms and Game Theory

Chiefdoms represent a controversial concept in anthropology. With its evolutionary pedigree, the term has been misused and misunderstood for two generations. In modern neoevolutionary thought, the notions of progress, teleology, and unilinealism have been essentially removed for well over 20 years even though untutored critics continue to offer anachronistic straw-man arguments against this tradition (e.g., see Feinman 2000 for a nuanced discussion of these issues). Chiefdoms are not the inevitable result of an inherent process of a cultural unfolding. Rather, the term refers to a kind of organization seen in the ethnographic and archaeological record that has great utility for comparative analysis (Earle 1987 and see Earle 1991 for an example of the comparative use of the concept).

The chiefdom concept is one that helps us define a specific type of political and economic organization in space and time. Such typological concepts are absolutely necessary for any comparative analysis and must be the basis of any scientific anthropology. There is not one "correct" definition of chiefdom, just as there is no correct definition of any type in any typological framework. The definition of typologies is dependent upon the nature of the questions asked. Typologies are analytical tools to be used and discarded as necessary.

The concept of chiefdom is a very useful analytical tool for understanding the emergence of complex society. We can define chiefdoms in game theory terms guided by the discussion above. For this we utilize the concept of coalitions in game theory. Egalitarian societies can be seen in game theory terms as groups of economically autonomous households that occasionally create an ad hoc cooperative coalition for specific tasks. Simple chiefdoms are characterized by the existence of a permanent single-coalition cooperative group that exists to create surplus above the household level. The autonomy of the household for social and material reproduction is preserved, but the ad hoc group of the egalitarian society essentially becomes permanent and institutionalized. The entire coalition is composed of the chiefs and nonelite who work together for common goals.

In more complex societies, referred to here as complex chiefdoms, a second regional coalition between elites emerges. The elite coalition forms geographically widespread and ideologically complex systems of interaction that benefit the participants. These systems of interaction are termed "pan-regional elite alliances" by one of us (Stanish n.d.) and characterize such societies as Chaco at its height, Chavín, Olmec, and so forth. Complex chiefdoms are therefore two-coalition regional societies (elite and commoner) that exist to produce surplus above households. Finally, state societies represent the development of a three-coalition regional society, a phenomenon outside of the scope of this chapter.[6]

Power therefore becomes a central factor in defining chiefdoms and distinguishing them from states and

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egalitarian societies. In chiefdom societies, power is not coercive, as it is in states. Rather, chiefly power derives from the ability of chiefs to mobilize labor (maintain cooperation) among economically self-sufficient households, organized by kinship. It is only in state societies that power becomes institutionalized and backed by a specialist class that is dependent upon an elite for subsistence and reproduction. In simple chiefdom societies in particular (those that would correspond to bigman societies in other typologies), chiefly power derives from the ability to maintain complex, specialized labor organizations.

Why do people permit chiefs to have managerial power? Can we avoid the tautology that surplus is needed for complexity, but complex social arrangements are needed to create that surplus?[7] For classic selectionist theory this is indeed problematic. But from an evolutionary game theory, agent-based perspective, this is understood as the result of adaptive and "smart" individuals assessing the costs and benefits of cooperation. Cooperation does not magically emerge. However, when the appropriate conditions are met, cooperation becomes the adaptive choice of people assessing the costs and benefits of participating in specialized versus nonspecialized labor, loss of autonomy, gain in material wealth and nonmaterial benefits, and degree to which the production and redistribution process is "fair." Under the appropriate circumstances, as we discuss above, such cooperation will occur. This is not a circular argument because people choose to participate for perceived enhancement of their social and material life within the constraints of "fairness" and choose not to participate when norms of reciprocity and fairness are violated.

