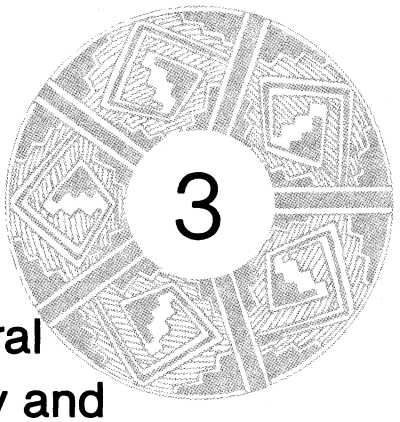

Breaking Down Cultural Complexity: Inequality and Heterogeneity

RANDALL H. MCGUIRE

> Evolution is a change from a no-howish, untalkaboutable all-alikeness to a somehowish and in general talkaboutable not-all-alikeness by continuous sticktogetherness and somethingelseifications.
>
> William Jones (Erickson 1977a:67)

INTRODUCTION

The broad sweep of human history encompasses a dynamic process of cultural evolution by which human societies have both grown in complexity and collapsed in disarray. The concept of cultural evolution implies not just any change, but developmental change; specifically, the process of change that separated the late Pleistocene world of independent, internally homogeneous human societies from the modern world of interdependent, internally heterogenous industrial nations. Even though the existence of such evolution now appears obvious, fundamental debate over the study of cultural evolution has raged in anthropology and archaeology for much of this century.

Most of this debate has focused on issues of explanation and has proven extremely resistant to empirical resolution. Often, dissatisfaction with extant theory has provoked epistemological arguments even more resistant to em-

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pirical consideration than the explanations they challenge. Surprisingly, however, few researchers have bothered to specify carefully what it is exactly they wish to explain. It is clear that a wide gulf separates Pleistocene hunter-gatherers from the modern industrial world system, but what aspects of culture have changed to create this gulf? The answer to this question would seem to be a prerequisite to any theory of the causes and consequences of cultural evolution. Yet many considerations of cultural evolution have not specified the dependent variable beyond the type of vague statement that introduces this chapter. The issue is not just At what level do we study evolution? but, more basically, What aspects of cultural change are we trying to explain?

As Flannery (1972) and Cordy (1981:8) have argued previously, the nature of change in cultural evolution must be established before we can argue about causes. Much of the current dissatisfaction with evolutionary theory (Dunnell 1980; Kohl 1981; Yoffee 1979) stems from the failure to adequately define the nature of evolutionary change. Until quite recently, archaeologists have by and large adhered to the typological format of the neoevolutionists (Service 1962, 1971, 1975; Fried 1967). These classifications lump all aspects of a society into a type, and societies become "black boxes" in archaeological analyses. That is, we can specify changes in external material variables, such as environment and population size, and identify the movement of societies between stages, but we cannot draw a causal connection between the material variable and the change. This is because the typological approach does not deal with the internal workings of cultural systems. More importantly, we cannot directly deal with forces within societies, such as competition within and between social groups, that may be causal to evolution. Rote application of this view leads to the mechanistic determinism that flaws most archaeological theories of cultural evolution.

Conceptualizing evolutionary change as a single variable (i.e., complexity) shares some common problems with the typological approach. Specifically, it lumps all the developmental change that occurs cross-culturally and prehistorically under a single heading. The concept of complexity subsumes a wide variety of potentially independent variables, such as stratification and diversity. As with the typological approach, researchers cannot study the interaction of these variables in change nor identify causal forces within cultures. It is becoming increasingly clear that the concept of complexity includes too much.

If archaeologists are to arrive at a better understanding of cultural evolution, we must recognize that current conceptions of this change embrace a variety of loosely related variables. I would contend that it is unproductive to speak of cultural evolution as a unitary phenomenon, measurable either in terms of types or as a single variable. We must first eliminate categorical con-

cepts that force us to think of cultural evolution in "either/or" terms; that is, societies are *either* chiefdoms *or* states, complex *or* simple. Second, we must break down compound concepts, such as complexity, into their constituent variables and study the interaction of these variables.

To accomplish this, I focus on the nature of evolutionary changes in social structure. There can be little question that the social structure of the modern industrial world system is in some sense more complex than that of Pleistocene hunting-and-gathering bands. Furthermore, there is general agreement that the constituent elements of this change include increasing inequality and increasing differentiation.

The model for evolutionary change in social structure that I propose recognizes the centrality of these two processes for earlier evolutionary theory and the position of numerous social theorists that social structure involves essentially two variables—inequality and heterogeneity (Blau 1977). *Heterogeneity* refers to the distribution of populations between social groups. *Inequality* deals with the differential access to material and social resources within a society. These two variables specify the vertical and horizontal axes of social structure, and their interaction defines the form of any given society. Considering how these interrelationships change produces an evolutionary model of social structure.

The model challenges several widely held assumptions about the nature of cultural evolution. Most importantly, it attempts to show that inequality and heterogeneity are not always positively correlated. In the broad scope of cultural evolution, these variables are first positively correlated and later negatively correlated. Furthermore, the model brings into question the existence of a great divide, or "watershed," of cultural evolution between state and stateless societies.

I regard the proposed model as a series of hypotheses that seek to account for much of the parallel developments we see in cultural evolution. As hypotheses, they are subject to empirical verification. The last part of this chapter specifies how the variables of heterogeneity and inequality might be measured archaeologically in one region—the Southwest.

STAIR STEPS TO COMPLEXITY: A TYPOLOGICAL APPROACH TO CULTURAL EVOLUTION

Most theories of cultural evolution, starting with the Italian philosopher Vico (1948) and continuing to today, have been typological. This represents both a theoretical position concerning the nature of cultural evolution and a methodology for studying cultural evolution. Several researchers have attacked the use of typological approaches in archaeology (Dunnell 1980;

Kehoe 1981; Steponaitis 1981; Wenke 1981; Yoffee 1979). It has become increasingly obvious that the theoretical underpinnings of this approach are often questionable and that its use as a methodology hampers the study of cultural evolution.

Typological theories of evolution, such as Fried's (1967) and Service's (1975), basically assert that in a case of pristine development, cultures will pass through a series of sequential stages. Many researchers, such as Wright (1977a:301), maintain that these stages have empirical reality and are not conveniences of classification or constructs of the researcher. Each stage represents a set of social and economic relationships that determine the nature of culture at that stage. This simplifies research, making cultural evolution unilineal both in terms of a single directional process of change affecting all aspects of culture and in terms of a limited set of steps. The validity of such theory is dependent on verification that cultures do cluster in discrete stages along an evolutionary scale and on the demonstration that evolutionary change is reducible to a single process determining the nature of all aspects of culture.

Although Steward (1955) rejected the theory of stage schemes, he did utilize a typological methodology. He established a classification of eras—including hunting and gathering, incipient agriculture, and the formative—to identify parallelisms in cultural evolution (Steward 1949). For Steward, these eras were not empirically real stages of development but rather, a convenient rank ordering that allowed cross-cultural comparisons of an underlying continuous process of change.

More recently, Sanders and Webster (1978) have challenged the unilineal theory. They conclude that both the assumption of a single process of evolution and of an inevitable sequence of stages are inadequate to explain the obvious variability in archaeologically documented sequences of cultural evolution. These authors accurately point out that the theoretical propositions of the unilineal theory can only be tested by using a multilinear approach. That is, the existence of universal stages and a single process of evolution can only be established by consistent identification of these stages and this process in specific evolutionary lines. They also recognize the limits of the stage scheme methodology and advocate the construction of a finer grained typology to facilitate multilinear research. Despite these observations, Sanders and Webster continue to use the old unilinear typology in their own model of evolutionary change.

A typological methodology places numerous limitations on our study of cultural evolution. As Plog (1974, 1977) points out, it makes what we are seeking to explain a series of types instead of a process; it forces us to think of change in terms of discontinuous units rather than as a continuous flow. We therefore treat our dependent variable as a category, the issue being why

some societies are complex and others are not or why the state arose in Mesopotamia. Such an approach inevitably degenerates into taxonomic arguments: What is a simple society? What is a state? Transforming types into variables eliminates the either/or decisions inherent in a typological methodology and makes taxonomic arguments largely irrelevant. The question ceases to be whether a society is complex or not and becomes, instead, "What is the degree of complexity in a society and in what ways is it complex?"

Second, by typologizing societies we subsume a potentially wide range of evolutionary processes under a single label. We are forced to assume that all aspects of culture follow the same trajectory of change at comparable rates. This leads to a mechanical view of cultural evolution because we cannot specify the logical relationships between our causal variables and the social systems that they affect. The effect that change in any causal variable has on a social system will depend, in large part, on the prior condition of that social system. This requires systemic models of the process of evolution. Before we can specify how cultural complexity changes, we must be able to specify the systemic relationships within a society that make it complex and the consequences of change in these interrelationships.

In order to arrive at such a model, we must break down the compound concept of *cultural complexity* into its constituent elements and specify the interrelationships between these elements. We can then apply causal theories to explain how these elements and relationships evolve.

CULTURAL COMPLEXITY AS A VARIABLE: THE HOLOGEISTIC METHOD AND SYSTEMS THEORY

Archaeologists and cultural anthropologists have laid a basis for transforming cultural complexity from a concept to a variable and for breaking the concept down into its constituent elements. Cross-cultural anthropologists have developed several methods for the measurement of cultural complexity, but their approach has not led to a systemic model of change in complexity. Some archaeologists have established a basis for such a model, but their formulations are limited by a "layer-cake" view of stratification and social structure.

Cross-cultural anthropologists utilizing the hologeistic (worldwide) method have given much attention to the issue of cultural evolution, making notable advances beyond the stage scheme approach (McNett 1970, 1979). They have utilized a variety of techniques, including indexing (Bowden 1969b, 1972; Naroll 1956; Tatje and Naroll 1970), Guttman scaling (Carneiro 1962, 1967, 1970a, 1973; Freemen 1957), and factor analysis

(Erickson 1972, 1977b; Lomax and Berkowitz 1972; McNett 1970; Sawyer and Levine 1966) to measure societies on a unilinear scale. All these analyses have utilized the concept of cultural complexity and defined complexity as the degree of functional differentiation in a society.

Despite the differences in approaches, these scales show a remarkable consistency in their ordering of societies and in the variables they define as being key. Many of these studies (Bowden 1972; Carneiro 1967; Ember 1963; Naroll 1956; Naroll and Margolis 1974) suggest a strong correlation between either population density (or maximum settlement size) and the complexity of social structures. The factor-analysis-based research (e.g., Erickson 1972, 1977a, 1977b; Lomax and Berkowitz 1972; McNett 1973; Sawyer and Levine 1966) and Bowden's (1969a) analysis clearly show that not all aspects of culture can be arranged in a single evolutionary scale.

All the methods utilized by cross-cultural anthropologists to arrive at evolutionary scales suffer from inherent limitations; specifically, they discard data and minimize variance. Indexing reduces several variables to a single score, thus averaging the effects of the variables that compose the index even when some of these variables are negatively correlated. Factor analysis, by grouping even more variables, has a similar result. As Carneiro (1967:235) explicitly recognizes, Guttman scaling throws away information by reducing continuous variables to present or absent scores, thus reducing the precision of the measures and the statistical power of the resulting analysis. Also, Guttman scaling does not evaluate the correlation between traits; therefore, it becomes possible to treat as independent variables several traits that in fact measure the same underlying phenomenon.

Partially as a result of these methodological problems, the conceptual relationship between the measures and theory is poorly made, causing the analyses to confuse dependent and independent variables. For example, Lomax and Berkowitz's (1972) factor analysis includes *social stratification,* a variable most researchers wish to explain, and the *caloric value of production,* an oft-used explanation for changes in social stratification. If the measure for complexity includes a variable such as population size, it would be circular to then use that complexity measure to test for the correlation of population size and complexity. Many of these studies attempt just such a correlation.

