

Introduction

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The publication in 1939 of Elsie Clews Parsons' monumental *Pueblo Indian Religion* marked the first time any scholar had ever attempted to summarize and synthesize what was known of all of the cultures of the "Pueblo crescent," ranging from Taos in the east to the Hopi mesas in the west. Despite its title Parsons' work represented an attempt at no less than a systematic assessment of the scholarly knowledge which had been accumulating since the energetic researches of Adolph Bandelier during the last quarter of the nineteenth century. Since then there have been several sophisticated, problem-oriented studies which vastly expanded our understanding of particular kinds of phenomena throughout the pueblos. Most noteworthy among these is Fred Eggan's *Social Organization of the Western Pueblos* (1950), which has long since taken a well-earned place among the classics of modern anthropology, and Robin Fox's *The Keresan Bridge* (1967), which applies the techniques developed in anthropology during the

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past two decades to the same range of problems with which Eggan dealt. Not until the publication of Edward Dozier's *The Pueblo Indians of North America* (1970), however, has there been another attempt to assess the full ebb and flow of Pueblo cultures, emphasizing prehistory as well as history, process as well as structure, and cosmology as well as social institutions. In an introduction to the late Dr. Dozier's work Fred Eggan noted: "The reader will find this volume the most satisfying and comprehensive account of the Pueblo Indians that has yet appeared."

In view of this justly deserved praise and the recency of Dozier's study, one might well ask what more can be said. In attempting to answer this question, I hope to accomplish what editorial introductions to volumes of collected essays too often do not, namely to take the reader behind the scenes to the conception of, and the rationale for, the volume. One reply to my hypothetical question is that both the number of anthropologists and the range of anthropological concerns have expanded so enormously since 1939 that no single volume can ever probe in sufficient depth all the problems with which scholars of the Pueblos are currently preoccupied. And even in 1939 Parsons required two sizable volumes to complete her summary. As convenor of the School of American Research Advanced Seminar out of which this volume grew, it was my prerogative to select the topics treated. In so doing I attempted to strike a balance between perennial problems and concerns peculiar to students of the Pueblos and issues currently being debated in anthropology as a whole; yet it was not possible to include everything worthy in either category. The selection consequently reflects my own biases as to just what the most important perennial concerns are, as well as what are promising new directions in research.

I especially regret not being able to devote more space to the complexities of contemporary affairs, and limit consideration of this area to John Bodine's original contribution only because Dozier's work summarized current trends among the Pueblos so well. Yet so very complex and interesting is the contemporary scene among the Pueblos that there should be a separate volume of this same size devoted to it. In view of Fred Eggan's equally monumental synthesis of Pueblo social organization and Robin Fox's detailed reappraisal and suggested re-orientation in terms of lessons learned and knowledge gained since 1950, I also decided to limit to one paper problems centering on kin-

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ship and social organization. I did this in full cognizance of the fact that if there is a center of gravity in social and cultural anthropology it is in the study of kinship and social organization.

Neither was it possible for us to address ourselves to many of the basically empirical problems which Parsons listed as needing research. Indeed, a surprising number of the gaps in knowledge that she noted remain. This is due in good part to the fact that many of the problems she lists have ceased to be regarded as important by the present generation of scholars, a reflection of the fact that anthropology among the Pueblos has, in important respects, developed in directions she did not envision. In part this is also due to the fact that some of the needed data simply are not obtainable, either literally or because the Pueblo people do not want to yield them to the anthropologist. The comparative scholar among the Pueblos, then, has always been faced with an incomplete ethnographic record.

This lack of comprehensiveness in the documentary record has had one general limiting effect for which we ask the reader's indulgence. It is that there could be no hope for balanced and systematic coverage of all of the pueblos under any one of the topic headings; comparable data simply are not available, whether it be for the Rio Grande pueblos alone, the western Pueblos alone, or for only those speaking a single language. It was in fact my original intention to limit the scope of the volume to the Rio Grande pueblos, but it soon became obvious that some topics (i.e., prehistory, world view, religion, and oral narrative) could not be handled very well if at all in that case. In other instances (i.e., ethnohistory of the Spanish period) it is possible to leave the western pueblos out of consideration and still not omit anything crucial. Our aim, therefore, became first that of attempting to present novel lines of inquiry and only second that of attempting to say something about all or even many of the pueblos. Thus while most of our essays represent reviews of the relevant and available literature and, therefore, are not about individual pueblos, it was sometimes difficult in practice to avoid exclusive reliance on single if substantial bodies of ethnography. The papers of Hieb and Tedlock, for instance, are based entirely on data from Zuni. Yet it cannot be said that this volume is about Zuni any more than it is about any other pueblo because the authors Louis A. Hieb and Dennis Tedlock are merely using the excellent data on Zuni sacred clown performances and oral literature, respectively, to

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illustrate their theoretical insights and new methods of analysis. In every instance where a choice had to be made we gladly sacrificed breadth of factual coverage for depth of theoretical treatment.

