demystification, enriddlement, and Aztec cannibalism: a materialist rejoinder to Harner

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Harner's hypothesis (1977) that the Aztec human sacrifice/cannibalism complex can be interpreted on the basis of protein deprivation poses serious substantive, interpretative, and epistemological problems accorded insufficient attention by Harner. These are exacerbated, furthermore, by the extension of the hypothesis to explain the patterning of state-organized warfare, imperial expansion, and demographic strategy. The present critique suggests that his essay renders opaque what it claims to demystify. Perhaps this is in part a function of the inherently sensationalistic nature of the subject matter; in part too, however, there are certain limitations in the manner in which the original theoretical model was constructed. The following discussion develops an alternative, more powerful explanatory model for the behavior in question and adopts somewhat different procedures for doing so.[1]

Where Harner has chosen to build a causal statement by asserting the relationship of two uniquenesses (that is, the only paleotechnic empire to lack large domestic quadrupeds is also the only paleotechnic empire to practice regular, large-scale human sacrifice), this alternative will take the one observed uniqueness—the sacrificial complex—and relate it instead to the nomothetic. The institution will be compared, therefore, first with known, generalizable aspects of the economic and political organization of the Aztecs, including not only identifiable single parameters, but also explicitly systemic interrelations obtaining among them. A second level of comparisons will be drawn with the institutional behavior of polities that in carefully stipulated ways can be deemed analogous. Because this critique is highly selective, it will not touch on many points, pro or con, that some might prefer to see treated; these I leave to others. It is, however, incumbent upon the critic to replace the model criticized with a better, or at least a competitive, one. Facts do not displace an existing theory: only a better theory is capable of doing so.

A recent paper by Harner (1977) explains the Aztec human sacrifice and cannibalism complex on the basis of a postulated protein deprivation and protein hunger. In response, the present model is developed on epistemologically stronger and more parsimonious grounds, which emphasize nomothetic aspects of the institution at the expense of supposed uniquenesses. Powerful systemic links to the economic network of production and distribution and to the related political and military instabilities are competent to explain the institution, rendering superfluous a supplementary protein hypothesis. Like Harner's original presentation, this paper is written within a cultural materialist paradigm but develops a different, competing, theoretical position within that paradigm.

The protein deprivation hypothesis seems implicitly derived from Harner's extensive work with the Jivaro (1972), an essentially egalitarian group whose agricultural staple is a root crop (manioc) rather than a cereal (maize). To such groups indeed, the availability of wild game rather than the productivity of agriculture is the limiting factor, in the sense of Liebig's law of the minimum. Population size and the distributions of entire settlements, population mobility, and competition within and between groups all show close and powerful linkage with the quantity and distribution of wild protein sources (compare Gross 1975; Ross 1976; Sanders and Price 1968). In a real sense it could be considered procedurally tenuous to analyze these groups as though they were even fully agricultural.

For this reason it is doubtful whether they constitute an adequate or relevant analogy for the explanation of the course of cultural development in the Basin of Mexico. Much of this section will attempt to make explicit the procedures governing the construction of valid analogies and the evaluation of their relative power; the protein deprivation problem will constitute an initial focus.

In the Basin of Mexico the carbohydrate staple was and remains maize, which is regularly and consistently consumed with beans. The two are effectively co-staples; the source of the bulk of caloric intake is also the source of most protein consumed. Only occasionally is there supplementation with protein from animal sources. Because the maize-beans staples are storable and regularly obtained in local-level trade (possible even with low-energy transport in a region of great internal ecological diversity), they are available year round although prices fluctuate seasonally. If one crop or the other fails there is disaster, and the result is not protein deprivation but famine.

The preceding description is based upon observation of the contemporary peasant population of the Basin and is particularly true for poorer families. They may consume animal protein perhaps once or twice a year, in spite of a plethora of domestic meat sources in the system—cow, pig, sheep, goat, chicken, and the native turkey. But many peasant families are simply too poor to afford to eat them. Many indeed practice a strategy wherein protein is exchanged for calories: a family may keep chickens but will sell the eggs in the market to buy maize and beans; chickens represent a cash reserve and are sold when a sum of money is needed (usually in an emergency).

Observations made in the present are highly consonant with what is known of sixteenth century conditions in the area. Direct material evidence indicates that the mode of production and its effects upon the numbers and distributions of people have changed relatively little until extremely recently. Highly intensive irrigated grain agriculture is interspersed with still more intensive *chinampa* cultivation (now somewhat diminished in extent as the industrial growth of Mexico City has siphoned off much of the necessary water); in zones lacking access to water a riskier and more extensive dry farming is still practiced. Areas heavily settled in the sixteenth century remain heavily settled; areas lightly settled then are for the most part still lightly settled. Since people tend to live where the means of living is, this comparability suggests comparability of the underlying economy.