In the late 1960s and early 1970s, a fruitful line of research utilizing general systems theory and information theory appeared in the works of several archaeologists (Clarke 1968; Flannery 1972; Wright and Johnson 1975). Flannery (1972), in the seminal article for this approach, utilizes a synthesis of Fried's (1967) and Service's (1962) unilineal theory but lays out a research framework that exceeds the limitations of a typological methodology. Flannery defines *cultural complexity* as a variable consisting of *segrega-*

tion (the amount of internal differentiation in a system) and *centralization* (the degree of linkage between higher order controls and various subsystems of a society). Flannery recognizes that the explanation of cultural evolution requires an understanding of the process by which segregation and centralization take place, the mechanisms by which they occur, and the socioenvironmental stresses that trigger such mechanisms. In the first two parts of this three-part research program, Flannery attempts to formulate a model for cultural complexity.

Flannery bases his model on a theory of information flow in a society. He views social structure as a system of hierarchically arranged, discrete subsystems, with a control apparatus regulating each subsystem to maintain it at homeostasis. He proposes two evolutionary mechanisms—*promotion* and *linearization*—and three pathologies—*meddling, usurpation,* and *hypercoherence*. These mechanisms provide for both increases and decreases in segregation and centralization. He completes the model by specifying fifteen rules for the relationship of environmental or sociological stresses to his evolutionary and pathological mechanisms but never specifies how the model might be operationalized. The emphasis on homeostasis keeps this model consistent with the stage scheme approach, but, to dismiss it on this basis is to ignore its structural insights as to what makes a society more complex.

Johnson (1973, 1978) and Wright and Johnson (1975) have also utilized information theory but have arrived at a model different from Flannery's. In their first formulations they utilized unilineal stages and measured complexity by the number of decision-making levels in a society. Johnson (1973:3) initially defined a *state* as a society that minimally had a three-level decision hierarchy. Wright and Johnson (1975) subsequently developed this model into a more complex formulation, incorporating various different sources and channels of information flow. Johnson (1978:109), in his latest article on the issue, has continued to link the information theory approach to a unilineal steplike theory of evolution. The work of Richard Blanton (1975, 1976, 1978) starts from a perspective similar to that of Wright and Johnson, but Blanton elaborates the emphasis on decision hierarchies through a focus on exchange and exchange systems.

Several researchers have applied information theory, or general systems theory, to interpret the cultural evolution of a specific locale (Saxe 1977; Renfrew 1972), but these applications have not led to the formulation of an improved structural model of complexity. Tainter (1977) has made such an improvement, utilizing information theory. Theoretically and methodologically, this model is to be preferred over earlier models because it is not tied to a unilineal view of evolution and because it contains no assumptions of homeostasis.

Tainter (1977) (see also, Cordy 1981) bases his model on Blau's (1970) consideration of differentiation within organizations. He posits two dimensions to social structure, a vertical and a horizontal. He, like other systems theorists, views increasing complexity as a process of increasing numbers of levels along the vertical dimension. He proposes that Shannon's (1949:50–1) measure of information be used to measure organizational constraints in a society and that Haray's (1959:23–25) measure of structural or positional status be used to measure rank differentiation. Despite the controversial aspects of Tainter's analysis (Braun 1981), it provides a more sophisticated measure of social complexity than Wright and Johnson's counting of hierarchical levels.

The use of systems theory and information theory in formulating theories of social evolution has recently received much criticism (Dunnell 1980; Salmon 1978, 1980; Wenke 1981). These attacks have been leveled as much at the use of functional models as at the use of systems and information theory. On the broadest level, Salmon (1978) has questioned the usefulness of general systems theory for all archaeological endeavors, whereas Dunnell (1980), Athens (1977), Sanders and Webster (1978) and Wenke (1981) have attacked its application to the study of cultural evolution. All these authors fault the systems models as being functional models of how social systems work and not causal explanations that account for change. Wenke (1981: 101) allows that systems models can provide rewarding descriptions of social functioning, can draw our attention to broad commonalities in complex societies, and can focus our attention on structural kinds of causal relationships, but he argues that they cannot answer many important questions about cultural evolution.

The important distinction here is between causal explanations of change and functional or systemic models of a phenomenon. Inasmuch as any researcher has claimed that systemic models explain the process of cultural evolution, most of these criticisms are valid. It is, however, questionable that a useful theory of cultural evolution can be constructed without reference to such systemic models. Before we can explain how a phenomenon, such as cultural complexity, originates or changes, we must first have a systemic model of the phenomenon. Such a model would define some societies as more complex than others and would specify the relationships and types of changes in such relationships leading to greater or lesser complexity. Explanation of cultural evolution requires not opposition of causal and systemic models but rather, their integration.

At this time, the most sophisticated systemic models for cultural complexity are those proposed under the rubric of general systems theory or information theory. They have broken down cultural complexity into its constituent elements and attempted (or at least advocated) that these elements be treated as variables. Regrettably, these models, and archaeological thinking in

general, incorporate an overly simplistic hierarchical notion of social structure: the "layer-cake" model of social stratification.

THE LAYER-CAKE MODEL OF STRATIFICATION

In the classic archaeological model of social structure, societies consist of discrete, hierarchically ordered layers arranged like those of a wedding cake, with a king or chief in place of the bride and groom and successively broader layers of courtiers, priests, scribes, craftsmen, and finally, peasants on the bottom. This model essentially equates stratification and cultural complexity because culture becomes both more complex and more stratified through the addition of new layers to the cake. The validity of this model is the subject of a fundamental debate in social science. This controversy between the views of Marx and Weber influences how we model developmental change, and, through our study of cultural evolution, archaeologists can contribute to its resolution.

Two conflicting views of social stratification exist in social theory (Cancian 1976). The modern layer-cake view effectively begins with Karl Marx's emphasis on class stratification. According to Marx, classes form due to the people's relationship to the means of production. In the tradition of Weber, other researchers (Fallers 1973; Jeffries and Ransford 1980; Lenski 1966) have advocated a multidimensional model of stratification, which postulates numerous lines of stratification in addition to that of class.

Marx (1906) and most of his students advocate the doctrine of classes and class struggle as an integral part of human evolution. According to Marx, classes provide the constituent elements of society, the key aspect of culture through which people make history. "The history of all past societies consisted in the development of class antagonism" (Marx 1906:94). According to Marx, class stratification constitutes a set of real life experiences and conditions that to a large degree determine what the behavior and perceptions of individuals will be. For Marx, all other forms of inequality within societies—whether they be sexual, age, or race stratifications—originate from class stratification. This position leads to a layer-cake view of stratification; each layer is a separate class.

Most archaeological and anthropological theories of cultural evolution utilize some variant of the layer-cake model. They identify only one line of inequality in societies but do not always label this inequality as class stratification. This view is one of the defining characteristics of all Marxist analyses, including those currently prominent in the cultural evolution literature (Friedman and Rowlands 1977; Gledhill 1978; Wallerstein 1976).

The basic tenets and principles of the multidimensional model derive from Weber (1947, 1968) and appear in the works of several anthropologists and

sociologists (Adams 1977:396; Berreman and Zaretsky 1981; Fallers 1973; Jeffries and Ransford 1980; Lenski 1966). This approach defines *stratification* as inequality and identifies multiple lines or parameters of inequality, including power, age, sex, ethnicity, and class stratification, which intersect in each individual. Their sum defines the individual's social persona. Numerous archaeologists (Rathje 1971; Saxe 1970; Tainter 1978; Whittlesey 1978) have derived a similar view from Ward Goodenough's (1965) work and attempted to identify such dimensions in prehistoric burial populations.

The multidimensional model offers three advantages over the layer-cake model for the study of cultural evolution. First, Marx's basic premise that all inequality originates from class stratification is a key issue in cultural evolution, and it can only be tested by first identifying multiple lines of inequality and then showing that they result from class stratification. For example, Engles (1942) links the evolution of sexual stratification to the origins of private property and the development of class stratification. The proposition can only be tested by identifying class stratification and sexual stratification as separate dependent variables. Second, once we equate stratification with inequality, stratification becomes a variable instead of a category. We can then avoid the taxonomic question: What is a stratified society? and instead ask, How is it that societies become more stratified? Third, and most importantly, ethnographic studies of supposedly egalitarian societies, such as hunter-gatherers (Begler 1978; Lee 1981; Newman 1981) and peasant communities (Davis 1977; Galt 1980; McGuire and Netting 1982), are demonstrating that equality is indeed a social impossibility and that inequality may vary greatly within societies that have been lumped together by a typology.

Recognition of multiple dimensions of stratification makes the issue of changing cultural complexity more involved. We must ask not only how many levels but also how many dimensions of stratification exist. Furthermore, if we accept the idea that the process of increasing cultural complexity involves more than just the addition of layers in a hierarchy, then we need a model of social structure more complex than that offered by proponents of either stage schemes or information theory.

BREAKING DOWN CULTURAL COMPLEXITY INTO CONSTITUENT VARIABLES: INEQUALITY AND HETEROGENITY

Moving beyond these formulations requires breaking down the concept of cultural complexity into its constituent elements and transforming these elements into variables (cf. Lenski 1966:20–21). Once this is done, these variables become the explicanda in our analyses, and complexity ceases to be an analytical concept.

To accomplish this breakdown, I must return to the question, What changes separate Pleistocene hunter-gatherers from the modern industrial world system? Needless to say, a multitude of transformations could be identified, but internal differentiation and the amount of inequality have been of primary concern. The earliest social scientists, such as Spencer (1900), Marx (1906), and Durkheim (1933), recognized that the so-called primitive societies of the world were homogeneous and lacking in extremes of inequality, whereas the industrial nations of Europe were heterogeneous and marked by extremes of inequality. They raised from these observations two key questions: (1) How do societies become internally differentiated? and (2) What is the cause of inequality? All subsequent researchers have raised the same two questions, but they have, through a layer-cake view of stratification, lumped these questions together as a single dependent variable—*complexity*.

As the information theorists have realized, increasing heterogeneity and increasing inequality involve changes in social structure. Following Blau (1977:1), *social structure* may be defined as "the distribution of people among different positions and their social associations." Individuals occupy different positions either because they hold different roles or because they differ in hierarchical status. Roles and status are the basic social parameters that delineate social structure and affect individuals' behavior and perceptions of the world. Social parameters—such as sex, ethnicity, age, wealth, power, and religion—characterize individuals and define social personae. These parameters may be overlapping, as when all members of an ethnic group belong to the same religion, or independent, as when an ethnic group contains members of several religions. From this perspective, societies are more complex if they contain a larger number of distinct social personae. This is a quantitative view of social structure that focuses on the distribution of populations among social parameters and *Heterogeneity* and *inequality* refer to two different aspects of these distributions.

Heterogeneity deals with the frequency of individuals among social parameters. Two basic kinds of social parameters can be defined: nominal and graduated. *Nominal* parameters—such as sex, kinship, and occupation—define roles and are categorical groupings that have distinct boundaries and lack inherent rank ordering. *Graduated* parameters—such as age, power, and wealth (Blau 1977:6–8)—define status and are inherently rank ordered and continuous. *Heterogeneity* as defined here refers to both the horizontal distribution of a population between categorical parameters and the vertical distribution of the population along nominal parameters. The relationship of these two axes of differentiation will determine the number of distinct social personae in a society. Heterogeneity may be operationally defined as the likelihood that two randomly chosen individuals do not belong to the same stratum of a graduated parameter or to the same categorical grouping. Both the number of categories in a society and the

distribution of a population among these categories determine this likelihood. The higher this probability, the greater the number of distinct social personae in a society.

Material culture both participates in the maintenance of heterogeneity and reflects the behavioral differences between roles. Societies maintain roles through the use of symbols, which may be either material or behavioral in form. Archaeologists—such as Wobst (1977), Hodder (1979) and McGuire (1982) have pointed out how material culture functions symbolically to identify the social dimension of ethnicity in societies. As markers for ethnicity, this material culture also symbolizes one aspect of an individual's social persona. The existence of differing roles also implies the existence of differing behaviors associated with roles. This relationship can be most clearly seen in the dimension of occupation. The tools of a carpenter are different from those of a priest, and these two occupations can be identified on this basis.