The essays reflecting perennial concerns—but handled in bold new ways befitting the ambitious title of this volume—are on prehistory by Richard I. Ford, Albert Schroeder, and Stewart Peckham, on Rio Grande ethnohistory by Schroeder, on social organization by Robin Fox, on religion by Byron Harvey, and on acculturation by John J. Bodine. The only editorial admonitions made to these and all other authors were general ones, the most important of which was to think in terms of a four-part outline when revising their essays for publication. The outline included an introductory section defining the problem and stating the aims of the essay; a brief review of at least the most important works bearing on that problem, topic, or area of research; the analysis; and a summary section which would also point out new horizons. While this general outline could not be adhered to in all instances, whether for reasons of relevance or absence of data, each of the authors nevertheless succeeds admirably in summarizing efforts in these several areas to date, as well as in suggesting new directions for future research. Each essay also poses questions not asked before and points out limitations of past views of the problem treated.

The study of Pueblo languages has also been of continuing interest, but the question of how to involve Pueblo Indians in the quest for solutions to perennial problems centering on language has not. Kenneth Hale's paper addresses itself to this problem and, as such, has ramifications far beyond the pueblos. The basic lesson to be gained from this frontal assault on traditional preoccupations in linguistics is that the time is long past when individual linguists—or, for that matter, other anthropologists—can venture forth among the Pueblos and conjecture on the genesis, nature, and persistence of a language without involving the speakers as colleagues and full partners in the undertaking. This is a lesson all scholars among the Indian people would do well to heed.

Of those papers which address themselves to relatively uncommon subjects and methods of inquiry, Richard Ford's paper on ecology opens the volume because it was my belief that an ecological perspective should underlie and serve as a backdrop for each of the other essays. While arguing cogently for the application of a rigorous ecological method to the analysis of Pueblo subsistence data, Ford provides the

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best insights available to date on the mutual interaction and interdependence of ritual and subsistence variables through time. This kind of beginning provided for vigorous discussion among the participants during our seminar, so I suspect the reader will also not be disappointed.

The contributions of Louis Hieb, Byron Harvey, Dennis Tedlock, Donald Roberts and myself most clearly demonstrate the intrusion of my own biases in the planning of this volume. All of these papers have to do with the study of symbolic forms and actions. If there is a center of gravity to this volume it is here, in the study of religion and ritual, world view, and oral literature. I made these selections quite consciously because, while the study of symbolic action is one of the most promising of current modes of inquiry in anthropology generally, it is easily the least developed in the study of the Pueblos despite the fact that the Pueblos present an especially fruitful field of investigation of symbolic activity. Hieb's contribution and mine represent complementary perspectives on many aspects of Pueblo world view, and pose some challenging questions for subsequent investigation in this largely undeveloped but potentially very inclusive method of inquiry. Hieb's paper was not presented and discussed during our seminar; in fact it was not written until several months later. I invited it as a contribution because his argument lends the depth of the detailed case study to some of the issues underlying my own and other papers.

Byron Harvey attempted the formidable task of saying something interesting and reasonably comprehensive about Pueblo religion in a short essay. The result is a perceptive overview of Pueblo religious beliefs. Tedlock, in his turn, brings a methodology to the analysis of Zuni narrative in its total social and cultural setting which promises, thereby, to open up exciting new vistas to the student of Pueblo literature. Robert's essay renders considerable order and direction to the literature on ethnomusicology, an old but traditionally nonanthropological subject of investigation among the Pueblos. In so doing he presents both the attraction and the challenge of a topic which students of religion, ritual, and world view among the Pueblos can no longer ignore if our comprehension of these phenomena is to advance significantly beyond the rather uncertain state in which Parsons left them more than three decades ago.

I should like to conclude with a brief word about the audience to whom this volume is addressed. It is, of course, first and foremost a

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specialized book addressed to present and future students of Pueblo culture. This was our charge. Yet, despite the specialized terminology in which our reasoning is sometimes couched, we believe that interested lay readers and the Pueblo people themselves will also find something of interest within these pages. I believe I speak for my collaborators when I say that we consider ourselves students *with* as well as *of* the Pueblo people. Accordingly, we hope that flaws in our reasoning or our facts, when found, will be called to our attention by the Pueblo people. And now the reader may wish to turn to Fred Eggan's splendid overview at the end of this volume to find out what the eleven intermediate essays are *really* about.

An Ecological Perspective on the Eastern Pueblos¹

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INTRODUCTION

An ecological perspective has rarely been used for understanding Southwestern societies. Although many studies have purported to be ecological, some are merely natural historical statements while others are fallacious environmental deterministic assertions. What then do I mean by “ecology”? In this study ecology is defined as the interrelationships between living organisms and their biotic and physical environments. Implicit in this definition is the idea that a human society is a biological population that interacts with other populations: plant, human, and nonhuman animal. Ecology, then, is dynamic and processual; an ecological statement is not a static, descriptive one, such as the fact that Tesuque Pueblo is in the Upper Sonoran life zone. Moreover, this concept does not assume as its basis a tripartite division of culture—technology, social organization, ideology; instead, each of the interacting or mutually affecting variables is examined without necessarily referring to traditional cultural subsystems. This last point is one of

several that distinguish this approach from Steward's excellent antecedent studies (1955).