Granted there have been technological changes since the sixteenth century. According to a materialist paradigm the degree of impact these have exerted upon the system should be measurable from the effects they have produced. Introduction of the plow by the Spanish, for example, has produced relatively little repercussion on the demographic/settlement system, and has had little effect upon either overall carrying capacity or upon the differential utilization of landscape. Frost-tolerant European crops,

particularly wheat and barley, have been more significant. Their presence in the system permits true double cropping in some lands and allows the expansion of grain cultivation into zones too high for maize or other native cultigens. Domestic animals, as previously suggested, have had rather few and weak effects upon the peasant sector in terms of the operation of parameters affecting human numbers and distributions.

From both material and documentary evidence, we know that the sixteenth century, like the present (at least prior to about 1930) was characterized by an agrarian economy and a highly stratified society. Accordingly, statements concerning phenomena such as land tenure (access to the means of production), adequacy of diet, and local conditions of population pressure upon resources must for both time periods take into account class position, differential wealth, and political power. For present-day Mexico, industrialization has in fact irrevocably altered the mode of production on a national scale; that of the peasant sector, however, has remained essentially paleotechnic and comparable to that of the sixteenth century.

Social stratification in sixteenth century Central Mexico comprised an upper class, which consisted of a local or supralocal ruling house, and a landed nobility, which formed an officer corps for the army and probably contributed to the upper echelons of the (celibate) priesthood. An incipient "middle class" of professional traders and craftsmen in sumptuary goods may have begun to put some pressure on the existing order, perhaps through increasing capital formation in this sector, perhaps for other reasons. Such strains would have been more important in some polities, where these groups were most heavily represented, than in others. At the bottom of the social pyramid, a large rural peasantry constituted primary producers. Of these, some were "free," holding land as members of *calpulli* groups (themselves internally stratified); others serflike, bound to the landed estates of the nobility, of civil offices and the ecclesiastical establishment, and of the royal houses. While the nobility was hereditary, an institution comparable to the life peerage also existed, wherein the king could ennoble commoners who had achieved (usually military) distinction. The relations of production implicit in this stratification would seem to have been not unlike those obtaining today.

Reasoning from analogy is entirely legitimate, a potentially very powerful means of generating testable lawlike statements. Some analogies, however, are more powerful than others. An implicit analogy based on the Jivaro cannot adequately explain the adaptive processes taking place in sixteenth century Central Mexico precisely because the Jivaro remain a small, dispersed population, highly mobile and essentially egalitarian in sociopolitical structure. Ross (1976) argues quite convincingly that these characteristics in fact represent adaptations to protein as a limiting factor. Because the Aztec configuration is qualitatively and quantitatively different, the comparability of the causal factors responsible is called into serious question. On simple epistemological grounds analogical reasoning is stronger when based on greater numbers of stated similarities between the members of the analogy; it is further enhanced when those similarities are demonstrably paradigmatic ones. Evidence from the contemporary peasant sector of Central Mexico can therefore be used with some reliability to shed light upon the sixteenth century situation. Nor would evidence from East Asian, South Asian, or European peasantries be amiss: for this discussion the fact of demonstrable historical connection between the present and the sixteenth century in Mexico is irrelevant to the fact that the systems resemble each other. As shall be shown below, analogies drawn from a wider range of space and time may well be used productively as long as stated systemic resemblances exist—as the latter must also do in cases of historical connection.

The contemporary poor peasant in Central Mexico does, in any case, get by on his essentially maize and beans diet; doubtless this is at the cost of an overall lowered life

expectancy, higher morbidity, and increased child mortality than characterize more favored classes. Behaviorally, reduced access to treatment for what is probably an increased disease load and strategies of differential food allocation within the family (Gross and Underwood 1971) affect the analysis of overall nutritional adequacy and stress. Most observations of clinical protein deprivation in this area are made on postweanling children who are normally and regularly scanted, especially when food is scarce. Given the differential treatment of this cohort, it cannot constitute a reliable index of nutritional status, nor a basis for generalization to the population as a whole. One would expect differential class incidence of such syndromes in Aztec times as well, given the comparability of social stratification. One would not expect protein-deprived adults in the sixteenth century, as one does not expect them now.

Paralleling, in a sense, the peasant economic strategy of cutting consumption when times are hard, data cited by Harris (1977 and personal communication) from a number of Old World paleotechnic states indicate a shifting of economic strategy as populations grew. Basing his argument on diachronic data, both archaeological and documentary, he suggests a decrease in protein consumption as states filled up demographically and the mode of production was intensified. Since intensification involves a priori a declining return per unit of labor invested, this observation could be seen as definitional. Particular species were, however, removed from the table (the cow of India, a critical component of agricultural intensification) or virtually from the ecosystem as a whole (the pig of the Near East, which competes with both man and crops for water). Substantive differences are found among these various examples depending upon empirical variation in adaptive parameters; neither protein deficiency nor protein hunger appears causally significant in any of these sequences.