The second major issue of evolutionary theory, *increasing inequality*, refers to how unequal the distribution of a population is along graduated parameters. The issue here is not the number of social persona in the culture but the extent of differential access to material and social resources, such as wealth and power, that define graduated social parameters. Whereas heterogeneity indicates how many individuals have comparable access to resources, inequality measures how much difference there is between comparable levels of access. An unequal distribution of wealth shows a big difference between the richest and the average; a heterogeneous distribution has few people at any one level.

Inequality can be characterized in three ways: absolute, proportional, and relative (Alker and Russett 1964; Blau 1977:56–60; Dalton 1920; Lorenz 1905). *Absolute inequality* refers to actual differences between individuals along a specified dimension. *Proportional inequality* refers to individual's position in the percentile distribution of a variable. *Relative inequality* defines each person's hierarchical position along a dimension of inequality relative to all other individuals thus accounting for both absolute and proportional inequality. For one individual's relative position to increase, another's must decline making this a zero sum concept.

In a hypothetical agricultural community, the absolute inequality in landownership between two individuals is the difference between their holdings in hectares. Therefore, if one individual's lands exceeds the other's by 10, the two are less unequal than if the difference is 100. The range of land holdings for all individuals would measure the absolute inequality for the entire community. Proportional inequality could be expressed by specifying the share of total agricultural land held by a small fraction of the population. For example, the inequality would be greater if 1% of the population owned 50% of the land and lesser if 1% of the population owned 20% of the land. This approach does not, however, take into account variation in the remainder of the population.

Relative inequality accounts for proportional inequality through the whole population and is best conceptualized in terms of a Lorenz curve (Lorenz 1905). To plot a curve for the hypothetical agricultural community, we would first arrange individuals from lowest to highest in terms of landownership. After doing this, the cumulative percentage of landholdings (y axis) would be plotted against the cumulative percentage of population (x axis). Complete equality (i.e., 1% of the population holds 1% of the land, 60% of the population hold 60% of the land) would result in a straight line with a slope of 1. The greater the deviation of the actual curve from such a straight line, the greater the inequality. Several different indices can be calculated from such a curve to summarize the inequality (Alker and Russett 1964; Allison 1978; Taagepera 1979) the most common being a Gini index (Shryock *et al.* 1973:178–181; Whittenburg and Pemberton 1977). Figure 3.1 illustrates Lorenz curves and Gini indices for three societies.

In general, the concept of relative inequality is more meaningful and possibly less misleading than that of absolute inequality (Allison 1978:866–67; Blau 1977:58–60). Considering only absolute differences ignores whether the rich have 100 times the wealth of the poor or only 3 times. Relative inequality focuses attention on exactly such proportional dif-

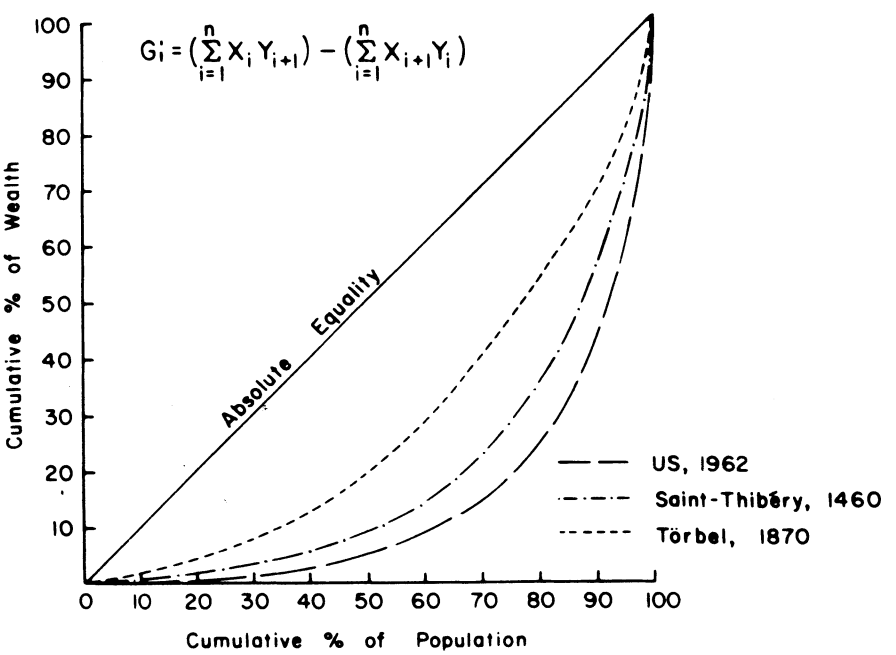


Figure 3.1. An example of Lorenz curves and Gini coefficients. (From McGuire and Netting 1982: Figure 2.) Data for the U.S. from Turner and Starnes 1976: Table 6 (Gini = .660). Data for Saint-Thibéry from LeRoy Ladurie 1974: Table 1 (Gini = .619). Data for Törbel yield Gini index of .413.

ferences because it changes due to shifts in the proportion of individuals along the cumulative distribution of the parameter being measured. To use the hypothetical agricultural community again, as more people come to control a larger portion of the land, inequality in landholdings decreases.

Relative inequality is also the more important concept for understanding social action. The absolute quantity of a resource that is available to an individual or a social group sets broad limits on their actions. Within these bounds, relative inequality determines the outcome of competition between individuals and social groups. The greater the relative inequality, the more a small number of individuals can dominate a society, and the greater the disparities in social resources within the society.

There can be some problems with the application of relative inequality; specifically, when absolute differences in the measured variable are very small or when 100% of the measured variable occurs at the high end of the distribution. Therefore, even though relative inequality is the more meaningful concept, absolute inequality cannot be ignored. Throughout the rest of this chapter, unless otherwise indicated, I will use the term *inequality* to refer to *relative inequality*.

The distribution of material resources represents an important aspect of inequality in all societies. Indeed, anthropologists and sociologists normally evaluate inequality by the division of material wealth within a society. Material goods reflect inequality well because they are both the symbols and the source of stratification. Fallers (1973) has discussed the importance of material items as symbols of inequality for more intangible social resources, such as prestige. More importantly, many social theorists maintain that the apportionment of material goods, that is, wealth, determines the distribution of a population along intangible social parameters, such as prestige or power (Blau 1977; Fallers 1973; Lenski 1966; Marx 1906).

Even though we may speak of inequality in terms of any graduated parameter, some parameters are of more theoretical interest than others. The core issue in the evolutionary study of inequality, from the nineteenth-century evolutionists through the information theorists, has been the distribution of power in a society. *Power* can be defined as the probability of a person or a group of persons carrying out their will when opposed by others (Weber 1947:152). Power is a relational quality that exists in all cultures and is always unequally distributed (Adams 1975, 1977; Lenski 1966). Social actions from which power is attained and expressed differ from culture to culture, but in all cases individuals compete for power (Lenski 1966; Lowie 1948:357).

Having defined the relevant variables of complexity, the first issue I must consider is the correlation between parameters of heterogeneity and parameters of inequality. Nominal parameters—such as religion, sex, and kinship—possess no inherent ranking. Such parameters become ranked due

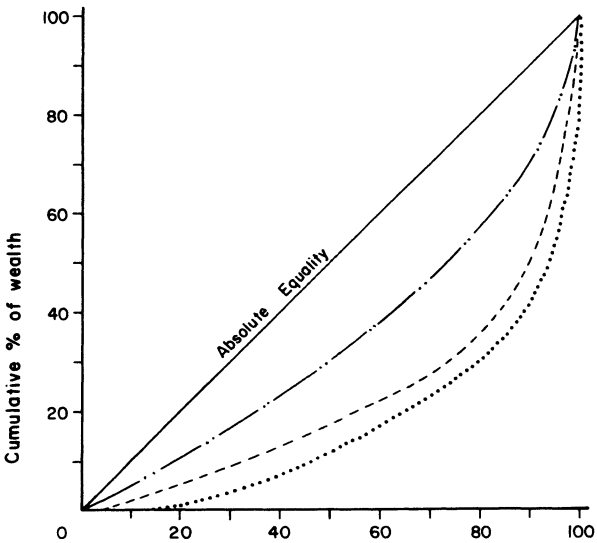
to correlation between themselves and parameters of inequality. For example, if lineages hold agricultural land, then the size of landholdings may be used to rank lineages. This would be in contrast to a society where nuclear families control agricultural land and no necessary connection would exist between lineages and landholdings. In societies with a low degree of heterogeneity, a high correlation between nominal parameters and graduated parameters can occur, producing a social structure approximating the layer-cake model of stratification. However, although the layer-cake model does adequately describe a certain range of cultural complexity, it should not be generalized outside that range. An example of such a social structure would be the Polynesian ramage system as described by Sahlins (1958).

The layer-cake model links heterogeneity and inequality by asserting that increasing the number of layers leads to increasing numbers of social persona (heterogeneity) and increasing differential access to resources (inequality). This theoretical perspective has broad implications of both a philosophical and a practical nature. Some anthropologists and sociologists have attacked inequality in modern societies as being pernicious; that is, humanly harmful and unjust to those it oppresses (Berreman 1981; Blau 1977; Bodley 1976, 1981; Rathje and McGuire 1982). These researchers raise the issue of how such inequality may be eliminated or alleviated. Several of them, utilizing the aforementioned assumption of the layer-cake model, have advocated scaling down the institutional structures of large-scale systems in order to decrease inequality (cf. Berreman and Zaretsky 1981). Essentially, they advocate reducing heterogeneity to reduce inequality. Examination of the systemic interrelationships of inequality and heterogeneity suggests that this assumption and the premise derived from it are false.

CULTURAL COMPLEXITY: THE INTERACTION OF INEQUALITY AND HETEROGENEITY

Inequality and heterogeneity change as a result of different processes, but because these variables are interrelated, change in one affects the other. Two basic types of change alter inequality, whereas three processes of change affect heterogeneity. As defined here, heterogeneity and inequality are both properties of graduated parameters, so that changes in one must affect the other, although not in a simple linear fashion.

Two types of change alter inequality along a graduated parameter: (1) movement of individuals toward the mean; and (2) movement of individuals away from the mean. Movement of both the upper stratum (i.e., that portion of the population above the mean) and the lower stratum (i.e., that portion of the population below the mean) toward the mean will result in declining



	Population Distributions			
Wealth	A	B	C	D
0	5	0	15	2
10	20	5	30	10
20	30	20	20	13
30	20	30	15	25
40	10	20	10	30
50	5	10	4	10
60	4	5	3	5
70	2	4	2	3
80	2	2	2	1
90	1	2	1	1
100	1	1	1	0
110	0	1	1	0

- - - - distributions A and B
..... distribution C
—··— distribution D

Figure 3.2. Lorenz curves for four hypothetical populations. Distribution A is the base distribution. Distribution B is distribution A shifted to higher values. Distribution C shows movement of cases away from the mean. Distribution D shows movement of cases toward the mean.

inequality (see Figure 3.2, distribution D). Movement of either stratum toward the mean will also result in a decrease in inequality if the other stratum remains constant. But, if movement of one stratum toward the mean is counterbalanced by movement of the other away from the mean, inequality does not change (see Figure 3.2, distributions A and B). Movement of strata away from the mean will result in increases in inequality, and the most pronounced such movement is Marx's classic proposition that under capitalism, the rich get richer and the poor get poorer (see Figure 3.2, distribution C). As is the case with decreasing inequality, movement of either stratum away from the mean will result in rising inequality unless counterbalanced by movement in the other stratum towards the mean.