In this study some additional definitions and assumptions must be clarified. The ecological variables can be viewed from a systemic, or ecosystemic, perspective. A system is a set of interactive variables such that a change in the value or state of one will cause a change in at least one other variable. Such a dynamic relationship can be measured quantitatively by monitoring the flow of energy of solar derivation through the system and by tracing the cycle of nutrients within the system. But this approach need not restrict us, since one can also study the interacting variables qualitatively in the absence of exact quantitative information.

The partitioning of the system depends on the analyst's problem. Some ecologists focus on large geographical units such as a lagoon ecosystem or a forest ecosystem. Following another approach anthropological studies focus on a human population and its relations with other biotic and abiotic variables. A study examining the interspecies interaction of a pueblo with its local environment is actually delineating a local system, since the village also exchanges goods and services with other human populations, Puebloan or not, in a regional system. However, by monitoring the energy flow, one readily learns that for practical purposes the local system is the ecosystem for a particular village.

Furthermore, my use of the term "environment" needs explication. Environment consists of all the factors, biotic and abiotic, operating in a given area; nevertheless, some of these may not be immediately important for understanding a given system. Consequently, one must distinguish the effective environment (Allee et al. 1949:1) which is those variables of the universe external to the population that are directly or indirectly important to its survival. But, members of the human population under study may view their environment in terms different from those of the outside investigator. The informant's categorization and explanation of his environment is called the cognized environment (Rappaport 1965:159). If one accepts the definitions employed here, it is immediately apparent upon comparison that many so-called ecological studies are merely environmental descriptions.

A population is defined as all the organisms of one species living in a given area. As with any population, a human population possesses

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an age and sex structure and has nutritional requirements. Population variables have often been overlooked in Southwestern ethnography.

In addition to a system's interacting variables, its regulatory or control mechanisms must be examined. Each variable has an acceptable range of values; however, when one or more deviate from a normal range of variation, certain mechanisms may operate to return anomalous variables back to their acceptable range, thus preventing breakdown or change. Each system must be viewed over time with each variable customarily having changing values and with different regulatory mechanisms operating at various times and by several means. One way is that connections between the variables may have a feedback function. Another is for certain special rituals to function automatically whether or not the system is jeopardized. These and other mechanisms may operate in a given ecosystem.

With the previous assumptions and definitions providing a background, this study will present a description of the effective environmental variables which impinge on each eastern Pueblo system and will discuss how certain regulatory mechanisms affect the maintenance of the human population. More specifically, I hope to test the hypothesis that in an egalitarian society living in an effective environment with unpredictable and potentially disastrous fluctuations of biotic and abiotic variables, reciprocity and ritual will regulate the circulation of nutrients for the survival of the human population. This will be tested by examining the effective environment, productivity, population requirements, and regulatory mechanisms which have operated in the eastern Pueblos within the historic period and especially at the turn of the century.

EFFECTIVE ENVIRONMENTAL VARIABLES

A number of factors affect the local and regional productivity of domestic and nondomestic plants and animals necessary to provision a Pueblo population. These include solar energy, soil nutrients, precipitation (rain or snow), temperature, frost, wind, hail, and animals.

Since we are delineating open systems, energy must come into the system from outside. The ultimate source of energy for the food chain is from the sun. Although it has not been measured, the amount of solar energy available to each pueblo during the growing season may

show some variation; more importantly, however, the amount reaching each farmer's fields within a particular village field complex is probably equivalent. Measurable variation certainly occurred in the past, but, for purposes of this study, it is only necessary to mention the role of solar radiation.

Soil nutrients from one village field to another are not identical. Yet, despite the fact that agronomists can show differences in the amount and availability of certain nutrients within any village's field complex, eastern Pueblo cognized or native taxonomic soil categories do not show these distinctions. Soil classifications may not be well developed, but Pueblo farmers do notice that certain fields or areas yield more than other areas. In addition to soil differences the fertility of fields in marginal areas abutting arroyos and gravel terraces can change very rapidly as a result of flash floods carrying sterile, sandy alluvium, which can drastically lower a field's potential productivity. The extreme severity of such events is best dramatized by recalling that floods in 1886 not only destroyed the fields around Santo Domingo but also the village itself. The significant point for this study is that not all farmers have fields of equal productive value, and even good fields can have their potential dramatically changed.