The societies in the Peruvian Late Preceramic and early Initial Periods were simple chiefdoms by this definition. They represented cooperative groups without any evidence of coercive power. In fact, in such a social environment, persuasive power was the only viable alternative. Based upon the theoretical principles outlined above, the continuing threat of spiteful punishment and cooperative breakdown would have profoundly affected the strategies of emergent elite. Thus, norms of fairness would have permeated the decisions that individual nonelite made.[8]

Architecture in Simple Chiefly Societies: The Andes and Beyond

The development of corporate architecture in the Andes represents a new cultural phenomenon. Following the above theoretical framework, its early appearance represents the development of a single-coalition cooperative group among autonomous households. There is no evidence of overt external coercion, internal coercion, or ecological stress in the Late Preceramic (and see Haas et al., this volume) that explains peoples' willingness to accept hierarchies. The lack of coercion, either from other people (war and/or systemic conflict) or from exogenous stresses such as population pressure, environmental change, and so forth, is somewhat problematic for traditional cultural ecological theory. The question therefore is, why did people start cooperating in the central Andes after at least eight millennia of noncooperation above small, multifamily groups?

Evolutionary game theory shows us that an entire group will tolerate or even encourage the emergence of a leader, under the appropriate conditions. Such a theoretical principle obviates the need to discover coercive mechanisms in the development of simple rank. However, while theoretically possible, we know that it is difficult for groups to maintain these organizations. This is supported by both theoretical work and empirical evidence. The ethnographic record is replete with examples of cooperative labor organizations in bigman and simple chiefly societies falling apart because of various internal squabbles. The lack of any coercive mechanism available to "elites" means that they must continually vie for support as well as compete against other emergent elites. To be successful, there must be some kind of social mechanism to ensure cooperation of all specialized laborers throughout the production process (in game theory terms, there must be a means to make cooperation pay for conditional cooperators, as well as to prevent free riding).

From this theoretical perspective, ritual is central to the successful creation of complex labor organizations characteristic of the early ranked societies. In an environment in which a group and leaders seek to maintain cooperative labor without the use of coercion, ritually sanctified participation and behavior in the production and consumption of resources becomes a powerful tool. The creation of a voluntary specialized labor organization implies the creation of a complex series of deferred debts that must be repaid at a later date. The danger for the individuals is that an elite could renege on promises and not redistribute the goods in a fair way. As noted above, there is the ever-present danger of free riding or defecting from the "rules of the game." Ritual, manifest in material items and architecture (DeMarrais et al. 1996), serves to encode proper behavior and provide the means to sanction people who do not cooperate.

To keep the group working together in specialized labor production, the individual laborers must be guaranteed that they will receive their fair share at the end of what can be a lengthy production process, with the emphasis on "fair." Raymond Firth refers to the essential role of the chief in "the apportionment of a common product among the members of a working party" (1963:306). He describes a number

of activities in Tikopia in which cooperative labor organization is managed by an elite, with the voluntary cooperation of the group. These include canoe-building, several rites involving the harvesting and preparing of foodstuffs, trading expeditions, and the like. More complex systems, such as the kula ring in the Trobriands, is an example of cooperative organizations used to produce commodities—pottery, fibers, shells, and other products—and to carry out long-distance exchange by boat over a wide area (Malinowski 1966). The entire kula exchange system is replete with ritual benchmarks and obligatory behavior by chiefs, lesser chiefs, and "notables." In particular, the famous shells and bracelets move in opposite directions and have no obvious economic utility. Yet, underneath this ritual orchestration is a brisk and vigorous trade in subsistence goods. Failure on the part of any of the participants to properly observe the ritual behavior ends the relationships with partners, and the economic exchange that parallels the ritual prescriptions falls apart. A plethora of other ethnographic cases teach us the same. Chiefs without coercive power organized the production of shell beads among the Chumash (e.g., see Arnold 1992, 1993), they resolve conflicts and/or regulate the distribution of water in irrigation systems that are effectively controlled by individual households or kin groups, they regulate the production of commodities for competitive feasting (e.g., the Kwakiutl of the Northwest Coast of North America), and so forth.