A combination of changes in material conditions can instigate these processes of change, including the classic prime movers of evolutionary theory: environment, technology, and demography. A good example of such factors at work is the green revolution in Punjab, India (Ladejinsky 1969). In this case, the new technology of hybrid seed, tube wells, and mechanization favored the larger farmers who had enough land to make the payments on loans for such improvements. At the other end of the scale were the small farmers who could not increase production to match interest payments and, thus, went out of business; the successful larger farmers absorbed their

fields. The rich got richer and the poor got poorer: increasing inequality. Constructing general explanatory theories requires that the explicit connections be established between changes in material conditions and the processes of change in inequality.

Increasing heterogeneity, as indicated by an increase in the number of social persona in a culture, involves three processes: (1) an increase in the number of hierarchical levels in a culture; (2) an increase in the number of dimensions of differentiation of groups and statuses; and (3) an increase in the amount of independence between social parameters. These processes are in some ways sequentially ordered, each being logically dependent on the existence of the previous.

The first process has long been recognized in archaeology and corresponds at least roughly with Flannery's (1972) concept of *promotion*. In all cultures there exists a hierarchy of control or, in information theory jargon, *decision making*. Households may be organized into multihousehold production units, which may be organized into communities, which may be organized into a larger regional polity. In the least complex societies, such as the !Kung San, no organization exists above the level of multifamily bands, whereas in modern industrial nations, the number of levels virtually defies graphic representation. With the addition of levels in such a hierarchy, the number of social distinctions in a culture increase, leading to an increase in the number of distinct social persona.

The second process for increasing complexity is adding dimesnions of differentiation. The same basic set of social parameters—such as sex, age, power, wealth, and kinship—exists in all societies, but how these are differentiated varies between societies. For example, inequalities in power exist in all societies, but the more complex the society, the greater the number of multiple hierarchies of power (or routes to power) that exist. In the traditional Pueblo culture of the southwestern United States, secular and religious hierarchies of power were difficult to separate, but by contrast, both secular and religious hierarchies of power clearly existed in the Spanish society that conquered the area in the late 1500s.

The existence of separate hierarchies depends in large part on the differentiation of categorical groupings. The existence of the inequalities in a religious hierarchy separate from inequalities in a secular hierarchy requires the existence of groups organized by religion separate from groups organized by secular principles, such as kinship. The creation of new types of categorical groupings may result from the splitting of two correlated parameters, such as religion and politics in the pueblos, or through the rare addition of new parameters. For example, less complex socieites, such as the Australian aborigines, may not contain separate ethnic groups. More complex societies may add the parameter of ethnicity through conquest of

neighboring societies or by other means. This creates a new kind of categorical grouping and amplifies heterogeneity.

The most powerful process affecting heterogeneity involves increasing independence (*intersection,* in Blau's (1977) terms) of social parameters. Two social parameters are independent if an individual's place in one does not determine his or her place in another. From the standpoint of social groups, the greater the membership in one group correlates with the membership of a second group, the less independent are the two parameters that define the groups. To use a hypothetical example, if all blacks are Baptist and all whites are Catholic, then the parameters of race and religion are not independent. In such a situation, race and religion would be redundant determinants of role, and only two social persona, black–Baptist and white–Catholic, would be possible. If both blacks and whites were evenly divided between Baptists and Catholics, then the parameters of race and religion would be totally independent. As such they would define four possible roles: black–Baptist; black–Catholic; white–Baptist; and white–Catholic. Independence varies by degree, both in the number of parameters that are independent and in the extent of independence between any two parameters (Blau 1977:87).

Increasing independence is the most powerful process increasing heterogeneity because it has a multiplicative effect on the number of distinct social persona. As in the above example, making two parameters independent increases the number of roles from two to four. Given X distinctions in one parameter, Y distinctions in a second parameter, and a high degree of independence between parameters, the number of unique social persona possible is $X \times Y$.

These processes of change in heterogeneity are sequentially related. Increasing differentiation of hierarchies logically assumes the existence of a prior hierarchy; that is, if a society does not have an existing hierarchy of control it cannot differentiate into multiple hierarchies. The increasing independence of parameters further implies the existence of multiple hierarchies or multiple nonhierarchical groupings; that is, if for each parameter only one categorical grouping exists, obviously, independence of parameters is impossible.

To say that these processes are sequentially related does not mean that they are equivalent to stages or that only one process is operating at any point in cultural evolution. In every society inequalities exist in power, and are manifest minimally along the parameters of sex and age. These parameters are furthermore always independent of each other and the parameter of kinship. Sequential ordering exists because at different points in cultural evolution, we can expect these processes to be differentially important to changes in cultural complexity. In the evolution of a given case the addition of hierarchical levels will be primary, followed by the establishment

of multiple dimensions of hierarchy, and ultimately, by the increasing independence of the parameters. This does not mean, however, that a significant social change cannot result from the addition of hierarchical levels even in the most complex society. As noted later, even these changes in emphasis do not correspond to the stages of Fried or Service.

As is readily apparent, the least complex societies of the ethnographic present and the archaeological past have (had) very low levels of both heterogeneity and inequality. Moreover, there can be no question that the modern world system has far higher levels of inequality and heterogeneity. The layer-cake model of stratification assumes that the evolutionary process by which societies move from the one extreme to the other has been one of adding hierarchical levels, resulting in greater inequality. This assumption does not allow for the addition of distinct lines of inequality and new types of groups, nor the increasing independence of parameters. More importantly, there is reason to believe that the evolutionary relationship of inequality and heterogeneity is not so simple.

The concept of inequality is paradoxical in a manner which suggests that heterogeneity and inequality may be negatively correlated. The paradox is that high concentrations of wealth, power, or any other resource imply most people have comparable access to that resource (Blau 1977:9; Simmel 1950:198). High levels of inequality indicate a small group holds most of the resource, while the mass of the population has very little of it. Increases in the number of groups and the distribution of people between comparable levels of resource access, increasing heterogeneity, leads to a decrease in inequality. This suggests that under some conditions, a negative relationship may exist between inequality and heterogeneity. However, in an evolutionary scheme, the relationship may be first positive and then negative.

In the least complex societies, which have very low levels of inequality and heterogeneity, an increase in inequality could lead to an increase in heterogeneity. This would happen with the establishment of a nominally defined elite group; that is, the development of ascribed status. Increasing differentiation of the population in terms of other social parameters—such as the division of labor, religion, or ethnicity—could then have the effect of decreasing inequality as more individuals moved toward the center of the distribution. Fallers (1973:251) illustrates such a case for west Africa, where increased occupational differentiation of the Buganda kingdom resulted in a decrease in relative inequality. Indentification of the exact conditions under which such a flip-flop in the relationship would occur represents an important empirical research question.

Increasing independence of graduated parameters boosts heterogeneity but decreases inequality (Blau 1977:106). This relates back to my earlier observation that increasing heterogeneity can result in decreasing inequality.

The proliferation of social roles resulting from the increasing independence of parameters heightens heterogeneity, but these positions tend to counterbalance each other, thus lowering relative inequality. For example, if secular and religious hierarchies are correlated in a society (i.e., secular and religious positions are merged), the two types of power do not counterbalance each other. If secular and religious hierarchies are independent, the power of individuals with high position in the secular hierarchy is counterbalanced by the power of individuals with high position in the religious hierarchy. This points once again to the fallacy of viewing cultural evolution as a simple process of lock-step increases in heterogeneity and inequality.

THE INTERACTION OF HETEROGENEITY AND INEQUALITY: THE PYRAMIDS OF EGYPT

Accounting for the developmental parallels we see in the record of cultural evolution requires consideration of the interaction of heterogeneity and inequality. Many authors have noted the appearance of monumental architecture as an indicator of early civilizations (Adams 1966:29; Childe 1951a, 1951b; Steward 1949; Wenke 1980:346–47). Rathje (1975) has further noted that in the development of civilizations, the nature of this architecture changes. In particular, there is a decrease from massive investment in religious and mortuary edifices to greater expenditure for more practical, economically related structures. This trend is most notable in terms of mortuary complexes. Massive investments in the burial of paramount leaders characterize all the so-called pristine states. Features such as the royal tombs of Ur, the Classic Maya burials beneath pyramids, the tomb of the first Qin emperor of China, and the pyramids of Egypt represent the greatest investments for the burial of single individuals in the history of the world. In the development of each of these civilizations there is an initial growth in expenditures for mortuary complexes, culminating in these examples. This apex is followed by a declining investment in kingly tombs.

There is no simple relationship here between such massive mortuary architecture and increases in heterogeneity. The initial increase in mortuary investment is accompanied by increases in heterogeneity, yet, the more complex societies that follow these early civilizations invest nowhere near as much in kingly tombs. What is changing is the relationship of heterogeneity and inequality. Specifically, I hypothesize that massive investment in kingly tombs and their accompanying monumental architecture will occur with a combination of low heterogeneity and high inequality. I have already posited that there exists an evolutionary trend relating to such organization, whereby heterogeneity increases initially due to increasing inequality and incorpora-

tion of additional levels of hierarchy. Once differentiation into multiple hierarchies occurs and independence of parameters begins to increase in importance, heterogeneity will rise but relative inequality declines. The pyramids of Egypt and their counterparts around the world may mark this transition. Lenski (1966:Figure 1) also recognizes this transition but places it slightly later in an evolutionary trajectory.

The pyramids of Egypt represent the most prominent examples of mortuary architecture in the world, and their development illustrates the processes just postulated. The crucial social parameters in this example are wealth and power, and, as is the case with all graduated parameters, these can be considered as either absolute or zero sum quantities. In examining the evolution of kingly burial in Egypt, it is important to consider these parameters in both senses. Specifically, a certain base amount of absolute power and wealth would be necessary for a pharaoh to build a pyramid. As long as such a base exists, then the zero sum or relative inequality of wealth and power would determine if one was built.

The late Pre-dynastic period in Egypt has been characterized as a period of increasing centralization that would culminate in unification under one king (Baines and Malek 1980; Hoffman, 1979). During this period, the tombs of the elite, reflecting this concentration of power, declined in number (Hoffman 1979). Hoffman (1979:326) identifies these tombs as *powerfacts,* the physical embodiment of the power relationships in the society. With the end of the Pre-dynastic and the unification of Egypt under one king, provincial elite cemeteries slowly decline. Elite burials in large mud brick mastaba tombs occur only at Abydos and Saqqara.

The distribution of wealth and power changed both in absolute and relative terms during this period. The successive unification of smaller societies into the whole that would be Egypt probably increased the absolute wealth and power of the rulers, whereas the concentration of these resources in a single king increased relative inequality. The basic political and settlement units appeared to have been semi-autonomous, closely bounded social units (Aldred 1961). Unification consisted of subduing and incorporating these lower-level units under a single ruler (Hoffman 1979:307–47), thus creating a single hierarchy with the king at the summit imposing controls. The resulting Egypt almost certainly had a greater degree of heterogeneity than any of the individual societies it absorbed and replaced, but the conquest probably reduced the overall heterogeneity for the total region, representing primarily a process of increasing inequality.

The height of pyramid-building occurred during the Old Kingdom (third–sixth dynasties). Throughout the Old Kingdom, all lines of power in the society originated with the king; there appears to have been no standing army, no religious organization separate from the pharaoh, and, at the

beginning of the period, no formal bureaucracy (Baines and Malek 1980:34). The king apparently maintained control by granting baronial-type estates to his officials, and the officials with the highest central authority were generally related to the king (Baines and Malek 1980:33). The most active time of pyramid-building occurred during the fourth dynasty, representing an apex in the growth of investment in mortuary architecture.