The moisture budget is particularly important for successful agriculture in New Mexico. Most ethnographers have noted the low level of annual precipitation in the Rio Grande Valley but not its full implication. An abundant snowfall is necessary for moistening the soil and recharging the water table, and generally speaking, snowfall is evenly distributed over the field system of any one community. But the same cannot be claimed for rainfall. The amounts reaching various fields used by the same village can vary markedly. It is not uncommon for, let us say, the southern series of fields at San Juan Pueblo to receive more rain than those north of the village one year but not the next. Furthermore, the epicenters of some storms are not very extensive, with the result that a lineal band of fields profit from a given storm while others receive amounts of rain too limited to be used by plants. In the case of severe storms, crops in the storm's path may be damaged while others are spared. To further complicate the problem, even with irrigation no farmer can predict whether or not his field is going to receive adequate moisture. The Indians also recognize that successful irrigation, maintained by high river levels, depends upon abundant precipitation at

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higher elevations in northern New Mexico and southern Colorado. Sometimes irrigation water is ample when local rainfall is subnormal, but at other times, despite the investment of time and energy for building and maintenance, the ditches are empty. This situation is historically verifiable as well; Benavides (Hodge, Hammond, and Rey 1945:69) noted famine among the Tewa for a lack of irrigation water. Thus, for each pueblo available moisture from precipitation and irrigation fluctuates unpredictably. The system must adapt to these extreme conditions and not to the deceptive mean values which are usually presented.

Another climatic variable is temperature. Although each pueblo may have a different mean temperature, within a pueblo temperatures do not vary greatly from one field to another. There is, however, one exception to this statement, and it is frost. The occurrence of the first and last frost can vary greatly—under extreme conditions by as much as two months, and to complicate the situation, these late spring and early fall frosts generally do not affect all fields within a village. Consequently, some farmers' plants may be unaffected while those in an adjoining field may be severely damaged, if not destroyed.

Wind is important for its evaporative effects which limit available moisture, but it also has other consequences. Violent winds often damage crops and fruit trees. Severe summer wind storms are frequently accompanied by hail, which can shred corn leaves, puncture cucurbits, and strip annuals and trees of their produce. However, such damage is not always widespread. As another phenomenon of summer storm epicenter movement, wind and hail may denude some fields while others remain unscathed.

In contrast to the abiotic variables just mentioned, the last effective variables to be presented in this chapter are biotic—insect, quadrupedal, and human. Often grasshoppers and other insects are sparse in each field, causing minimal damage. But on other occasions they swarm in one or more areas of the field complex and cause extensive damage; as an example, informants in many pueblos testify that grasshoppers sometimes destroy fields on only one side of the Rio Grande. Of the quadrupeds, rabbits, skunks, deer, elk, and even bear can damage individual fields. Again, Benavides (Hodge, Hammond, and Rey 1945:39) recorded the destruction of crops by rabbits. Each of my Picuris informants who has killed a bear did so while the animal was raiding his corn fields or apple trees. From this systemic perspective it appears that

the damage by skunks is increasingly more severe because the coyotes which controlled the skunk population are being wantonly shot. The final type of destruction to be mentioned here resulted from nomadic raiders who stole harvest and butchered domestic animals. All villages have accounts, varifiable by historical documentation, of damage caused by Navajo, Apache, Ute, Comanche, and on rare occasions Cheyenne and Arapaho. As one would expect, their appearance was irregular as well as unannounced.

At the next level of analysis these factors are systemically connected and affect plant and animal productivity. Precipitation, temperature, and wind all concern available moisture needed by edible wild and domestic plants and by grasses which support domestic herds and which are browse for deer and elk. Productivity also relates to other systemic factors besides those already discussed. For example, an expanding human population can bring more and consequently marginal land under cultivation which in turn affects yields and vulnerability to predatorial or erosional destruction.

In summary, it is not enough to describe a pueblo's effective environment as arid or some other classificatory term. The Pueblo Indian has to deal with a variety of factors that are neither regular in their occurrence nor equally pervasive in their effect. I am arguing that it is precisely to these unpredictable environmental fluctuations that individual pueblos must adapt. The consequences of such an environment are manifest: one farmer can lose his entire crop while another can have a bumper crop; the very next year the reverse may be true. To explicate this phenomenon further, computation of an energy budget is necessary.

POPULATION AND PRODUCTION

Similar to other biological populations, human societies consist of individuals of different ages and sexes with concomitant physiological needs. Ecologically speaking, population variables have been ignored in Southwestern ethnography to the detriment, I think, of an understanding of fundamental Pueblo institutions.

Since a given population must be provisioned, it is necessary to calculate its caloric expenditure and other needs and then to determine how these requirements are met. Although the data were not the best, I attempted this for the San Juan population (Ford 1968). By comparing

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analogous activities of known expenditure values to native activities and by taking into account the age and sex structure of the population about 1890, I estimated that the population's sustenance requirement was approximately 354,710,000 calories per year. This figure should not be interpreted literally, but it does provide a comparative guideline.

In contrast, I tabulated the energy input from total production of cultigens, 322,620,000 calories; domesticated animals, 42,135,000 calories; wild plant products, 12,430,000 calories; and wild animals, 5,550,000 calories. These total 382,735,000 calories which indicated that there was less than two month's surplus. However, to understand the implications of these figures we must examine the basis of Pueblo production.