The difference from the Aztec case is that domestic animals were present in the other systems (as they are today in the Basin of Mexico); it is, however, erroneous to assume that their meat was necessarily eaten. Within any system the function of traits may be variable, and the explanation of this variability provides a more subtle, more productive, dimension of comparison than merely presence versus absence. Especially because our problem is ultimately the evaluation of the differential impact of traits upon human behavior, the presence-absence criterion is not a reliable predictor of the etics of diet except in the most obvious, gross sense. A better predictive criterion can be derived from the observation that in the course of imperial expansion there is a strong, regular association of demographic growth, productive intensification, and lowered standards of living. As shall be demonstrated below there is unequivocal material evidence of the interrelated processes of imperialism and intensification in the sixteenth century Basin of Mexico—evidence that supports analysis of the Aztec system as one more example of a developmental regularity and that, concomitantly, reveals its supposed uniqueness in the matter of protein as an artifact of reasoning.

It is therefore possible on a number of grounds to question the entire hypothesis of the existence of widespread protein deficiency in the Basin of Mexico. There is thus far simply no evidence beyond the sacrificial cannibalism complex itself. Famine, particularly during the fifteenth through sixteenth centuries, is, on the other hand, amply documented (compare Kovar 1970). Dietary deficiencies and outright famine do not, however, exhibit comparable systemic behavior. In the face of absolute shortages of basic staples—shortages that in stratified society always have disproportionate impact upon the poor (Wrigley 1969)—it frankly makes no sense to talk about protein deficiencies. A doctor does not treat varicose veins when a leg is broken. Famine regularly increases mortality and emigration rates; it appears to have done so in sixteenth century Mexico as well. While I agree with Harner that famine will also exacerbate competition and warfare,

our explanations of this process and the mechanisms responsible differ markedly. Malthusian negative checks were, in sum, at least beginning to operate in the Central Mexican system—in response to well-documented conditions of famine, famine that exerts effects in the Basin of Mexico comparable to those documented for it elsewhere.

The assumption that processes will be regular when the contexts in which they operate are demonstrably similar permits us to say that the effects of famine will be most severe when the population is at or near carrying capacity. Normal fluctuations of agricultural cycling may produce a bad year for a small population, a famine for a large one. We still lack, however, documentation of protein deficiency as opposed to lack of food.

The sixteenth century in Central Mexico was a demographic maximum in the area, with a population considerably larger than at any earlier period; in fact it reached a level not attained again until the second half of the twentieth century. Because Harner's model is basically a demographic one, it is inexplicable that his treatment of these questions has been so superficial. Acceptance of Borah's population estimates would be legitimate and justifiable in terms of the problems Harner is addressing: they are the highest estimates made in recent times and are, therefore, most consonant with Harner's argument. Unfortunately, there is considerable controversy attendant on these figures; this fact suggests the desirability of an explicit statement concerning the basis for their adoption. Other population estimates (compare Sanders 1970) are much lower and treat the ecological and methodological limitations of the Borah figures. Limitations of space preclude expanded discussion of the varying proposed estimates cited in what is actually a relatively large and growing literature. In terms, moreover, of the purpose of this paper such treatment would be both irrelevant and futile. Because the present critique is methodological in purpose, it is sufficient to observe that Harner's failure to note alternative positions seriously weakens his argument. Protein deficiency is substantiated to a large extent upon the basis of the Borah figures; any doubt whatever that is cast upon them and the way they are used can only diminish the hypothesis.

Protein deficiency receives at best the verdict of "not proven." There is no concrete evidence that the bulk of the population of Central Mexico—the lower classes—were any more protein deprived than the lower classes of the same area today, or than the lower classes of other known paleotechnic empires, where the domestic sources of protein in the system were available only at an economic and bioenergetic cost that precluded regular distribution on any but a sumptuary basis. Harner nonetheless argues, in evolutionary terms, that the human sacrifice/cannibalism complex is selected for (that is, is maintained in the system) on the basis of its ability to assuage chronic protein shortages. No independent evidence of such shortages can be demonstrated.

Nor can it be demonstrated that the institution in question does in fact address them. While much of the rest of this paper will treat the complex features of political economy scanted by Harner and will use these as the basis upon which an alternative explanation can be constructed, a number of observations may be noted at this point. First, much of the meat was at least ostensibly never consumed by man. Second, most of it never reached the groups most in need (just as most meat fails to do now: such differential consumption is of the very nature of a stratified society) but remained largely in the hands of classes already well able to afford the variety of meats regularly for sale in the markets (Sahagun 1961).