In short, the entire set of relationships between individuals in a complex labor organization has to be based on notions of reciprocity, fairness, and ritually sanctioned redistribution. Therefore, one of the necessary conditions for a successful economic organization in ranked societies is an ideology of reciprocity that guarantees equitable redistribution of production. These ideologies keep productive groups together and sanctify the allocation systems mediated or controlled by the elite.[9]

Equally fascinating is the degree to which people in societies without very complex sociopolitical organizations permit or even encourage the existence of rank markers in their society. In Tikopia, Firth (1963) provides a rich body of information about the *normative* power of chiefs. Chiefs claim to own all of the sacred canoes; they claim the right to issue taboos, to collect foods, to congregate on beaches during feast times, and to banish individuals; and they claim ownership of the land, and so forth. But when one reads this ethnography carefully, it is clear that the norms are vastly different from the behaviors. In spite of the de jure or customary power of the chiefs accorded to them by their society, the actual exercise of the power is greatly restricted. Firth discusses the numerous cases in which taboos are violated, chiefs are ignored, and conflict is resolved by the group with the chief as spokesperson, not by coercive authority. Cooperation is ritually obligatory but practically voluntary. The clash between norms and behaviors is nothing new in anthropology. What is critical for this discussion is that people continue to maintain the normative power of the chiefs for use by the group when necessary.

Architecture is central to the goal of maintaining these labor organizations under the social and demographic conditions of the earliest ranked societies as seen in Peru. Corporate, public architecture, that is, those buildings created by a group for the use of that group, becomes the center of community events. A central axiom is that corporate architecture reflects the sociopolitical structure of the community in which it is built.

From this theoretical perspective, we propose the following model. With the first evidence of a very weak chiefly organization, we expect to see several small public buildings in a village. This corresponds to the development of several competing elites in simple chiefly or bigman villages. Flannery (1995) notes that in such sociopolitical contexts, there may be several chiefs in a single settlement. This observation is borne out by ethnographic observations in Polynesian, Melanesian, and African chiefdoms. Archaeologically, the early Middle Formative Period in the Lake Titicaca Basin is a case in point in which early villages contain numerous small, specially constructed structures (see Hastorf 1999; Stanish 2001b, 2003). Likewise, from outside the Andes, Marcus and Flannery (1996:87) note that in the Tierra Largas phase in Oaxaca people constructed small, nondomestic structures that held a fraction of the population of the village. This phase preceded the development of full-blown rank in the valley. These structures were moderately sized, measuring no more than four by six meters. Marcus and Flannery note the similarities of these structures to kivas in the American Southwest, another architectural form in a similar sociopolitical context that conforms to this model (see also Flannery 1999).

As rank emerges and takes hold, we hypothesize that there will be fewer elites per village and, as a result, fewer but larger corporate constructions. Once elite factions coalesce into recognizable groups with their own internal dynamic, composing a single coalition in game theory terms, we expect to see more centrally located corporate constructions. The people of Paso de la Amada in Chiapas built larger "initiates' temples," one of which measures 11 by 21 meters. Marcus and Flannery see these as the result of "strong community leaders attracting followers and competing to erect bigger and bigger…temples" (1996:90). Likewise, in the Middle Formative of the Titicaca Basin, the small, special structures were replaced by more formal sunken courts and small attached pyramid structures. The Titicaca-area Middle

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Formative structures would be equivalent to the Chiapas temples and to the later and larger corporate structures at San José Mogote, specifically structures 1 and 2 as described by Marcus and Flannery (1996:109) during the San José phase.

The key observation is that the size and number of the public structures reflects the sociopolitical organization. This is not to say that the corporate structures have to hold the entire community. Rather, they simply have to hold the entire group of decision-making individuals in that society. Where there are numerous elites with small factions, we expect to see several small corporate constructions that can hold the entire faction. As the size of the factions increases, we expect to see correspondingly larger constructions. As the entire village is incorporated into a single faction, we expect to see a qualitative change in the architecture. In this latter case, we suggest that either the entire village or at least the entire set of household heads would have access to the corporate activities taking place on or in the architecture.