Subsistence products are obtained by individual households, which may or may not be extended. The male member of each household tends his own and his spouse's fields; at harvest time there is sometimes cooperation between relatives, friends, and/or neighbors. In addition to hunting alone or with a friend, each man has sole access to his own domestic animals, even though they may be pastured by old men, war captains, or others assigned to the task. Besides preparing these foods, women collect edible plants, and all members of the household collect pinyon nuts when they are available. In some villages the men corporately plant and harvest the cacique's fields; they also hold communal rabbit hunts and, in times past, deer drives with a cacique, a sodality, or individuals receiving the meat.

Recalling our discussion about the environmental factors which limit production, it was shown that some farm losses are quite variable. Consequently, even though a village may have a food or caloric surplus in a given year, individual households may have only a marginal yield or even a catastrophic year. Pueblo folklore recalls famine and times of hardship; yet there was no person in authority and no formal kinship means for spontaneously and regularly assisting those in need, as illustrated by this quote from Stevenson (1894:12):

Each year a period comes, just before the harvest time, when no more pottery is required by their Indian neighbors, and the Sia must deal out their food in such limited portions that the elders go hungry in order to satisfy the children. When starvation threatens there is no thought for the children of the clan, but the head of each household looks to the wants of its own, and there is apparently indifference to the sufferings of neighbors.

How then is household surplus recirculated? In certain societies, such as in Polynesia, a hierarchical authority distributes surplus to those in need of certain commodities (Sahlins 1958), but such a personalized authority does not exist in Pueblo cultures. I would argue that Puebloan societies, despite many structural differences, are egalitarian (Fried 1967) since positions within the society are not hereditary and since each official's performance is checked by others who remove fellow officers in case of malfeasance. Thus there are no persons empowered to coerce surplus from households other than their own. Similarly, because of this social structure, the effective communication of information about subsistence needs is difficult because each household has a different yield and, concomitantly, a different empirical basis for evaluating the received information.

At this point we have described a problem in which environmental variables may cause random errors in the productivity or energy flow that need to be corrected. These errors are variable from one year to the next and from one household to the next. To solve this problem, we must consider reciprocal relationships within the framework of calendrical rituals and critical rites (Titiev 1960) to discover how the productivity of the community is impersonally regulated to meet household needs.

*REGULATORY MECHANISMS:
CRITICAL RITES AND
TIME-DEPENDENT RITUALS*

We have discussed regulatory mechanisms in the abstract. Our discussion now centers on how they operate within various Pueblo societies. In the absence of Pueblo ability to control the values of the various effective environmental variables that directly affect food production and population survival, a means is needed to overcome their detrimental effects. To test the success of such mechanisms, we must see if they actually operate to wrench food from well-supplied households and circulate it to other members of the community.

Within the pueblos any service performed by persons outside the household usually is rewarded by payment in food. And, it is presented during or immediately subsequent to the completion of the task. This

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etiquette, based on balanced reciprocity (Sahlins 1965), is operative at all levels within the society: the simplest acts of mutual assistance will be concluded by a shared meal or a gift of food; and formal gatherings of bilateral relatives or clansmen include a feast, while community activities, such as planting a cacique's field, incorporate a large and wholesome meal for all participators. Such reciprocity is also extended to the gods through the assemblage of vast quantities of food to symbolize the pueblo's success and to thank them for their benevolence. Later the food is redistributed either to the ritual participants or to the whole community. In the analysis that follows it will be seen that no individual gains permanent authority or power over others as a result of this relationship since payment is immediate. Also it is advantageous to have household members or at least close kinsmen in various sodalities because payment for their services is divided among the members who, in turn, often further proffer the produce to relatives.

The type of impersonal redistributions presented here obviously differs from that operative in ranked, inegalitarian societies. Generally speaking, in these societies discrete authorities, such as chiefs, arrange for storage and accrue prestige in the course of regulating the redistribution. In contrast, I view the impersonal, sodality-regulated redistribution as a variant. Here the redistribution is diffuse, with goods coming differentially from individual storehouses and dispersion occurring at various locations, depending upon the particular rite.

Turning first to critical rites, these involve changes in an *individual's* state of being—physiological, psychological, or social. Critical events include birth ceremonies, initiations, marriage, death, and sickness. In the eastern Pueblos each of these nonperiodic events involves an exchange of food for services rendered. The midwife, sometimes accompanied by an assistant, receives at least a basket of ground cornmeal or a bowl of stew for her assistance. At various water-giving ceremonies, inducting a child or new wife into a Tewa moiety, the mother or bride gives the cacique ground flour or bread which he shares with others assisting him. Marriage ceremonies often witness two large redistributions of food, one when relatives celebrate the Indian marriage and another following the Catholic ceremony when the entire village may be fed. At death relatives bring food to the survivors' home which is shared by all. No matter which type of Pueblo kinship system one examines there is a

common theme: an individual has numerous relatives, enabling him to participate in a number of occasions when food functions as the tangible symbol of reciprocal interdependence.