Natural selection, moreover, is not class specific. An evolutionary statement unable to account for the fact that the etics fail to behave in the manner postulated is in deep trouble. The natural selection to which Harner refers constitutes an emic lapse in a paper otherwise generated by an etic research strategy: it is stated to operate upon a desire or hunger for meat. Such a postulated hunger, however, is entirely emic and therefore

cannot as such be operated upon by any variety of natural selection. Selection pressure is entirely etic and can affect only emitted behavior. Thus it could act upon an actual deficiency, by acting upon the behaviors of populations that for any reason alleviate the deficiency. But the action of the evolutionary process upon a desire is a cross-paradigmatic statement, epistemologically illegitimate. Desires, hungers, and so forth are, furthermore, properties of the individual, not of the system. The evolution of the system, or of its institutional components, cannot be reduced to such individual wills or motives, not only because the latter are emic, but also because they are properties of a different, lower, level of phenomena and of discourse.

an alternative model

Two closely interwoven themes comprise the basis for a rather different explanatory model, one which explains more and does so—in its way—more economically. First is the nature of the sociopolitical structure—its evolution, internal and external behavior, and organizational stresses and difficulties. Second is the state's demographic strategy, and what might be termed its demographic paradox. As previously stated, the problem of determining exactly how many people there were will not be addressed; more to the point of this argument is the problem of how the state behaved vis-à-vis its population dilemma.

From its fourteenth century foundation to the time of the Conquest in the sixteenth century, the Aztec polity underwent major changes in social, political, and economic structure—changes that had massive repercussions throughout Central Mexico and beyond. The Basin of Mexico in the fourteenth century was politically fragmented into a myriad of small (circa ten thousand to forty thousand) competing city-states; by the Conquest the area was far more highly centralized than Harner credits. Ironically, therefore, the behaviors he systematically relates to and explains by decentralization are actually most apparent at a time of maximal political centralization. Changing distributions of population provide an etic, material basis for the documentation of these political changes; the assumption is that larger and/or more numerous settlements in a region indicate an economic advantage that in turn underwrites a differential political influence. From the standpoint of an etic research strategy this class of evidence is both more reliable and more powerful than that obtained from documents alone.

The myth of Aztec decentralization has, in fact, fairly wide and persistent currency, due in part to excessive reliance on documentary data at the expense of the settlement evidence or that of the behavior of the state itself in the course of its expansion. Chroniclers faithfully recorded information from well-enculturated members of Aztec society and added, on occasion, emic biases of their own; much traditional material is not well placed in time, reflects political propaganda of various types, and mixes ideal and actual behaviors or events. These same methodological limitations have produced an equally widespread myth of Inca centralization; Inca political emics were evidently very different. Contrast between these "ideal types," however, regardless of the existence of either, has obscured the very predictable similarities a more etic strategy might reveal.

Continued persistence of small, relatively stable city-states has similarly been misinterpreted as evidence of imperial decentralization. While many of these were in fact "independent" in the fourteenth century, sixteenth century political organization involved the formation of larger polities incorporating these smaller units at a subordinate level: political units, in other words, tended through time to become larger, more complex, and multilevel, reflecting changing economic and competitive conditions. City-statelike units, many of them the same ones, became *municipos* of the Colonial

period (Gibson 1964) and remain in the present; these units in all periods since the Conquest comprise the lowest level of the national political hierarchy. As the context altered, in other words, so too did the function of these units; by the sixteenth century they were firmly embedded in a state organization, where they have remained. While in Aztec times each city-state retained its own ruling house, these ruling houses were stratified vis-à-vis each other; each in turn was systematically linked to the level immediately above it by a regular pattern of mother's brother's daughter marriage (Calnek 1966). The city-state form is easily misinterpreted if the overall network of political relations and the functional interrelation of parts are ignored, and if stasis is assumed to characterize two hundred years of political evolution.

Aztec warfare, in its scale and location, permits the tracing of the strong tendency toward centralization during the approximately two centuries of development. By the advent of the Spanish, Aztec warfare was carried out on a large scale, involving the stationing of garrisons and the resettling of populations from Central Mexico. It was, furthermore, being carried out well away from the Basin of Mexico proper—in Oaxaca, near the Guatemalan border, against the Tarascans (Michoacan) and the Tlaxcalans. Key evidence of the process by which this expansion of frontiers was accomplished is found in the regular, systematic role of the *pochteca* (professional long-distance merchants). A principal function of this group was the funneling of (largely) luxury goods into the capital from areas politically outside Aztec hegemony. As the *pochteca* did so, they also acted incidentally as spies and as *agents-provocateurs*; they cannot therefore be considered apart from state policy even though they were technically not under direct "state control." Once a province was conquered, the activities of the *pochteca* shifted elsewhere, always at increasing remove from Tenochtitlan; the system of taxation and tribute replaced the merchants as a means of directing the surplus of that province into Tenochtitlan. No polity, finally, could or would attempt such foreign ventures unless, minimally, its own home base was secure, posed no threat, and was able to furnish the necessary manpower.