A review of architecture in early ranked societies in the Andes indicates that visibility was a central goal of the builders in such chiefly societies with a small number of elites in villages with populations in the hundreds. In state societies palaces for elites and compounds for specialized labor classes such as artisans are found in closed, inaccessible locations in towns and cities (Flannery 1995). In early ranked societies, visibility is the key: the corporate architecture either is visibly open and public or is large enough to hold the entire population of household heads in that community. An example of the latter would be kivas in the U.S. American Southwest. While the kivas indeed do not provide visibility, their size roughly correlates to the number of household heads in the communities. In most cases, multiple kivas were constructed. In cases where there were few kivas, such as Aztec or Pueblo Bonito, they were so large that they could hold the entire number of household heads of that community. The Late Preceramic and Initial Period sites provide classic examples of this principle as well.

Visibility in Late Preceramic and Initial Period Monuments

The site of Aspero, located on the northern edge of the Supe River adjacent to the Pacific Ocean, represents one of these early settlements built according to this architectural principle. The earliest phases of corporate construction began around 2800–2000 B.C.E. (Feldman 1987:12; Moseley 1992:117).[10] One large monument is the Huaca de los Idolos, a flat-topped pyramid 1,500 square meters in size used for ritual display (Feldman 1987:11; Moseley 1992:115). Along with this pyramid, Aspero has 12–15 hectares of domestic midden areas and 17 other pyramids between one and four meters high. Excavations at the site reveal a pattern of continually rebuilt constructions by a resident population, a pattern found at many sites throughout the coastal valleys at this time. The architecture of Aspero, El Paraíso, and others illustrates the principle of openness, public performance, and visibility. The pyramids are built low on the beach where they can be viewed from a wide area. Importantly, they are built low, below the flanking hills. The pyramids could have been built higher up on the ridge, but the clear architectural intent was to place these buildings in a highly visible area.

A very widespread U-shaped architectural tradition stretches from the northern Andes into the Titicaca Basin (Stanish 2001a). The ideal layout of the U-shaped architectural tradition was a high, flat-topped pyramid mound flanked by two projecting linear structures to form a large U. Perhaps the largest settlement of this time period, El Paraíso, is located two kilometers from the coast in the Chillón Valley and is part of this tradition. According to Jeffrey Quilter (1985:294) and Michael Moseley (1992:119), the major construction at the site was in progress by 2000 B.C.E. and it continued to be occupied for two to four centuries. The 100,000 tons of stone masonry construction is found in at least seven mounds that form a giant U shape over 58 hectares (Quilter 1985:279; Quilter and Stocker 1983). It has a huge, 7.0-hectare plaza located between the arms of the U. Many structures at El Paraíso were elaborately decorated. In particular, one structure was painted red and had a bright-orange burnt floor with evidence of fire rituals. Moseley (1992:120) notes that artifacts include red pigment grinders, bird feathers, unfired figurines, and fruit tree branches, all suggestive of elaborate and repetitive rituals. Earlier, we believed that there was little evidence for permanent habitation at the site. However, later work has indicated that it indeed had a resident population (Fung Pineda 1988; Quilter 1991a, 1991b:427).

The site of Huaca La Florida, located 11 kilometers inland in the Rímac Valley, is one of the oldest of the classic U-shaped structures so far studied (von Hagen and Morris 1998:51). The main pyramid is 17 meters high and the two projecting structures rise from the base to a height of four meters for approximately 500 meters of their length. Construction at the site began in the 18th century B.C.E. Burger estimates that the site required 6.7 million person-days of labor. He notes that it is not even the largest of the U-shaped sites on the coast. The poorly known site of San Jacinto in the Chancay Valley is four times as large, with a 30-hectare plaza and two million cubic meters of fill (Burger 1995:61).