The succeeding fifth and sixth dynasties represent a decline in investments for kingly mortuary architecture (Table 3.1). Fifth dynasty pharaohs not

TABLE 3.1
Dimensions for Egyptian Pyramids for Which Reliable Information Exists

Pharaoh	Dynasty	Basal dimension (in meters)	Height (in meters)	Date of king's death (B.C.)
		Old Kingdom		
Djoser	3	140 × 118	60	2611
Sekhemkhet	3	120 × 120	unfinished	2603
Khaba	3	78.5 × 78.5	unfinished	2599
Huni	3	147 × 147	93.5	2575
Snofru	4	220 × 220	104	2551
Snofru	4	183.5 × 183.5	105	2551
Khufu	4	230 × 230	146	2528
Radjedef	4	104.5 × 104.5	unfinished	2520
Khephren	4	214.5 × 214.5	143.5	2494
Menkaure	4	105 × 105	65.5	2472
Userkaf	5	73.5 × 73.5	49	2458
Sahure	5	78.5 × 78.5	47	2446
Neferirkare	5	105 × 105	70	2426
Neuserre	5	81 × 81	51.5	2392
Izezi	5	57.5 × 57.5	43	2356
Wenis	5	78.5 × 78.5	52.5	2323
Teti	6	78.5 × 78.5	52.5	2291
Pepy I	6	78.5 × 78.5	52.5	2255
Merenre	6	78.5 × 78.5	52.5	2246
Pepy II	6	78.5 × 78.5	52.5	2152
		First Intermediate Period		
Ibi	8	31.5 × 31.5[a]	?	?
Merykare	9	50 × 50[a]	?	?
		Middle Kingdom		
Amenemhet I	12	78 × 78[a]	55	1962
Senwosret I	12	105 × 105[a]	61	1926
Amenemhet II	12	50 × 50[a]	?	1892
Senwosret II	12	106 × 106[a]	48	1878
Senworet III	12	105 × 105[a]	78.5	1841
Amenemhet III	12	105 × 105[a]	81.5	1797
Khendjer	13	52.5 × 52.5[a]	37	1745
?	13	80 × 80[a]	?	?

[a]Mud brick pyramid (source: Baines and Malek 1980:36–37, 140–141).

only built substantially smaller pyramids than their predecessors but also shifted the focus of their expenditures slightly, building solar temples in addition to their smaller pyramids. As Baines and Malek (1980:34) note, there is only limited evidence of overall economic decline in the fifth dynasty, suggesting that there was not a great reduction in the absolute supply of wealth or power. What changed was the social structure of Egyptian society. In the late fifth dynasty, elite burials begin to appear not only surrounding the pharaoh's pyramid but also in provinical cemeteries, and holders of high office are no longer necessarily members of the royal family. Baines and Malek (1980:34) suggest that "an administration based on autocracy and kinship gives way to something like a fixed bureaucracy." The heterogeneity of the society was increasing due to the establishment of province-based lines of power and separation of power through kinship to the king and power through position in a bureaucracy. Although the absolute power of the fifth-dynasty kings may have been the same or even greater than that of the fourth-dynasty kings, their relative power was slipping, and the trend continued into the sixth dynasty.

In the aftermath of the sixth dynasty, Egyptian society broke up into smaller autonomous units and at least two different lines of kingship, one for the upper and one for the lower kingdoms. During this First Intermediate Period, few monumental mortuary complexes occurred, and, indeed, no one king commanded the absolute quantities of power or wealth necessary to erect pyramids that would match those of the sixth dynasty.

The Middle Kingdom begins with the reunification of Egypt under Nebhepetre Mentuhotpe of the eleventh dynasty. In the twelfth dynasty, pyramid construction begins anew, but with an important difference: The new pyramids are built of mud brick, not stone. In the thirteenth dynasty, pyramid construction ceases, not to be resumed. More important than this cessation, however, are the actions of Senwosret III, who broke up the power of the nomes governors. In their stead he enhanced the power of the central bureaucracy that dominated the thirteenth dynasty and of the standing army, thus introducing two new lines of power in the country. The thirteenth-dynasty kings raised few public monuments. In their stead, masses of private monuments appear, suggesting that individuals other than the king had greater access to wealth and power (Baines and Malek 1980:41). The Middle Kingdon ends with the Hyksos takeover of lower Egypt.

The New Kingdom has often been described as the peak of Egyptian power. Around 1532 B.C., Ahmose expelled the Hyksos invaders, and his second successor, Tuthmosis, expanded the Egyptian empire to its greatest extent. The New Kingdom pharaohs ruled the largest and most powerful Egypt in the ancient world. These pharaohs, however, sought their final resting place not under massive pyramids but in the rock-cut tombs of the

Valley of the Kings. The village of the workmen who constructed these mausoleums consisted of a walled settlement including some 70 houses (Baines and Malek 1980:100). This contrasts sharply with the fourth-dynasty workmen's barracks at Giza, which could have housed 4–5000 individuals (Fakhry 1961:14; Mendelsohn 1971:212).

Egyptian society of the New Kingdom was more complex than that of the Old and Middle kingdoms. The maintenance of a large empire required the existence of a standing army, and such an army provided a hierarchy of power independent of kinship distance from the pharaoh. Perhaps most significant, the priesthood established itself as a powerful force separate from the pharaoh. Although the New Kingdom pharaohs ruled an Egypt unmatched in power and wealth, their relative power was limited by the army, and more importantly, the priesthood.

If the relationship between the construction of monumental mortuary architecture and inequality is a positive one, as posited here, then that relationship should also be reflected in private tombs. That is, if the pharaohs were losing relative power, then others must have been gaining in relative power. Indeed, comparison of private tombs from these three periods demonstrates that they become increasingly costly with each period (Baines and Malek 1980:146–151). This relationship is also expressed in temples that become more elaborate as investment in kingly mortuary architecture decreases (Baines, personal communication, 1982).

This discussion of changes in Egyptian kingly burial practices of the third and second millennia is intended primarily to illustrate how inequality and heterogeneity may relate to archaeological issues and to suggest that the relationship between these two aspects of cultural complexity is not a simple, positive one. A quantitative analysis of these two variables in the evolution of Egyptian society would most certainly produce a far more complicated set of relationships than those posited there.

THE INTEGRATION OF SOCIETIES: THE INTERACTION OF HETEROGENEITY AND INEQUALITY

Many researchers have talked of cultural evolution in terms of a great divide. As Service (1975:3) states, "the watershed in the evolution of human culture occurred when primitive society became civilized society." This, for most scholars, represents a change in the integration of societies from personal relationships based on kin ties to control and direction by a central government (e.g., Maine's *communitas* to *civitas,* Durkheim's *mechanical solidarity* to *organic solidarity,* and Marx and Engle's *primitive communism* to *the state*). Considering the implications of changing heterogeneity and inequality for social integration provides a different perspective on this issue.

Explaining the great divide has become a dominant concern among anthropologists and archaeologists studying cultural evolution. The stage schemes of both Service (1975) and Fried (1967) separate cultures preceding the divide into two or three stages and lump cultures following the divide into a single stage usually referred to as *the state*. These formulations seek to explain the advent of this stage and have inspired a plethora of archaeological theories to explain an event, the rise of the state (Athens 1977; Claessen and Skalnik 1978; Cohen and Service 1978; Krader 1968; Saxe 1977; Wright 1977b). This research framework lumps everything from Shaka's mid-nineteenth-century Zulus to the modern world system under a single heading (Service 1975). The range of cultural complexity encompassed by this category easily matches or exceeds that separating Shaka's Zulus from the !Kung. Most importantly, this framework channels theory to explain an event, the great divide, causing researchers to ignore processes that account for most of the variability seen in cultural evolution.

Fully modern humans (*Homo sapiens sapiens*) had appeared on the world scene by at least 40,000 B.P., and all cultures of the world were hunters and gatherers until at most 20,000 B.P. In Europe the so-called rise of civilization does not occur until 4,000 B.P. in Crete and Greece. In terms of heterogeneity, distinct social persona among Pleistocene hunter-gatherers probably numbered no more than a few dozen, if that, whereas the number of distinct social persona in the early civilizations of Crete and Greece may have approached several hundred and modern European censuses recognize 10,000–20,000 unique occupational roles alone. The true number of distinct social persona in modern industrial nations is astronomical and most certainly exceeds a million. This suggests that an exponential increase in heterogeneity has occurred in the cultural evolution of Europe.

Such an exponential curve points to the limits of a great divide perspective. Figure 3.3 graphically portrays a hypothetical exponential growth curve for Europe. Placing the great divide at the take-off point of the curve illustrates that, although the old framework incorporates most of the prehistory of Europe, it ignores most of the change in the dependent variable, heterogeneity. Archaeologists and anthropologists may be best equipped to focus their research on that variability that precedes the take-off, but our models of social structure must be applicable to the full range of change to generate theories of cultural evolution. Reconceptualizing this issue in terms of the interaction of heterogeneity and inequality and the implications of this interaction for social integration is a step toward such models.

At the most basic level, I would shift our study from concern with the basic parameters of integration to the structural characteristics of the integration. What is critical is not that kinship becomes less central as an integrating principle but what the structural consequences are of this change. More importantly, this rephrases the great divide into a process of change in-

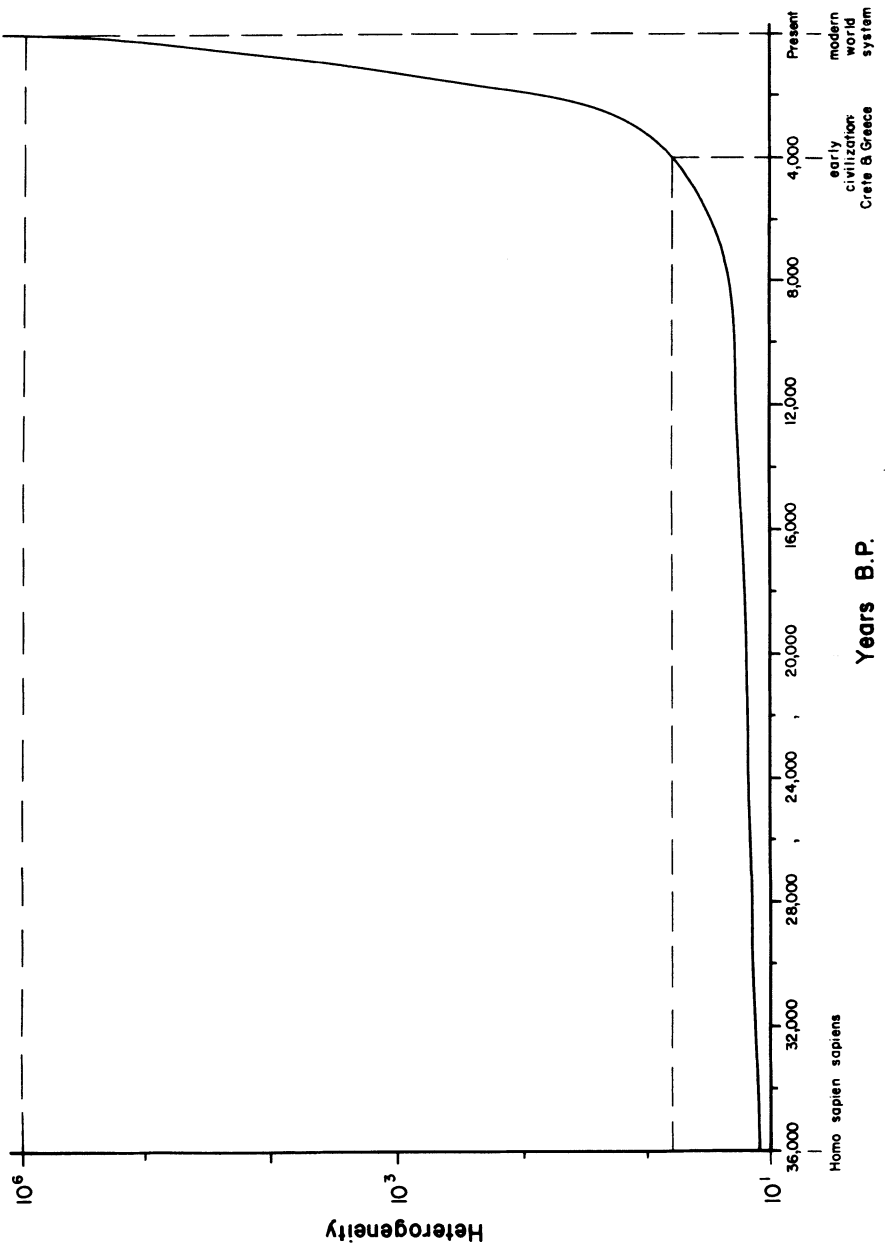


Figure 3.3. Hypothetical curve for the growth of heterogeneity in European prehistory.

stead of an event. Kinship does not cease to be an integrating principle in any society, it just becomes less important and less central.