In comparison with Teotihuacan, a predecessor in the Basin of Mexico, Tenochtitlan does appear by my own criteria to be somewhat less centralized. Teotihuacan was in fact a primate city, with no potential competitors in size and power in the Basin or anywhere else in Mexico in its time. It was also energetically and demographically smaller than Tenochtitlan, more selective in its expansion and in its exploitation of its own landscape. For Teotihuacan, moreover, we have a beginning, middle, and end; Tenochtitlan was conquered in what is necessarily a homotaxially formative stage of its evolution, a stage in which some evidence of decentralization might be predictable (compare Price 1977). Political centralization at Teotihuacan, at least involving its own valley and adjacent areas, was accomplished quite early in its growth; the same appears to have happened in Tenochtitlan. By the time of the Conquest, only relatively distant, relatively recently conquered provinces retained political "independence" from Tenochtitlan. The latter was not, however, a primate city; it had well over 100,000 inhabitants, with Texcoco (the second largest city of the Basin of Mexico) having some 40,000 inhabitants and other urban centers of 10,000-30,000. Population was still distributed lognormally, without urban primacy, but the indications are strong that Tenochtitlan was growing at the expense of any potential competitors.

This differential rise of Tenochtitlan is almost certainly linked to a shift in the mode of production: the shift to *chinampa* agriculture (Armillas 1971). Almost certainly known and used earlier elsewhere in the Basin, the designation of a shift involves the increasing reliance upon this technique for probably the bulk of the society's calories and its concomitant absorption of an increasing, even disproportionate, quantity of the

agricultural labor supply and much of the public works activity. The southern lakes—the largest area capable of supporting this productive system—became the demographic center of the Basin of Mexico; increasing reliance upon this mode of production shifted local balances of power in favor of those settlements strategically situated to control *chinampas*. Tenochtitlan, from unprepossessing beginnings, underwent a continuous demographic and political expansion concomitant with an expanding *chinampa* agriculture.

What is significant here is the relation of growth in general, and of differential growth, to the expanding system of agricultural production. Zones capable of supporting *chinampas* grew at the expense of those that could not; cities controlling such lands expanded politically and came to dominate competing settlements both politically and economically. In the fourteenth century context, where jockeying for position was chronic, this shift in mode of production effectively settled the issue. If protein availability had in fact been the limiting factor at any time during these two hundred years of political evolution, the course of expansion and the political economy that evolved *should not look like this*. One would predict, furthermore, that this entire cycle of growth associated with *chinampa* agriculture should have been aborted. Instead it was expanded to a scale previously unknown in the area, which suggests that agricultural productivity is more powerfully implicated than is protein in the evolution of empire—as it appears to have been in other known paleotechnic states.

In spite of the immediately preceding arguments, one might understandably opt to favor a hypothesis of political decentralization for sixteenth century Central Mexico: myth can be both powerful and seductive. But to attribute this decentralization to the Aztec need for "foreign" cannibal victims and their consequent "reluctance" to annex a conquered polity into a single centralized state structure is to create a problem where none exists. The exigencies of balance-of-power politics may have delayed incorporation in some instances; but political centralization or its absence is a complex problem not reducible to the Aztec desire to "eat out." To rely on the latter hypothesis represents another emic lapse in Harner's essay; an etic research strategy, however, is fully capable of accounting for the phenomena in question.

This alternative model postulates that the institution of human sacrifice in combination with cannibalism acts to stabilize and reinforce an existing system of social stratification and distribution of political power. Full explanation of the development of that system is beyond the scope of the present paper. Certain evident stresses within the upper class, however, have already been noted: competitive stresses are inevitable within an upper class when the royal house occupies a position of *primus inter pares* vis-à-vis its own landed nobility. The only power base available to either is land with its associated labor, and the supplies in this instance were not limitless. This is probably the principal consideration underwriting the structural instability of the ruler, an instability suggested in the chronic succession problems and in the existence of a life peerage that owed reliable and undivided loyalty to the throne. Parallels are not unknown in the history of Europe. Louis XIV, for instance, built Versailles, removed his fractious nobles to court with full pensions, and virtually bankrupted the country in order to do this—all at a time of ostensibly a high degree of political centralization in France. The fact that this was not the direction from which the French Revolution ultimately came does not vitiate this strategy: stave off potential rebellion by keeping potential rebels well fed and paid off.

In implementing a comparable strategy, the Aztec monarch resorted to periodic redistribution of sumptuary goods. Depending upon their provenience, some of these goods were obtained in long-distance trade by the *pochteca*, some in tribute; the sequential relation between these methods of procurement has already been suggested.

Jade, gold, cotton textiles, feathers, and particularly cacao were of special importance; the distribution of human flesh seems to a considerable extent to follow the pattern documented for these other sumptuary goods. As such, the entire pattern of state redistribution, including the meat, becomes part of a functional institutional equivalent of the known policies of a Louis XIV, and a good deal cheaper (the overall energy content of the Aztec system is, of course, lower). It is a means of pacifying an economically and politically powerful class that was therefore potentially troublesome. Where centrifugal political tendencies result from intense competition and from difficulties of terrain combined with paleotechnic transport, the regular inclusion of the nobility of conquered provinces in these redistributions served as an additional technique—both economic and ideological—for enhancing imperial centralization and perhaps somewhat reducing the expenditure of force required to do so. All the articles involved in state redistribution were luxury consumables rather than the capital goods that could increase existing competition. Luxury goods of themselves do not, of course, significantly affect carrying capacity or power balances; they are, however, not without impact upon the functioning of the political system. Differences of form between a Versailles and a Montezuma's Dinner ought not to mask the striking similarity of the social and political work being done in both by functionally comparable institutions.