Initiations into sodalities are more complex, but they further illustrate the point. Although these are calendrical due to the prerequisite preparations, they involve a *permanent* change of status for an individual candidate. At these affairs the many baskets of flour and bread and bowls of meat provided by the initiate's family are shared equally by the households and relatives of sodality members, who have patiently devoted the past year to the revelation of their esoteric arts.

Sickness caused by witchcraft is cured by specialists acting either alone or in concert in the Tewa and Keresan pueblos. At the conclusion of such rites the patient's family presents the exhausted practitioners with food. In the past, even the Picuris or Taos patient who came to San Juan for curing paid in produce.

Lest one be misled, this is not to assert that the Pueblos give undue attention to the individual, for, as Ortiz (pp. 153-54) and others have persuasively argued, the opposite is the case. However, what is apparent is that there is a flow of food throughout the year, difficult to measure, but nevertheless important for survival.

It is during the annual or periodic calendrical observances, so rich in symbolism, that the greatest amount of food is redistributed. Many anthropologists have witnessed the public portions of these ceremonials, yet few quantitative data concerning them are available, but where they are available, it is clear that immense quantities are involved.

The following discussion sketches some illustrative descriptions of quantifiable calendrical ceremonies for each pueblo. However, presently and discouragingly, a detailed comparative ecological study is impossible for another important reason: complete ceremonial calendars are unavailable for the majority of the pueblos. This fact, combined with the absence of quantified data, militates against our understanding differences in the periodicity of the recycled food and the specific adaptive strategies employed by the various pueblos. Since available water, temperature, and other variables are different at, let us say, Taos and Isleta, one intuitively would expect the specific regulatory mechanisms and their occurrence to differ accordingly, but the published studies only suggest answers.

The published ethnographies for Taos only hint at these food re-

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distributions. Parsons (1936) states that feasting accompanied the presentation of a Scalp Dance and bread was thrown to dancers and villagers during the Rain Dance on San Geronimo Eve and Day. Curtis (1926:43) indicates that rabbits slain during a drive preceding each fiesta go to persons bearing the name of the soon-to-be-celebrated patron saint. In exchange the beneficiaries' wives cook the rabbits and grind corn to feed the dancers.

Rabbit hunts in other pueblos also show recycling of food among households. The Santo Domingo hunter receives lunch, while the Isleta maiden gives the hunter squash or ground meal. Tewa customs reveal a more complex arrangement. After a girl receives a rabbit from a hunter she brings him a basket of meal. Later he returns this basket filled with meat.

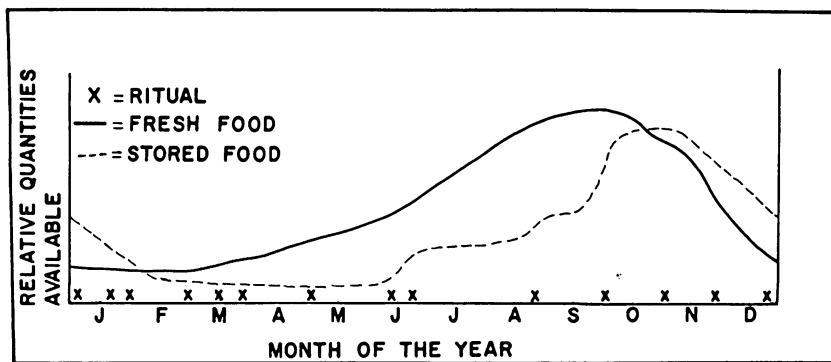


FIGURE 1. RELATIONSHIP BETWEEN AVAILABLE FOOD AND TIME-DEPENDENT RITUALS

Knowledge of calendrical rites with accompanying redistributions is probably best for the Tewa villages and San Juan in particular (Ford 1968; Ortiz 1969a). Figure 1 clarifies this assertion. I have plotted the relative amount of fresh food available to the population throughout the year. It is maximal in the late summer and early fall when the cultigens are ripe and the pinyon crop is ready. The amount decreases with the end of further vegetative foods but animals take up the slack with the commencement of bison and deer hunting. In winter, however, even animal meat becomes scarce as storms force the hunters to stay near the village. The amount reaches a yearly low when with the abatement of winter the animals move from the hills near the village back

into the mountains and when spring plants are not yet available. Spring increases the supply of fresh food as the migratory robins and bluebirds can now be trapped and plant roots can be obtained. The preparation of fields in the spring means the availability of greens and later fruits. This curve can be compared to the stored food.

Each household stores its own produce. The amount is greatest in the fall after the harvest and rapidly diminishes as it is the sole source of food for days on end in the winter. Most years the total amount within the community is ample to see it well into the summer with only a few households suffering shortage. Other years supplies are more critical.