The three processes of change in heterogeneity I have posited would lead to an exponential growth in heterogeneity. Initial increases due to the addition of hierarchical layers would have an additive effect, each new layer creating new, distinct roles. Increasing the number of hierarchies in a society would also have an additive effect but would lead to an increase in the rate of change because continuing addition of layers would occur in more than one hierarchy. More importantly, increasing independence of parameters in a situation of multiple hierarchies could produce an exponential take-off. If only two parameters are involved, increasing independence of parameters has a multiplicative effect on the number of distinct social persona defined. When more than two parameters are independent, the effect would be exponential. These processes of change in heterogeneity also relate to differing mechanisms of integration.

In examining the evolution of social integration, it is first important to recognize that each society is a hierarchy of social structures. All societies are composed of diverse groups, each of which has its own internal social structure, and every society must integrate such diverse groups into a whole.

As Simmel (1950:141–142, 151) initially recognized, all societies utilize two different mechanisms to integrate their diverse subgroups. The first mechanism is concentric circles of nominal parameters; that is, a hierarchy of increasingly inclusive groups referred to here as *concentric integration*. The second is the use of independent parameters; that is, having membership in one parameter be independent of membership in other parameters. When this is the case, parameters "intersect" on individuals; this mechanism is referred to as *intersection* (Blau 1977). Both mechanisms achieve integration through the linkage of individuals with the interests and welfare of groups. Furthermore, these two forms of integration provide alternative means of classifying individuals. *Grace's boy, of the Corn Clan, of the village of Hotevilla,* and *of the Hopi tribe* all classify an individual in terms of concentric circles of nominal parameters, whereas *young, male, Indian,* and *pipefitter* could classify that same individual in terms of independent parameters that intersect on that individual. Figure 3.4 portrays concentric integration and intersection from the perspective of an individual.

Two of the processes that alter heterogeneity do so in terms of concentric integration, whereas the third relate to intersection. The addition of layers to a hierarchy involves the expansion of concentric integration to incorporate more individuals by adding more generalized distinctions to the hierarchy. The addition of new dimensions of inequality (that is, new hierarchies) elaborates on concentric integration by establishing separate bullseyes of concentric parameters that are normally integrated by a higher level concen-

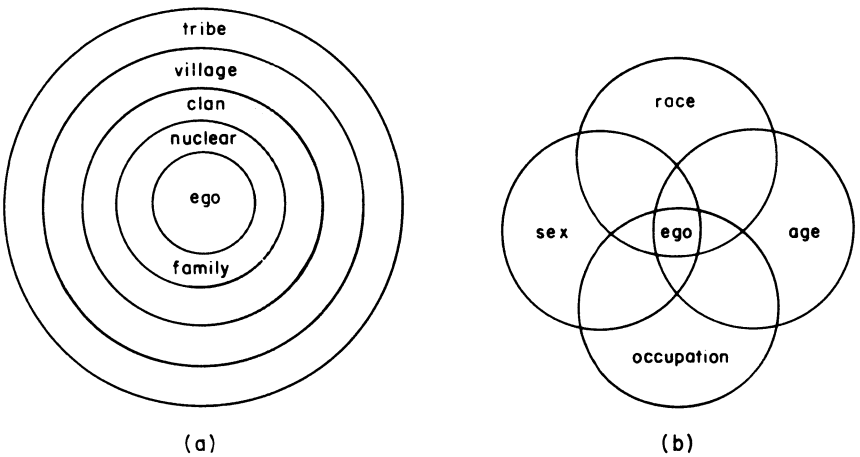


Figure 3.4. Graphic illustration of concentric (a) integration and (b) intersection.

tric parameter. Increasing independence of parameters increases intersection by definition.

Because the processes of change are evolutionarily related, so is the relative importance of the two forms of integration. Less complex societies depend more heavily on concentric integration than intersection. Many archaeologists and anthropologists studying cultural evolution have recognized and described this basic form of organization (Flannery 1972; Fried 1967; Service 1975). This is also the view of social structure underlying Sahlins' (1972:196–200) theory of primitive exchange. The initial process in cultural evolution involves the addition of concentric circles to the hierarchy and the increasing inequality that results from individuals gaining control over such a hierarchy. This is often done through extension of kinship principles, such as in the Polynesian ramage system (Sahlins 1958). The layer-cake model, if useful at all, is most clearly replicated at this level of cultural evolution. Also, as long as closely bounded, competing, hierarchically organized groups dominate a social structure, Flannery's (1972) mechanisms of cultural evolution appear useful. Both these perspectives, however, do not adequately account for the deferentiation of hierarchical parameters or the increasing independence of parameters in cultural evolution. For this reason, neither gives us many insights into the processes of cultural evolution beyond societies with lower levels of heterogeneity.

The phenomenon of segmentary lineage illustrates extreme dependence on concentric integration (Evans-Pritchard 1940; Hart 1970; Sahlins 1961). The classic example of this form of organization is the Nuer of East Africa (Evans-Pritchard 1940). At the highest level, the Nuer are divided into twelve major tribes that decompose in four concentric circles to villages.

Kinship organization also mimics this pattern, with the Nuer being divided into 20 clans and each clan being divided into successively smaller lineages. As is the case with the Nuer, concentric-circle integration is most commonly derived from kinship.

The Abron Kingdom of the Ivory Coast and Ghana provides an example of a society with multiple hierarchies or dimensions of inequality and a primary reliance on concentric integration. As described by Terray (1974, 1975), there were two hierarchies of inequality within the society. The first was a political hierarchy with a king at the top, a level of chiefs below him, followed by village leaders, and finally, compounds heads. A single ethnic group, the Abron, dominated the top of this hierarchy and provided the king and most of the chiefs. Another ethnic group, the Kulango, made up the lower levels. A third ethnic group of Islamic traders, the Dyula, formed a second hierarchy separate from the political hierarchy. These long-distance traders were under the authority of the king but had a separate concentric integration and special privileges. In this case, the parameters of kinship, ethnicity, class, and occupation were not independent. Kinship determined ethnicity, which in turn determined both class and occupation.

The extreme of integration through intersection can be illustrated by modern U.S. society, where intersection is more important than concentric integration. An individual's distinct role results from a variety of parameters, including education, occupation, wealth, ethnicity, sex, and age. Integration results not from a hierarchy of groups, but from individuals having cross-cutting membership in many groups. Thus, a black construction worker and a white construction worker differ in their race but share certain common goals, attitudes, and life experiences as a result of their occupation.

These mechanisms do not represent different stages of cultural evolution. As has already been shown, both forms of integration exist in all societies, and cases intermediate between the three previous examples can be readily produced as well. These mechanisms also cannot be directly related to either Service's or Fried's stage schemes. If Shaka' Zulus and Kamehameha's Hawaiians represent the initial establishment of states and the least complex examples of state or stratified societies (Service 1975), then most of the structural change discussed here occurs after this point in cultural evolution. In both examples, concentric integration is dominent, and power is distributed principally along a single dimension originating with the king.

Numerous researchers have noted and demonstrated a correlation between the population size or density of a culture and its level of heterogeneity (Bowden 1972; Carneiro 1970b; Naroll 1956; Zipf 1949). This increase in population relates directly to the changes in mechansims of integration. Specifically, increasing emphasis on intersection allows more individuals to

be incorporated into a single social structure (Blau 1977:132–33; Oberg 1955). The integration of a culture is dependent, in part, on individuals' abilities to establish appropriate role relationships with others. In very small groups individuals can do this in terms of personal relationships, but beyond a certain point (i.e., less than 100 individuals), they must utilize social distinctions derived from an individual's distinct roles. The number of such distinctions that individuals can make are limited (Hare 1976:271). Classifying a population in terms of social parameters reduces the number of distinctions individuals must make to establish appropriate role relationships.

As I noted, concentric integration and intersection provide alternative means of classifying individuals. Concentric integration allows people to make distinctions based on concepts of social distance, such as Sahlins (1972:199) discusses. Intersection increases discriminating power because the same number of criteria for making social distinctions permits individuals to identify a greater variety of social roles (Blau 1977:134).

The difference in discriminatory power relates back to the discussion of the number of roles defined by concentric versus independent parameters. For example, if a tribe has two moieties, each with two clans and each clan with two lineages, this hierarchy of concentric circles produces seven dichotomous social criteria (one for moieties, two for the clans in each, and four for the lineages in each clan). By contrast, seven dichotomous intersecting criteria yields 128 (2^7) subcategories.

These relationships suggest that there exists a structural or functional relationship between population size and level of heterogeneity. That is, a larger population requires increasing heterogeneity in order to integrate larger numbers of individuals within a single structure (Blau 1977:134). Failure to modify the mechanisms of integration in the face of population growth could produce instability in a social structure that would lead to collapse. If this is a valid conjecture, then increased heterogeneity is a result, at least in part, of increasing population within a society. Population growth is not, however, a necessary cause for increases in heterogeneity because other processes, such as the relationship between technology and the division of labor, clearly affect heterogeneity.

Changes in mechanisms of integration further relate to a social structure's potential for change. That is, they provide an important prior condition that affects how cultures will respond to stress, and they affect rates of change. Specifically, the greater a culture's dependence on concentric integration is, the more resistant it is to structural change and the more dependent it is on intersection, the greater its potential for structural change will be. As Blau (1977:122) has argued, concentric integration inhibits structural change because very few individuals share membership across groups at any given level of the hierarchy. Each group in the hierarchy is, therefore, closely

bounded, having social barriers between it and other similar groups. These barriers serve to limit change as each group resists any threat to its own integrity and attempts to operate for its own self-interest rather than the interest of the broader society. Extreme concentric integration focuses inequality along one dimension, resulting in greater power inequality. The greater relative power of the elite in such societies allows them to impose the social connections between such groups from above. Because they impose the connections linking groups, they can use this control to shape interaction within the society for their own purposes and, by playing off groups against each other, can keep their enemies scattered and powerless (Blau 1977:122). Such a structure inhibits gradual adjustments to changing material conditions, both because change is rarely in the best interest of a ruling elite and because of the lack of cohesion and common interest between groups. Without a mechanism for gradual adjustment to changing material conditions, pressures in such cultures are more likely to result in collapse instead of structural change. This may account for the tendency of early civilizations, such as the Classic Maya and Old Kingdom Egypt, to develop slowly for hundreds of years and then collapse suddenly. This may also be the key to the Marxist dilemma of why the Asiatic mode of production has such a low potential for structural change.

As dependence on intersecting parameters increases, all other things being equal, societies should exhibit structural change at a more rapid rate. This dependence should also result in greater resistance to collapse or revolution. Such integration allows greater structural change because individuals cross-cut social groups, weakening the boundaries separating groups and strengthening the interconnections linking groups. This cross-cutting both weakens the integrity of subgroups within the society and increases common interest between groups. Furthermore, as already noted, the increasing heterogeneity involved with increasing independence of parameters results in a decrease in inequality of power, thus weakening the ability of a small elite to control a society and block change. This results in greater potential (or, put another way, less resistance) to structural change and, therefore, a greater tendency to change. Increasing dependence on intersecting parameters does not make a civilization immune to collapse but does make it more resistant to collapse. Furthermore, differential emphasis on these mechanisms of integration affects what happens to civilizations when they do collapse.