While centered on the central coast of Peru, this U-shaped architectural tradition has been noted as far south as the Lake Titicaca Basin (Stanish and Steadman 1994:13) and as far north as Piura (Guffroy 1989). It represents an

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architectural style that encourages visibility of performance by a large group of people (see Moore 1996 for a nuanced discussion of these principles). The flanking arms as well as the main pyramid provide excellent elevated platforms to view activities inside the U.

A second architectural tradition centers on the construction of sunken, circular courts usually next to pyramids. A third architectural tradition is known as Cupisnique and is characterized by low platform pyramids, large stairways, and rectangular courts. Colonnades and elaborate painted sculptures distinguish this architecture (Burger 1995:92). The architectural complex known as Huaca de los Reyes at the site of Caballo Muerto is emblematic of this late Initial Period style. Ware-feline motifs executed as adobe friezes adorn this pyramid (Conklin 1996). Again, all of these features suggest elaborate and repeated rituals conducted in the open.

Each of these traditions is distinguished by an architectural principle that encourages public accessibility of performance. The Initial Period represents the apogee of this principle. One of the richest areas of the Initial Period culture is the Casma Valley. By 1400 B.C.E. and perhaps earlier, the site of Sechín Alto was the largest settlement in the Western hemisphere (Burger 1995:80; Moseley 1992:123–124). It is dominated by a huge stone masonry platform 300 meters in length and 250 meters in width that forms the base of a U-shaped center.

Located near Sechín Alto is the site of Cerro Sechín. The oldest construction at Cerro Sechín was built on a stepped platform with three levels (Samaniego et al. 1985:173; Tello 1956). In this early Initial Period, the site covered only about five hectares. A possible sunken court was located in the front of this pyramid and noted long ago by Julio Tello. Perhaps the most outstanding feature of Cerro Sechín is the numerous carvings in stone on the outer wall of the pyramid. These early Initial Period carvings depict macabre scenes of war including decapitations, trophy heads, and body parts plus warriors and victims in various states of subjugation.

The bulk of the architecture of Cerro Sechín is visible from the front, from the sides, and from the hill above. There are some possible covered structures, but these are possibly later additions, as are the stone carvings (Burger 1995:79–80). The original construction was, according to Burger (1995:79), a terraced platform that measured about 34 meters on a side. There was a "summit complex" that is difficult to define (Samaniego et al. 1985:167). Likewise, there was a circular sunken court in front of the platform, possibly quite early in date. While it is difficult to determine the precise nature of the early architecture, it appears that the site was originally characterized by an earthen platform at the base of a hill where most or all of the activities could be viewed.

The macabre scenes at Cerro Sechín indicate neither large-scale warfare nor some purely ritual activities. Rather, as Samaniego and colleagues defined in time and as Burger interprets, the later stone carvings probably represent raiding behaviors. Such behaviors are consistent with both one- and two-coalition chiefly societies as organized, cooperative activities that developed as a source of obtaining outside wealth. The existence of this iconography emphasizes the theoretical point that conflict between chiefdoms occurs when internal coercive mechanisms are absent.

The Casma Valley site of Pampa de las Llamas-Moxeke stands as one of the most important Initial Period sites in the Andes. The site has two huge artificial mounds, plaza areas, other buildings, and a substantial habitation area. The Moxeke mound measures 160 by 170 by 30 meters and is decorated with elaborate friezes along its flanks. The second mound, known as Huaca A, measures 140 by 140 meters at its base and reaches up to 9 meters in height. Both of the mounds are aligned along a central axis. These two aligned pyramids demarcate high walled enclosures, a pattern that suggests a surprisingly high degree of site planning. Sheila Pozorski and Tom Pozorski (1994:67) note that middens up to 1.5 meters deep are found at the edges of the corporate architecture. This residential debris, at least 110 "administrative" buildings, and the mounds and enclosures cover up to 200 hectares, although the total area of purely residential midden and corporate architecture is substantially less.