The preceding discussion furnishes the basis for extended treatment of Harner's explanation of Aztec warfare as motivated by a quest for meat rather than by political economy. In the context of my model it is at best tangential to pursue the question of individual motivation in warfare and epistemologically unacceptable to consider such motivation causal; such a procedure is not only reductionistic, but it is also powerless to explain a warfare pattern that pertains to the system and must be explained at that level. Peasants, of course, go to war because the state tells them to. It may nonetheless be noted that at least some, if not most, of the landed estates of the nobility were obtained as spoils of war; the serf class may largely have originated in the depression of status of formerly free peasants through conquest and expropriation of their lands. Land and the labor to work it are capital goods, the means of production, the basis of differential political power. On the basis of the model developed here, it is more probable that the officer corps at least might emically have perceived this as a rather more significant opportunity than meat; this, even if one wishes to explain motivation, is the more powerful explanation. Thus, while the motives of individuals or classes are regularly explicable in terms of the general properties of the system, they cannot legitimately or productively be used to explain the state of the system: the relationship here is epistemologically asymmetrical.

An interpretation of war as quest for meat, moreover, like its parent, the hypothesis of protein deprivation as limiting in this system, is once more based upon a misleading, if implicit, analogy: it fails to account for the different systemic functions of warfare at different levels of sociocultural integration. Central Mexican warfare during the Aztec period is inextricably linked to a state-level political economy; its context is irrevocably one of institutionalized force, social stratification, economic specialization and intensification. Rapid population increase, partly in response to both general and sectorial increase in labor demands, would seem clear to all observers whatever the magnitude of the figures actually cited. Explanation of the expansion of the Aztec state must take account of this technoeconomic system and its demographic correlates and must further consider the warfare as one parameter of a larger, more general, energy flow complex. From this standpoint the unquestioned fact that cannibal victims were procured becomes analytically an epiphenomenon, a dependent function of some more inclusive and powerful statement—a fact indeed, but one that is low in the epistemological hierarchy.

Warfare, as Harner agrees, has causes; the disagreements lie in what those causes are. On the paradigmatic grounds we both share, those causes must be sought in the technoeconomic, material conditions of life; they cannot, for instance, be referred to innate aggressive drives, to individual motivations, or to beliefs and values that themselves must be explained. The present differences result from the problem that the sociopolitical organization of warfare, its operation within a systemically organized behavior stream, is not everywhere and at all times the same. Lowland South American warfare, for example, functions to space populations, maintain boundaries, shift boundaries, protect no-man's-land game reservoirs (J. Ross, personal communication). Thus it is only minimally comparable to Aztec warfare, which is one parameter of an entire political economy organized for expansion, conquest, the exaction of tribute and the siphoning off of economic surpluses, and the maximum possible degree of political incorporation. One of the reasons the Aztec were not better at it is the fact that many of their neighbors were comparably organized and doing exactly the same things. Balance-of-power politics was accordingly complex and directed the conduct of the warfare itself (see below). Generally in such a setting larger states with larger populations and stronger economies will have a competitive edge, but in sixteenth century Mexico such competitive edges were often neither large nor consistent.

Because of the systemic interaction of all these parameters, one would expect not only that the organization of warfare was influenced by the nature of the state, but also that it affected state organization as well. If demographic pressure is one factor underlying competition in general and warfare as a specific manifestation, then the impact of warfare upon demography is an obligatory question. Its answers, while involving universal, nomothetic principles, will nonetheless vary substantively, according to, among other things, the total energy content and complexity of the system. Cross-level analogies (from one level of integration to another), although technically legitimate, become highly tenuous. There is no question that Aztec warfare involved considerable mortality of combatants; in effect the prisoners taken, whatever their ultimate fate, constituted etic battlefield deaths. What is not entirely clear is their impact upon the system.

In terms of the existing technoeconomic regime, the sixteenth century Aztec system seems to have been approaching carrying capacity. Intensive agricultural techniques such as irrigation, terracing, and *chinampa* cultivation had come to occupy nearly all environmental zones capable of supporting them; nonagricultural extractive and craft specializations were similarly at maximal development. In all probability return per unit of labor in all sectors was declining rapidly as the entire system was intensified (partly definitional); benefits conferred by the shift to *chinampa* cultivation were ephemeral, probably because of the geographic limitations on the spread of the technique. As noted above, the high demographic levels acted to magnify the effects of the poor agricultural years that occur regularly in Central Mexico: famine is a classic negative check that may have begun at least temporary reduction of local densities through mortality and emigration.