Several authors have discussed the near decomposibility of societies (Eisenstadt 1964; Miller 1965; Yoffee 1979). This concept derives from the observation that societies are themselves hierarchies of social structures and purports that they will, under certain conditions, dissolve into such subgroups. A greater reliance on concentric integration will make a social

structure more decomposible than will a greater reliance on intersection. In the extreme development of concentric integration, with strongly bounded groups, each level of the hierarchy of circles represents a viable social unit with a discrete membership. This, coupled with an integration imposed from above, makes decomposition quite easy. With intersecting parameters group memberships are not discrete and integration is through cross-membership of individuals in groups. All other things being equal, civilizations with a strong dependence on concentric integration could be expected to collapse rapidly, like the Classic Maya or Old Kingdom Egypt, whereas greater dependence on intersection should result in a process of collapse like that of Rome: a slow deterioration over many years.

In discussing the variables of inequality and heterogeneity and the implications of changes in these for mechanisms of social integration, I have posited numerous functional or systemic relationships and the implications of these for cultural evolution. I regard these relationships and implications as hypotheses subject to empirical verification. Beyond testing a systemic model of cultural complexity, we must also attempt to explain why cultural evolution occurs. Both these goals require that we measure inequality and heterogeneity archaeologically.

MEASURING CHANGE IN CULTURAL COMPLEXITY

Economists and sociologists have already derived interval measurements for both inequality and heterogeneity. Relative inequality can be measured using a Lorenz curve and one of several available indices derived from such a curve. Blau (1977:1) presents an interval measure for heterogeneity. These formulas are not simply measures of theoretical concepts but rather, are part of the definitions for inequality and heterogeneity. The problem facing archaeologists is how to reconstruct social structure so that these definitions can be applied to archaeological data.

As Curtis and Jackson (1962) pointed out, multiple indicators should be used whenever a researcher has definite variables he or she wishes to relate but for which he or she cannot obtain a single, unambiguous direct measure. Such multiple indicators are most effectively used if instead of combining the indicators into an index, the researcher examines the association between each indicator. This method provides a means for detecting the effect of known or unknown third variables on the dependent variable. The most pernicious unknown third variables in archaeological research are factors of cultural and natural formation processes. Fortunately, not all indicators of a single variable are subject to the same formation processes. For example, burial data and architectural data would be subject to differing sets of for-

mation processes. If two indicators for the same variable were drawn, one each from these classes of data, and this yielded comparable measurements, then we could be more confident that the indicators were measuring the desired variable rather than a third unknown formation process.

Because the measurement of a variable becomes an integral part of the definition of that variable, archaeological measurement of inequality and heterogeneity requires consideration of both theoretical and technical issues. Specifically, the range of social parameters that can be included in such measures is great and, to a certain extent, dependent upon how the researcher classifies the data. What is measured must reflect both the theoretical issue at hand and the archaeologist's ability to reconstruct social structure.

In attempting to measure heterogeneity archaeologically, it is useful to focus on residence groups and institutions (Cannon and Hayden 1981). Cannon and Hayden (1981) define *residence groups* as "those which come into being as a result of strong economic or environmental pressures, and which, as a result, exhibit a recognizable degree of residential coherency." *Institution,* on the other hand, refers to a social group that does not form a residence grouping, but has an existence past the life span of its members. This focuses our considerations on the enduring structural characteristics of societies and eliminates from consideration more ephemeral phenomena, such as task groups that form for a specific purpose and then disband. Cannon and Hayden (1981), in an ethnoarchaeological study of 150 contemporary Mayan households, found that residence groups and institutions provide archaeologically recoverable units of analysis.

I would propose that heterogeneity can be measured in terms of the distribution of a population between residence groups and institutions. In order to also deal with the mechanism of integration in societies, this measurement must be done in terms of the three processes of change identified earlier in the chapter. These processes produce social structures with various combinations of concentric integration and intersection.

Inequality is a characteristic of any graduated social parameter, but, as I have already pointed out, the distribution of power is theoretically most fundamental to the study of cultural evolution. As is true for all graduated parameters, power can be thought of as either a zero-sum quantity or in terms of its absolute value. Increasing the number of residence groups and institutions increases the number of social groups and individuals that can be controlled by increasing the absolute sum of power in the culture (Adams 1975, 1977). In general, however, the relative concept of power is of the most interest because it has the greatest effect on human behavior within a society. The pool of absolute power limits the range of action open to individuals in a society, but it is power as a zero-sum quantity that determines what actions

individuals will take within this range. Unfortunately, even in extant cultures, relative power cannot be directly measured on a societal level (Blau 1977:225–226). Some other variable that reflects the distribution of power must be substituted for it.

Many sources of power can exist in societies, but the control of economic resources is the most basic because all people have some interest in these resources and they provide a generalized means for a great variety of ends (Blau 1977:224; Lenski 1966:44). The total amount of wealth an individual controls provides the basic measure of economic power. The emphasis here differs from that of most Marxist theory since control and not ownership is seen as most important and control can take many forms, such as ownership or executive authority. For example, the Pope may own little or nothing, but the church he controls is one of the world's wealthiest entities. Different forms of control may appear at different points in cultural evolution, each form having different implications for the manipulation of wealth, but the underlying principle of control transcends all cultural evolution. Control of wealth results primarily from an individual's ability to manipulate the wealth of a social group. Given the intimate relationship between power as an aspect of social position and the power of a collective, the inequality in wealth between social groups (i.e., residence groups and institutions) should reflect the inequality in power as a product of social position. This means that inequality, like heterogeneity, can be measured as a phenomenon of both groups and individuals.

Archaeologically examing both individuals and groups provides two indicators for the variables of inequality and heterogeneity. These indicators, furthermore, can be derived from two different classes of archaeological data: burials and architecture. Burials provide the best class of data for determining the wealth and roles of individuals because in no other class of data are individuals so clearly associated with the material residue of these social parameters. Architecture is built by social groups, both residence groups and institutions, to house and-or symbolize their activities. For this reason, it can be expected to reflect the number, type, and interconnection between such groups as well as their wealth (Cordy 1981:49–87).

Of these two indicators, archaeologists have paid the most attention to bruials. A considerable literature exists discussing the problems inherent in measuring both roles and wealth using burials (Bartel 1982; Binford 1971; Braun 1981; Rathje 1971; Saxe 1970; Tainter 1978; Ucko 1969). With the notable exceptions of Arnold and Ford's (1980) analysis at Tikal, and Cordy's (1981) analysis of Hawaii, little attention has been paid to using architecture to measure these variables. In the interest of brevity, I will not explore the implications of my view for burial analysis but will discuss one approach to measuring these variables using architecture. This approach will

be discussed in terms of a specific archaeological region, the United States Southwest.

MEASURING CULTURAL EVOLUTION: THE SOUTHWEST

Almost 100 years of Southwestern archaeological research has established the usefulness of architecture for identifying social groups, especially residence groups. Many Anasazi archaeologists recognized that architecture resulted from the needs of social groups and, therefore, was a physical reflection of such groups. They noted that large pueblos were not random associations of rooms and kivas but were composed of smaller units (Bandelier 1884; Brew 1946; Fewkes 1919; Haury 1958; Mindeleff 1900; Morley 1908; Prudden 1903, 1914; Roberts 1939; Roys 1936).

Recent architectural identifications of social groups have formalized the methodology, emphasized the economic importance of the groups identified, and attempted to apply the approach outside the Anasazi area. Both Rohn (1971) and Dean (1969) have continued to expand on Prudden's basic concepts by emphasizing the relations of access and dendrochronology. Both these authors perceived these groupings as economically important and demonstrated the correlation of architectural units and areas of domestic activity. More recently, Wilcox (1975, 1976) formalized many of the basic assumptions involved in such analysis. Finally, Doyel (1974), Wilcox and Shenk (1977), and Wilcox *et al.* (1981) have attempted to expand this methodology by applying it to Hohokam sites.

Not all prehistoric edifices were the product of corporate residential groups. Many were clearly the constructions of institutions. These groups construct architectural units to house their activities and-or to symbolize their existence. Archaeologists have long recognized a variety of structures as the material representations of such institutions, such as kivas, great kivas, ballcourts, and great houses. Isolating residence groups and institutions provides the units for measuring heterogeneity and inequality. Having identified the units, I will now discuss what characteristics of those units reflect changes in heterogeneity and inequality. For heterogeneity, this requires consideration of the three structural processes of change discussed earlier. For inequality, this requires discussion of how architecture would reflect differential control of wealth.

The number of hierarchical levels in an archaeological case can be measured by examining the hierarchical relationships of corporate residence groups. As both Prudden and Fewkes recognized, archaeological sites consist of hierarchically related architectural units. The minimal unit would be a household consisting of a room or pithouse with a hearth and associated

storage rooms, features, and activity areas. That is what Winter (1976) refers to as a *household cluster.* Such households can be grouped into larger units that correspond to Prudden's *unit Pueblos,* Rohn's (1971) *courtyard units* and Doyel's (1974) *plaza* and *room units.* Such units may represent a village, as in Prudden's unit pueblos, or they may be combined together to form villages—a third level of hierarchy (Figure 3.5). In some regions—including Chaco Canyon, the Gila-Salt Basin, and Casas Grandes—features like roads and unique sites give evidence of a fourth or even fifth level of interregional organization above the village.

All the above examples refer to one type of nominal parameter, residence groups. Such groups probably correspond to kinship groupings and repre-

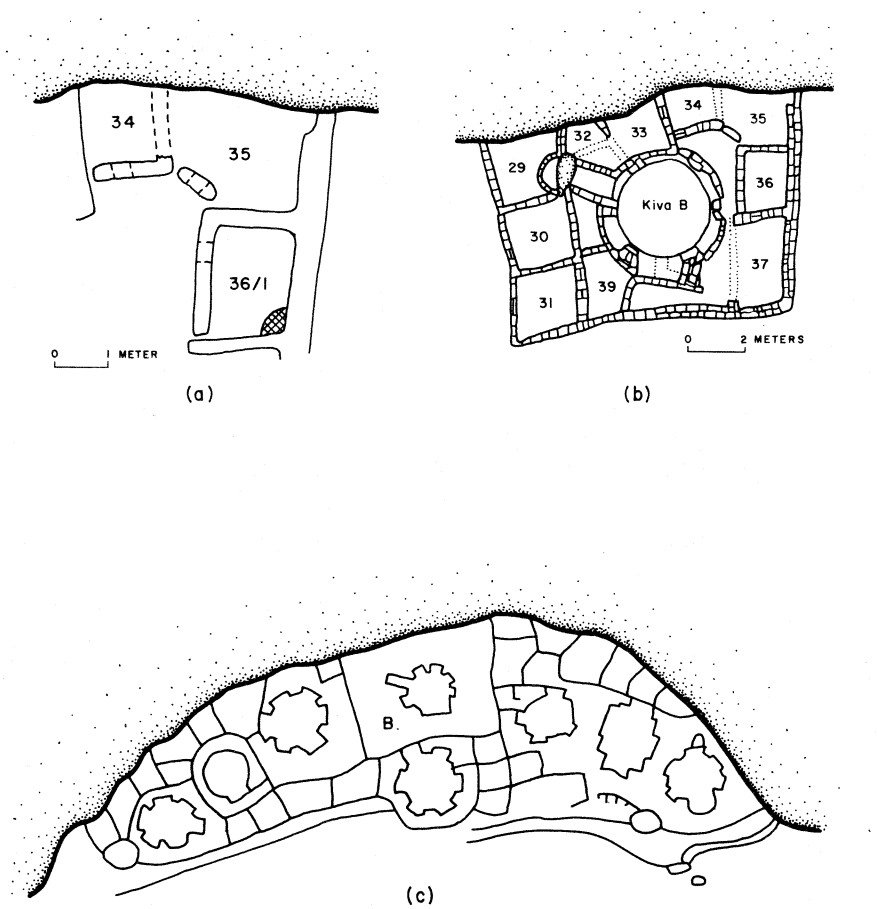


Figure 3.5. Hierarchy of social organization at Mug House: (a) household 36/1, (b) courtyard unit B, and (c) Mug House village. (Rohn 1971).

sent one line of inequality in a society. The existence of edifices that do not house corporate residence groups indicates the presence of additional types of nominal parameters, and concurrently, additional potential hierarchies.

