

General Systems Theory

Douglas J. Kennett
Department of Anthropology
University of California, Santa Barbara
Santa Barbara, CA 93106

General systems theory has had a significant impact on contemporary archaeological thought over the past three decades. Prior to the 1960's there was no well established body of theory for exploring the prehistoric past. Traditional archaeologists were more concerned with describing the archaeological record and developing cultural chronologies. Dissatisfaction with this traditional approach prompted a new generation of archaeologists to develop more scientific approaches for understanding and reconstructing prehistoric human behavior. General systems theory, inspired by the biologist Ludwig von Bertalanffy, was one such approach advocated by archaeologists as a means for explaining stability and change in human cultural systems. The attractiveness of the systems approach was its focus on multivariate causality and its emphasis on the interrelationships between components of prehistoric cultural systems.

Resurgence of evolutionary theory in the field of anthropology during the early 1960's set the stage for the development of a systemic view of culture and the use of systems theory in archaeology. The earliest and strongest proponents of systems theory were Lewis Binford in the United States and David Clarke in Britain. Binford (1962) conceived of culture as a system composed of technological, social and ideological subsystems. He argued that structural relationships in prehistoric cultural systems could be investigated through the careful study of artifact assemblages related to each subsystem. Likewise, Clarke (1968), influenced by locational analysis and general systems

approaches of the New Geography, envisioned social systems as inter-communicating networks of attributes or entities forming a complex whole. The more holistic approach that systems theory offered was quickly applied to a wide array of archaeological problems from the origins of agriculture in the Southern Highlands of Mexico (Flannery 1968) to the emergence of civilization in the Aegean and Mesopotamia (Renfrew 1972, Redman 1978).

Increase in the use of general systems theory in archaeology was paralleled by a debate focused on what actually constitutes a system. Systems are generally conceived of as a number of interrelated entities, components and subsystems that have discrete boundaries. Information flow coordinates a systems components in response to internal structural changes and stresses from the external environment. Changes are either regulated to maintain equilibrium (homeostasis) or amplified to promote system wide changes. Homeostasis is maintained by self-regulating mechanisms (negative feedback) that serve to prevent system wide changes or collapse. Changes are caused by the amplification (positive feedback) of small perturbations within the system. These irreversible changes either cause systems to collapse or develop until a new level of homeostasis is obtained.

As with most living systems cultures are open to the input and output of matter, energy and information. Therefore, cultural systems are extremely complex and have been defined by archaeologists in many different ways. Plog (1973) defined a cultural system as "a series of groups (families, communities, lineages etc.) exchanging goods, services and information with each other in such a way that change in one component of the system is likely to produce changes in the other." While Flannery and Marcus (1976) believed that systems were "characterized by exchanges of matter, energy and information among their components ." Yet, beyond recognizing the

systemic nature of culture there is no real consensus among archaeologists on how to define and measure the various variables, components and subsystems within a cultural system.

General systems theory was introduced into archaeology as a means for explaining why cultures change through time. This was one of the principle goals of the "new archaeology". Unfortunately, many of the initial applications of systems theory focused on how cultural systems operated in equilibrium. These static models made it difficult to explain cultural change. This led many archaeologists to the unsatisfactory conclusion that change must be stimulated by stresses external to the system. As a result, archaeologists were forced to rely upon "primemovers", such as environmental change and population increase, to explain cultural change. Reliance on these "primemovers" essentially undermined the multivariate approach that systems theory allowed for. The fact is, systems theory actually describes *how* cultures change rather than explaining *why* they change.

More recently, the use of systems theory has been criticized by "postprocessual" archaeologists for being overly mechanistic and functionalist. Postprocessual archaeologists argue that the emphasis that processual archaeologists place on cultural systems presupposes group adaptation and ignores the needs, aspirations and desires of individuals within the system. They also point out that due to the complexity of cultural systems the same factors may have different effects depending on individual circumstances. General systems theory is, therefore, overly reductionist and inappropriate for explaining complex cultural phenomena. Unfortunately, they have not provided an alternative approach for investigating the prehistoric past.

Although in recent years there have been few studies that explicitly use general systems theory, the underlying principles of the systems approach still exist in contemporary archaeology. Most archaeologists recognize that systems theory has provided unparalleled insight into the complex ramifications of cultural process. Although the explanatory value of the systems approach is questionable it does provide an explicit and practical framework to organize various components of a society. Coupled with recent advances in computer simulation and modeling, the systems approach may provide an effective means for investigating more complex interrelationships in human societies. If archaeologists recognize the limitations of the systems approach it can be used heuristically for exploring the prehistoric past.

Bibliography

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