Harris (1975) has noted that human populations at various levels of sociocultural integration may exhibit behaviors that not only reduce immediate population pressures, but that also systematically reduce the rate of growth. He suggests further (personal communication) that state-organized societies tend not to adopt such practices, that given the exigencies of this form of adaptation such behaviors would constitute a handicap rather than an advantage. The Aztec state, in a complex of difficulties not overtly recognized by Harner, was faced with a simultaneous need to stimulate population growth and to limit it: an obviously untenable long-run position, a demographic paradox. Its neighbors and competitors were to a greater or lesser extent in exactly the same

dilemma. Any theory of Mexican warfare must of necessity deal with these problems.

Warfare and the sacrificial complex associated with it represent a compromise between two mutually exclusive extremes and are understandable only within the context of sociopolitical organization, the economics of production, and the technology of warfare. In spite of a productive system intensified to the point of approaching diminishing returns, all of these factors stimulated yet additional demographic expansion. An increasing demand for labor in production resulted from limitations on geographic expansion—this meant, among other considerations, more people working to maintain levels of output. Labor investment in production also included labor on state-initiated public works projects such as irrigation, drainage, and diking to control relative lake levels; all such activities acted to increase both yield and security of primary production. Precarious as it may have been in some respects, the economy was still capable of absorbing additional labor and profiting from doing so.

The implication is that for any structural unit—an extended family, a *calpulli*, a city-state, or some larger polity—its economic base, and thus its competitive edge vis-à-vis other comparable units, will improve as labor is added to the system, no matter what the actual stimulus triggering this process. Such a paradox is familiar from present-day agrarian societies with large peasant components, where a national policy of reducing population growth is presently in direct collision with the local-level adaptive strategies of peasants. Competition among polities, inherent in a situation of economic expansion without corresponding expansion of resource base, enhances the advantage of rapid population growth.

As is the case in modern examples, a well-developed system of social stratification exacerbated the population problem caused by numbers and densities alone in sixteenth century Central Mexico. Growth in size of the empire through cyclical conquests led to increasing concentration of often choice lands in private or official hands; the concomitant development of a serf class at the expense of a free peasantry may be noted. Through time, decreasing amounts of land were held in *calpulli* tenure; not only could such holdings not expand to meet demographic growth, but in some areas they were probably contracting. Any pattern of social stratification is a priori bottom heavy, with greatest numbers concentrated in the lowest strata. This observation suggests one characteristic of the Aztec demographic pyramid, as the preceding paragraph has furnished another: because this population was growing rapidly it would also have been a disproportionately young one, its bulk concentrated in the younger cohorts. In sum, most people were young and poor.

Military service was a universal obligation in Aztec society, not only for young adults but lasting apparently through mature adulthood. The noble class formed an at least semipermanent officer cadre, with the mass of manpower raised by levy. Even if we assume random call-up (improbable on a number of counts), most draftees would be poor young peasants, merely on grounds of their representation in the population. Insofar as the *calpulli* leadership (the unit itself was internally stratified) was to some probable extent responsible for selection (as they were for collecting the taxes and allocating land to members), the expectation on a basis of chance alone can almost certainly be strengthened.

When a young man married, his *calpulli* was obliged to grant him land for the support of his household. Should he then die, his widow and children, if any, retained his land claim. Given the limitation on an increasingly circumscribed supply of *calpulli* land, a strategy of exposing these young unmarried men to high mortality risk seems quite canny. For the ten to twelve years preceding, the *calpulli* has utilized their labor; these years are, not incidentally, the years in which they consume least. At draft age they

become surplus—eating like adults and putting additional stress on an already fragile system of land tenure. Maximizing mortality at this age involves minimal risk to the productive system. At the same time, just as the investment of labor in production provides an economic advantage to a community, differential military successes are probably most strongly correlated with the size of the army fielded. In both instances there is a strong stimulus to population increase, and to a relatively age-specific mortality. What is implied is that in its application to stratified, state-organized agrarian societies, the concept of population pressure must be modified to include differentials resulting from class position in relation to access to resources, and from the differential (age, sex, class) labor demands of a complex productive system. The concept of population pressure is empirically easier to apply to egalitarian societies, but such application cannot be generalized uncritically to polities like the Aztec, which require a somewhat more differentiated model.

As it increases mortality, warfare is capable of reducing immediate population pressure to some extent; unless combined with female infanticide (Divale and Harris 1976) or unless it is total war involving significant civilian casualties, it is in the long run an extremely inefficient mechanism of demographic regulation. Paleotechnic warfare primarily eliminates males; but the capacity of a population to grow depends upon the number of females of reproductive age, not upon the number of males. If, however, the warfare is repeated at least twice per generation, culling the surplus males as they mature, it will succeed in periodic removal of excess consumers without impairing subsequent growth. Central Mexican warfare, for reasons closely linked to the highly competitive political economy, was of course so repeated.