A comparison of these two curves with each other clearly indicates that the late winter can be a very difficult period. But here is where the calendrical rites enter. They are most numerous in the very periods when they are needed to further assist households in short supply, and a brief description of some of these indicates how they operate. In January, Kings' Day is often celebrated with a Buffalo Dance administered by the Hunt society. It is followed by a communal feeding by the recently installed officers. The Deer Dance in February parallels the Rabbit Hunt in that the woman who catches the fleeting deer presents it with white or blue cornmeal; the basket is returned in four days filled with food. Following the Butterfly Dance, food is thrown from the housetops to the spectators by relatives of the dancers. After the ceremonial shiny ball is taken into a house, it is thrown out along with bread, apples, and other foodstuffs. Feasting in households accompanies the spring rite of the Yellow Corn Dance and dances on San Antonio's Day and San Juan's Day. On these occasions villagers eat in their own homes as well as with other households. The Early Harvest "work" in mid-August witnesses the bearing of vast amounts of fresh fruits and vegetables to the heads of sodalities. Later people seize what they can from the immense piles. The Harvest Dance, a biennial September rite, is also an occasion when fresh produce from the Made People's (Ortiz 1969a) personal stores is thrown to the villagers. During this one ceremony more than 1000 kilograms of produce are redistributed. In November following one sacred ceremony the Winter People feed the Summer People. (In some villages the Summer People reciprocate following one of their spring ceremonies). During other kachina dances the kachinas also bring presents of food to the people. Finally, in December both feasting and the pre-

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sentation of quantities of bread to dancers and *Kossa* alike are intrinsic aspects of the Turtle Dance.

While the Tewa fete friends and relatives in their houses on saints' days, the Keres follow a practice of throwing food and presents from the rooftops of homes of people bearing the name of the honored saint—San Antonio, San Juan, San Pedro, Santiago, Santa Ana, and San Lorenzo. The amounts distributed in this way are sometimes staggering; in the past, I am told, hundreds of loaves of bread, strings of chile, and even pottery were involved at Cochiti. (And more recently what anthropologist standing inconspicuously at the back of a crowd of spectators has not had to dodge a can of coke or beans!) However, recirculation is not limited to these events. At Cochiti during the *Ku-sha'li* (*Koshare*) dances, relatives throw gifts to the members who toss them to spectators. This is paralleled by the *Kwe'rana* Dance at harvest time (Lange 1959:308). In February there is reciprocal feeding by the kiva groups concluding the *Owe'e* Dance.

Curtis (1926:158–59) gives one of the few quantitative examples we have for Santo Domingo. Describing the San Juan fiesta and *gallo*, he noted that all the Juans (and probably Juanitas) gave food and hand-crafts to the participants who brought them to the church. By this means the principals received three to five wagonloads of food and clothing!

For the remaining Keresan villages we have additional, albeit incomplete, information about these redistributions. White noted at least nine occasions when it was part of calendrical rites at San Felipe (1932) and Santa Ana (1942). Two Sia ceremonies graphically described by White, especially when contrasted to the earlier quote from Stevenson about Sia, add further potency to the point.

Periodically the War Captains, assisted by their helpers (*gowat-canyi*), go about the pueblo in the evening. They have a drum. At the door of each house they sing and dance. People give them food, pottery, arrows, and other gifts. The War Captains take them to the rock that covers the entrance to the underground chamber. They give small portions of the gifts to the sacred rock; the rest they deposit in a pile nearby. After a simple ritual and prayers, the War Captain invites the people to help themselves to anything they want in the pile of presents. This they do with alacrity, and the whole affair is ended. (White 1962:53)

The second details the events concluding the *Opi* Dance in December.

After a song or two, men and women bearing presents in baskets, tubs, and blankets came into the plaza, up to the singers and started throwing their gifts: melons, dishes, squash, canned goods, cloth, bread, candy, feathers, hides, a young beef's head (skinned), pottery, garlic, chili, cigarettes, a large kerosene lamp, etc., to the singers who scrambled for them with great zest. (White 1962:261)

Isleta and Jemez also reveal the same pattern of calendrical rites associated with food redistributions. For Isleta, Parsons (1932) lists one summer and one fall ceremonial but five winter ceremonies at which food is given to participants and spectators. For Jemez the data about these rites are poor, but the information on the activities of the Women's society, Scalp Dance, and Hopi Dance (Parsons 1925a) suggest a function similar to that in other villages.

The preceding sketches are far from complete, but they serve to illustrate that in each village food is paradoxically both a gift of the gods and a fulfillment of reciprocal obligations. There is a paradoxical aspect in an ecological sense as well. Puebloan prayers and related sacred acts are intended to control the spirits behind the effective natural environmental variables, the most difficult of all to conquer and the very ones that modern climatologists wish they could control. But these ceremonies have the ecologically important latent function of prying surplus from household units for use by others, a most difficult task in egalitarian societies.