Independent parameters arise in large part due to the existence of institutions separate from kinship groups. The establishment of institutions, such as Keresan clown societies or the bureaucracy of Middle Kingdom Egypt, creates intersecting lines of relationship between corporate residence groups. These institutions require built space to house their activities, and the more individuals in the institution, the greater the amount of built space required to house it. The heightened importance of such institutions should result in an increase in the ratio of nonresidential to residential built space. The process of increasing independence of parameters will ultimately destroy the architectural patterning of corporate residential groups because, as individuals increasingly center their lives around institutions instead of kin groups, they should increasingly define their residence in terms of their institutional membership and not their kin ties. This deterioration of residence pattern almost certainly does not occur at the levels of heterogeneity normally encountered in the prehistoric Southwest.

These architectural relationships provide measures for each of the processes of change in heterogeneity. Increasing levels of hierarchy are reflected in the number of levels of organization for residence groups; the number of differing institutions provides an estimate of the variety of dimensions or hierarchies of inequality; and the ratio of residential to nonresidential built space provides an indication of independence of parameters. This last ratio should be calculated by adding the quantity of residential built space (r) to the quantity of nonresidential built space (nr) and then dividing this total by the quantity of residential space (r): $(r + nr)/r$. This will yield a number between one and infinity. Considering each of these measures independently would allow for testing the hypothesis that they are sequentially ordered in their importance for changes in heterogeneity. As discussed earlier, the first two of these processes have additive effects on heterogeneity, whereas the third, increasing independence of parameters, has a multiplicative affect. A measure of heterogeneity can be derived by adding the number of levels (A) to the number of types other than residential (B) and multiplying this total by the ratio of residential to nonresidential built space: $(A + B)[(r + nr)/r]$.

Measurement of the second aspect of cultural complexity, inequality, also can be derived from considerations of corporate residence groups and institutions. Two different features of the archaeological record can be used to generate Lorenz curves. First, the investment of labor in buildings of both corporate residence groups and institutions can be used. Arnold and Ford (1980) have utilized a similar technique to measure inequality at Tikal. Second, the volume of storage facilities associated with both corporate

residence groups and institutions should reflect the wealth of such groups. It is important that institutions be included because they represent wealth controlled by the individuals who direct such institutions. Once such Lorenz curves are constructed, an index, such as Gini, can be used to summarize the inequality in the case.

In order to demonstrate the practicality of this approach, I have applied it to the Casas Grandes sequence in northwestern Chihuahua and the Hohokam sequence in the Gila Basin. I derived the data for the Casas Grandes sequence from the work of Charles Di Peso (1974; Di Peso *et al.* 1974). The data for the Hohokam were drawn from a wide variety of researchers and sites (the latter, most notably Snaketown and Casa Grande) (Doyel 1974; Fewkes 1912; Gladwin *et al.* 1937; Hammack and Sullivan 1981; Haury 1945, 1976; Hayden 1957; Johnson 1964; Weaver 1977; Wilcox and Shenk 1977; Wilcox and Sternberg 1981; Wilcox *et al.* 1981).

Architectural development in both sequences is similar to other areas in the Southwest, involving a shift from pithouses to adobe compounds and, finally, to multistoried adobe buildings. Pithouses characterize the Convento and Pilon phases at Casas Grandes and the Pioneer through Sedentary periods among the Hohokam. Contiguous adobe rooms built around a plaza or compound appear during the Perros Bravos and Buena Fe phases at Casas Grandes and in the Soho and Civano phases among the Hohokam. Multistoried adobe buildings were built in the Civano phase by the Hohokam and on an even more massive scale at Casas Grandes during the Paquimé phase. In both sequences public architecture includes platform mounds and ballcourts.

Considerable disagreement exists concerning the development of heterogeneity and inequality in these sequences. Di Peso (1974) posits only slight changes in both these variables from the Convento to Perros Bravos phases, sharp increases in both during the Buena Fe and Paquimé phases, and then a sharp decline in both during the Diablo phase. Haury (1945, 1976) allows for little or no change in both variables throughout the Hohokam sequence, whereas a variety of other researchers (Grady 1976; Plog 1980; Wilcox *et al.* 1981) reconstruct a steady growth in these variables from the Pioneer to the Civano. Finally, Doyel (1977) sees values for both variables increasing from the Pioneer to the Civano and then declining in the Soho and Civano. My analysis provides a quantified test of these reconstructions and a basis for comparing cultural evolution between the two sequences.

The residence groups and institutions defined for this analysis utilize distinctions previously interpreted by other researchers. The basic residence unit used in both sequences was a family cluster. Di Peso *et al.* (1974) defined these for Casas Grandes, whereas Wilcox *et al.* (1981) and Doyel (1974) have established criteria for delineating such groups in Hohokam sites. In both cases a *family cluster* consists of several households either connected by

doorways or sharing a common courtyard. These clusters are organized into higher level units called *plaza clusters* at Casas Grandes (Di Peso *et al.* 1974) and *groups* in the Hohokam sites (Howard 1982). I derived my regional level interpretations for the Hohokam from Wilcox (1979) and Upham and Rice (1980) and for Casas Grandes from Di Peso (1974).

Labor estimates were based on data from Erasmus' (1965) earth and stone moving experiments in Mexico. Using this information, masonry construction was figured at 8.5 person-days per cubic meter, adobe construction at 5.25 person-days per cubic meter, and excavation at 2.6 person-days per cubic meter. These estimates allowed a comparison of energy investment between quite different features, such as family cluster adobe rooms and large public ballcourts.

The metric volume required for each feature was either taken from the descriptions of the excavators or calculated from scale drawings in the report. What is important about these figures is not that they accurately reflect total labor input but that they do permit estimation of relative person-day expenditures.

Table 3.2 summarizes the analysis of heterogeneity for the Casas Grandes sequence. The sequence shows a steady growth in the number of levels and

TABLE 3.2
Heterogeneity and Inequality at Casas Grandes[a]

Phase	*A*	*B*	$r(m^2)$	$nr(m^2)$	$(r + nr)/r$	*H*	Gini index
Convento	Household Village	0	90.48	45.25	1.50	3.00	.2
Pilon	Household Village	0	110.15	68.37	1.54	3.08	.2
Perros Bravos	Household Family cluster Village	1	227.08	34.21	1.15	4.60	.2
Buena Fe'	Household Family cluster Plaza cluster Village	1	6,428.00	1,471	1.33	6.65	.5
Paquime'	Household Family cluster Plaza cluster Village Region	2	29,951.18	24,320.81	1.81	12.67	.8
Diablo	Household Family cluster Plaza cluster Village Region	2	47,000.71	9,442.62	1.20	8.4	.5

[a] *A* is the number of levels; *B*, number of institutions; *r*, residential space; *nr*, institutional space; *H*, heterogeneity measure.

institutions present. In both Convento and Pilon there exist only households (in the sense defined by Winter [1976]) and villages composed of groups of such households. In the Perros Bravos phase, several households occupy contiguous, interconnected rooms, identified as household clusters. Also in this phase, the *community house* appears as an institution separate from a family cluster. In the Buena Fe phase, family clusters are congregated around separate plazas to form *plaza clusters*. Each plaza cluster includes a community house but no institutional structures appear outside plaza groups. In both the Paquimé and Diablo phases, Di Peso (1974) has found evidence that Casas Grandes controlled a sizable portion of what is now modern Chihuahua, adding a fifth level of organization. Also in these two phases, institutional structures appear outside of plaza clusters. Overall, the trend in heterogeneity fulfills Di Peso's expectations of little change in the Viejo with a sharp jump and decline in the Diablo.

Table 3.3 summarizes the analysis of heterogeneity for the Hohokam sequence. The Pioneer period definitely contained individual households organized into villages and may have had family clusters (Wilcox *et al.*

TABLE 3.3

Heterogeneity and Inequality-Gila Basin Hohokam[a]

Phase/Period	*A*	*B*	$r(m^2)$	$nr(m^2)$	$(r + nr)/r$	H	Gini index
Pioneer	Household Family cluster? Village	1	659.75	0	1	4.00	.2
Colonial	Household Family cluster Village	1	894.41	955.49	2.06	8.24	.6
Sedentary	Household Family cluster Group Village Irrigation system	1	2096.21	1281.77	1.61	9.66	.8
Soho	Household Family cluster Group Village Irrigation system	2	1368.42	594.94	1.43	10.01	.8
Civano	Household Family cluster Group Village Irrigation system Region	2	2167.32	1979.45	1.91	15.28	.9

[a] *A* is the number of levels; *B*, number of institutions; *r*, residential space; *nr*, institutional space; *H*, heterogeneity measure.

1981:168). The Pioneer period construction of Mound 40 at Snaketown suggests that institutions other than residence units may have existed. In the Colonial period, family clusters definitely exist (Wilcox *et al.* 1981), and the appearance of ballcourts indicates the existence of institutions separate from residence groups. During the Sedentary period, family clusters appear to aggregate in larger groups (Howard 1982), and villages appear linked along irrigation canals (Upham and Rice 1980). In the Soho period, the number of institutions appears to increase because ballcourts continue and houses appear on top of platform mounds. Finally, in the Civano period, regional integration above the level of the irrigation system is suggested by specialized administrative centers, such as Casa Grande and Los Muertos (Wilcox and Shenk 1977), and at least two separate institutions are represented by the great houses, clan houses, and houses on mounds. Overall, this analysis suggests a steady increase in heterogeneity through the Hohokam sequence.

In calculating inequality, the unit of analysis was the family cluster and the institutions defined in the heterogeneity measures. Using the procedures described by Lorenz (1905), a Lorenz curve was produced from each phase, and Gini coefficients were then calculated (Shryock *et al.* 1973). At Casas Grandes, these coefficients exhibit no change in the first three phases but rise dramatically and then fall in the last three (Table 2). In the Hohokam sequence, they increase consistently from one period to the next, except between the Sedentary period and the Soho phase, when no change occurs (Table 3).

This analysis demonstrates quite different patterns of cultural evolution at Casas Grandes and in the Gila Basin. Inequality and heterogeneity change little at Casas until the Buena Fe phase, when both rise rapidly through the Paquimé phase to fall in the Diablo. Increase in these variables is more continuous in the Hohokam, with a slight plateau at the Sedentary–Soho transition. This analysis also suggests that Paquimé phase Casas Grandes was not as heterogeneous or unequal as Civano phase Hohokam.

CONCLUSION

I have, in these discussions, challenged several widely held assumptions concerning the nature of cultural evolution. We can no longer speak of developmental change in terms of a great divide between state and stateless societies. We must cease to assume that increasing inequality always accompanies increasing heterogeneity. Cultural evolution does not reduce to a unitary phenomenon measurable by a taxonomy or a single variable. Indeed, the latter conceptualizations lead us to unproductive taxonomic debate and bind us to the assumptions I question.

My model of cultural evolution breaks down the anthroplogical concept of cultural complexity into two variables: inequality and heterogeneity. Once this has been done, we can treat the suspect assumptions as research questions. The real value of this model lies not in the truth of my assertions about developmental change but in its potential for testing propositions concerning the nature of cultural evolution. Only by defining evolutionary change in terms of measurable variables can archaeologists test for the great divide or prove the unitary nature of culutral evolution.

More importantly, by discarding complexity in favor of measureable variables, we discard a "black box" concept of cultural systems. Our theories can then incorporate the internal relationships of societies that affect and effect developmental change with causal statements regarding change in material variables. This linkage leads away from a mechanistic determinism to a fuller understanding of cultural evolution.

I have by no means fully answered the question, "What aspects of culture have changed to create the gulf between Pleistocene hunter-gatherers and modern industrial world system?" In part, this is because many changes define this gulf and I have only considered those relating to social structure. Also, this is a research question of the same importance as explaining why this change occurred. Only by measuring the "change from a no-howish, untalkaboutable all-alikeness to a somehowish and in general talkaboutable not-all-alikeness," can archaeologists account for "continuous sticktogetherness and somethingelsifications."

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