In the Early Horizon, the architectural principles begin to change. Sites continue the sunken court and plaza traditions (e.g., Grieder et al. 1988; Mujica 1988; Pozorski 1987; Rick 1988). However, we also see the emergence of less accessible constructions such as galleries and covered buildings. This process is directly discussed by Jerry Moore (1996 and this volume). He notes, for instance, that the architectural principles begin to change toward constructions with less obvious access. Examples here include the galleries at Chavín and covered buildings such as found in Pucara, Chiripa, and a number of sites on the coast such as Cerro Sechín, Mina Perdida, the sierra site of La Galgada, and others.[11] Such a shift, a topic for another paper, parallels the shift in the sociopolitical context in which the architecture is created. In this case, the great Early Horizon societies were complex chiefdoms possessing two coalitions of actors—an emergent elite with a panregional ideology and style and a local nonelite—and the architecture reflects this sociopolitical reality.

Summary

The evolution of nonstate, ranked society can be reformulated in evolutionary game theory terms as the

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development of permanent cooperation between large, nonkin groups. Recent theory indicates that consistent adherence to norms of fairness and free-rider punishment stand as fundamental and necessary conditions for the emergence and maintenance of cooperative labor organizations in the absence of coercion. Aspiring elites who are perceived to be unfair will be left without followers and bereft of power. In such a context, emergent elites must strictly adhere to norms of reciprocity to keep their status position. In other words, they must persuade people to work cooperatively, providing material incentives and maintaining the appropriate ideologies for that reciprocity to take place. This is precisely the kind of social context in which the earliest public architecture developed in the central Andes. The Late Preceramic and Initial Period monuments represent the manifestation of persuasive powers by the earliest elites in the Andes as they sought to keep heightened levels of specialized labor production within their communities.

We view these monuments as the products of the community, directed by an emergent elite and supported by the rest of the settlement; they created physical places where ritual and work combined to provide a means to maintain complex specialized labor organizations. The notion of "fairness"[12] permeates the architectural ground plans and construction of these sites. With very few possible exceptions, the architecture on these sites is either "open," that is, visible to the entire community, or the structures themselves are large enough to hold the entire community of household heads. Flat-topped pyramids are places where processions and other rituals can be publicly viewed. The monuments are inevitably in the middle of habitation areas, not peripheral to them as they are in many states. Storage units, if identified correctly, are usually located adjacent to or within the public complex. Walls separating areas of the "public" and the domestic are rare. With nonelite houses virtually abutting the monuments, the division between sacred and nonsacred is barely evident.

The use of space is radically different from that seen in state-level societies in which an elite monopolizes force. There are no palaces or private spaces for elites. Access or procession is not so much restricted as it is guided up or down pyramids and/or into special places generally visible to the community. In the cases where we see restricted-access structures in nonstate societies, that access leads into rooms and plazas that can hold the entire population of households heads of that community. In other words, there is little evidence for restricted space that excludes a part of the community or household heads.

The key to these architectural features is that group cohesion can be maintained by avoiding conflict over the fairness of elite-directed behaviors. All activities are visible to all household heads, at least, if not the entire cooperative group. Because of this, one of the principal factors that lead to group dissolution—perceptions of unfairness—can be avoided. That is, if all communal activities involving the assigning of tasks and the redistribution of surplus take place in a prescribed place, at prescribed times, in a visible location, then allegations of unfairness are difficult to sustain. Furthermore, the punishment of free riders can be justified by the community more easily if all people, particularly the relatives of those punished, have the opportunity to witness all of the activities.

Evolutionary game theory provides the concepts to model the origins of simple chiefdoms, not as a response to exogenous stresses but as the outcome of individuals in coalitions, under appropriate conditions, creating complex cooperative groups. The early architecture of the Late Preceramic and early Initial Period in Peru both represents the successful creation of such cooperative groups and is one of the necessary conditions for their development.