Calendrical rituals are examples of time-dependent regulation, since they operate irrespective of the state of any erratic variables causing difficulty for individual members of the pueblo. Sometimes a redistribution function is purely symbolic while at other times it is very important for assisting many members of the community. However without feedback loops this type of regulation is not cybernetic. Thus under the most severe circumstances when all households are suffering from simultaneous environmental deprivations, time-dependent control may fail, and other mechanisms are needed to assure the continuance of the population.

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REGULATORY MECHANISMS: FEEDBACK

Two additional customs found in the Pueblos need to be clarified in light of the above discussion: gleaning and the use of the caciques' stores. Found in all eastern Pueblos, gleaning permits poor people or those with a poor harvest to go into any harvested field to scavenge any foods left behind without the onus of begging for food from a lucky farmer. The other custom is the planting and harvesting of fields by the community for the cacique. Reportedly, he, in turn, provides food from his stores for needy families. My own investigations of this practice in Tewa and Keresan villages indicates that quantitatively very few families could be provisioned in this way for even a short period of time. Further, the practice is most prevalent in pueblos where the cacique is old and restricted in his capacities; therefore he is dependent upon these stores.

It cannot be maintained that these last two customs are not ecologically important; but the caciques' stores simply cannot accommodate large numbers of people and gleaning is a one-shot affair in October when storerooms are full. Obviously, other institutions need to be examined.

When the Pueblo system is severely jeopardized, it appears to be a result of a change in the ratio of a village's population and the local carrying capacity caused by the mutual effects of a constellation of anomalous variables. Regulatory mechanisms to change this ratio by means of feedback loops are needed, and the literature suggests several possibilities.

One is migration of the entire community to a more favorable location. The cause of the move may be cognized by the community as the failure of the gods to respond to their propitiations. Such a mechanism appears to have pre-Hispanic implications. Historically, accusations of witchcraft did lead to the exodus of individual families from pueblos which may have had a feedback effect.

Another regulatory mechanism is warfare within a regional system causing either a decrease in population or causing a population to move. However, Pueblo warfare is not well-known and admittedly this mechanism has not operated for more than a century at least.

It becomes apparent that life in the pueblos was not as easy as intro-

ductory anthropology texts lead us to believe. Although it is far from adequate, our knowledge of nonfeedback types of controls is superior to these with cybernetic connections.

COMPARISONS AND CONCLUSIONS

The regulatory role of ritual for assisting the survival of a population is not unique in the non-Western world. The most elegant analysis available is the now famous study of the Tsembaga Maring, a nearly pristine New Guinea tribe, by Rappaport (1967, 1967b). He found that ritual practices regulated a number of interacting variables—pigs, people, acreage, warfare—on a *nonperiodic* and cybernetic basis. Similar long-term ritual regulation is not described for the eastern Pueblos. But Rappaport's work certainly shows how important multivariant regulation is. Much more work is needed in the Pueblos. Even though I have suggested two mechanisms, they may not have worked and must be demonstrated by further study.

Contrasting with Rappaport's work, this study has stressed control by time-dependent rituals. The difference is extremely important because the mechanisms he described actually rectify deviant variables while those described here merely increase the availability of stored food to people who need it without correcting the causes of the problems themselves.

The impact of the Spanish on Pueblo ecosystems must not be ignored. Some of the calendrical ceremonies mentioned in the text are introduced saints' days, but whether they replaced native ceremonials or were additions to the existing repertoire is debatable. No matter what the answer is to the problem of food shortage, the redistribution of food and other goods is firmly embedded in these rituals. What is known is that the Pueblo's subsistence base certainly became more secure and expanded with new varieties of established foods as well as new foods. Nevertheless, these Catholic rituals are also time-dependent.

This paper has shown that Pueblo population survival can be very precarious at times. Since there are a number of effective environmental variables that affect household productivity on a microgeographic basis, means are needed to bolster some households, even when the village as a whole shows a surplus. Furthermore, as household provisions diminish differentially, mechanisms are required to accommodate families

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whose stores are exhausted at later dates. Even a once or twice per year redistribution probably could not serve this purpose; recurrent events are required, some random (critical rites) and some nonrandom (calendrical rites), in order for the system to be regulated under these circumstances. However, more serious deprivations require some type of feedback with more permanent effects. Migration caused by perceived ritual ineffectiveness (or perhaps witchcraft) and warfare are two suggestions that in all likelihood archaeologists will have to verify.

Ecologically, this study shows that certain systems such as the Puebloan are programmed to operate automatically to counteract crises and stressful times. However, if we continue to merely describe the environment in terms of mean climatic factors and neglect their extremes and other vicissitudes or simply place a village in a geographical location, we miss the functions of many cultural institutions at different levels that a thorough ecological study can reveal.

NOTE

1. This study was partially supported by NSF Grant GS-659 and by the University of Michigan Museum of Anthropology. Although I am responsible for the ideas expressed in this paper, I want to thank Professors Roy A. Rappaport and Kent V. Flannery for their invaluable ideas and comments about time-dependent rituals.