Finally, the argument presented in this chapter begs the question of what the appropriate conditions were that—interacting with human psychology and present cultural practices—led to the development of simple chiefdoms in the central Andes in the early third millennium, and not before. From a game theoretical perspective, any factor that altered the cost-benefit calculation in favor of cooperation over noncooperation would provide a potential context for the emergence of complex society. The slow but increasing population densities that made migrations more costly is one possibility. The genetic alterations in crop plants that increased the benefits of sedentary village life and horticulture constitute another factor. Moseley (1975, 1992) has famously noted the importance of the maritime resources to the Preceramic peoples. On the coast at least, the concentration of exceptionally high resource areas in circumscribed environments holds the potential to magnify population increases from the perspective of group cooperation. High productivity of marine resources, along with increased population in the higher elevations would have made long-distance regional exchange substantially less costly than before the Late Preceramic. This would be because sedentary populations in the upper desert river valleys would have been able to obtain and produce goods for exchange with the coastal peoples. Down-the-line trade between established trading partners is substantially less expensive in labor time than having individual household members walk long distances to obtain and/or produce their own exotic goods. These and other factors that occurred in the Late Preceramic created a new "landscape" of costs and benefits that the people could readily appreciate. Under these appropriate conditions, ranked societies flourished along the coast and in the highlands. Public

architecture, power, and chiefly organization were all created by the groups of people in the central Andes as they took advantage of these conditions for the evolution of cooperation in this critical time period in South American prehistory.

Notes

1. In some cases, the first complex architecture actually occurs in the very late third millennium B.C.E. For the purposes of this chapter we will retain the traditional dates.

2. Michael Moseley first coined the term *corporate architecture* and used it to characterize the Late Preceramic architecture of the central Andean coast.

3. Hayden's definition of some weakly stratified societies would be included in the definition of chiefdoms here.

4. This argument is developed in Stanish (2004) in great detail. In this chapter, we focus on the role of corporate architecture.

5. Such approaches assume that evolutionary disequilibrium, a condition of mismatch between phenotypes and the environment caused by environmental changes outpacing evolutionary processes, is a possible explanation for the fact that individuals in behavioral economics games exhibit cooperative behavior even when interactions are anonymous and consist of a single round of play. This would be akin to explaining the fact that a traveler tips in a restaurant to which he or she may never return by claiming that the psychology that motivates adherence to prosocial norms operates as if it were in a world of repeated interactions where reputations matter, despite the increased anonymity of modern societies.

6. This typology is worked out in greater detail in Stanish n.d.

7. We thank an anonymous reviewer for pointing out this issue and paraphrase his or her comments.

8. Numerous ethnographic data reinforce this deduction. In particular, the work of Raymond Firth among the Maori and in Tikopia, that of Douglass Oliver in the Solomans, studies of the Kwakiutl, and many African ethnographies illustrate the degrees to which chiefs seek to conform to norms of reciprocity and equity.

9. Others have emphasized the relationship between ritual and cooperation. Irons (n.d.) suggests that religious rituals are a form of costly signal that demonstrate commitment to cultural norms of reciprocity and cooperation. Roes and Raymond (2003) suggest that ritual and religious systems that depend on a belief in moralizing gods provide a sense of fairness and legitimacy—via a third-party disinterested arbiter—to a "moral" system that promotes reciprocity and cooperation among large groups. We propose that culturally evolved ritual reciprocity and redistribution practices are important and also that public architecture has an essential role in such cultural practices.

10. All dates are uncalibrated unless indicated.

11. We thank an anonymous reviewer for pointing out this parallel in our work.

12. We recognize that "fairness" is underspecified and that it may refer to either processes or outcomes. Our account implicitly focuses primarily on the former, insofar as fairness involves an open and publicly monitored process that follows prescribed procedures, though we also assume that such processes must have led to outcomes considered fair according to local norms in order for such systems to function.

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