Reduction of population pressure cannot, however, be analyzed so simplistically. In a productive system in which additional labor investment is profitable far beyond the risk of environmental degradation, such investment raises, rather than lowers, carrying capacity in both the long and short run. Natural selection, however, can act only upon short-run phenomena: evolution, including cultural evolution, is opportunistic. This means that any institution deemed to have a long-run adaptive payoff (for example, a means of demographic regulation) must have a demonstrable short-run advantage as well, or selection cannot be postulated to have favored it. In this instance the short-run impact probably lies in the economics of differential labor investment and the easing of pressure upon the system of land tenure.

The conduct of the warfare itself reflects the Aztec demographic paradox, particularly in the pattern of prisoner capture. In strictly military terms this pattern results in lowered efficiency when compared to the alternative of killing victims outright. A soldier could probably have killed three of the enemy in the time required to take one prisoner. Warfare, which increases mortality, seems to be conducted to minimize it. This situation illuminates the feedback loops implicated in the evolution of the system and renders that system in certain ways more puzzling. As a demographic strategy it is at best inconsistent and equivocal, and because of these limitations is extraordinarily flexible in response to varying conditions; its adaptive advantage is apparent. Linkage of the prisoner-capture pattern with this broad, complex demographic strategy that attempts at once to enhance and to limit population growth provides a more powerful explanation than simply its linkage to a need to obtain cannibal victims. The overall strategy described might have proved untenable in the long run—but the long run is not subject to the action of natural selection. In the short run its flexibility maximizes the options open to the state and permits a range of opportunistic behaviors that can vary in response to varying circumstances.

The foregoing leads to a final point of disagreement with Harner. "Flowery wars,"

ethnohistorically described as wars fought under treaty for the purpose of obtaining sacrificial victims and accepted as such by Harner, can be viewed instead from a more consistently etic standpoint. In the highly competitive setting of the Basin of Mexico and adjacent areas in the sixteenth century, where nearly all the participants had the same problems, where no side could achieve consistent advantage over its opponents, the military result is a series of sieges, standoffs, and stalemates, of rebellions by conquered towns followed by reconquest. Regardless of the reports of sixteenth century writers (neither they nor their informants would have been free of various emic biases), it is possible to regard such wars in etic terms, as deadly serious and as integral and normal aspects of a military campaign.

This type of warfare tells us something about the recurrent nature of the military and political interaction. It is a manifestation of locally shifting balances of power and ceases in an area once the ambiguity is resolved. Any implicit assumption of blitzkrieg tactics of conquest and consolidation is almost certainly erroneous; most conquests probably consisted of such a series of forays, each one largely inconclusive, the more so the more evenly matched the combatants. Conquest was more probably a process of attrition, of gradual wearing down, of shifting balances. Until and unless an unequivocal energetic and military edge was achieved and maintained, outright annexation was precluded. Through the evolution of the Aztec empire, warfare was carried out at increasing distances from Tenochtitlan. Manpower for these foreign adventures was probably procured from virtually the entire Basin of Mexico—within which, at the time of the Conquest, no flowery wars were waged.

Given the regularity of this type of inconclusive military operation, nothing would be more probable than the existence of ideological mechanisms capable of keeping up an understandably sagging military morale. How does the team feel when most of its games end in tie scores? It is, of course, this ideology that was reduced to writing by the chroniclers and seems destined to be accepted forever after as literal truth. Ritualizing the drawn-out process of conquest into "flowery wars" provides an emic transformation of a standstill into a situation where something is ostensibly happening, ideologically justifying behavior that need not look too promising. It keeps rather hopeless-looking encounters going, often intermittently over decades, in pursuit of a victory, perhaps evanescent but capable of providing at least a few years' tribute before the town or province reasserts itself and breaks away again. It keeps the army in the field in circumstances where a high desertion rate, especially with peasant draftees, is expectable. The relationships between the emics and the etics in this particular instance do not appear to be particularly opaque: certain beliefs and practices enhance the probability of military success under stated circumstances of the conduct of war. "Flowery wars," superficially a military lunacy if accepted uncritically as described, are in fact thoroughly consonant with conditions of war that are both regular and statable.

conclusions

To explain a single institution in a complex, state-organized polity, it would seem most economical to explore initially the links that institution demonstrably possesses with other institutions of that society, then to seek definable parallels between that society and others demonstrably similar in parameters deduced as relevant from the paradigm. The link between Aztec warfare and Aztec human sacrifice is obvious to both Harner and myself. But while he considers the needs of the sacrificial complex sufficient to generate the warfare, I consider the reverse causal statement to be more powerful. Much is, after

all, known about the causes and patterning of state-level warfare. Reference to these same causes—for example, imperial expansion, economic intensification with a restricted resource base, differential costs and benefits of warfare versus other means of obtaining a consistent economic surplus in a context of centralized control of force—reveals that such conditions obtained in sixteenth century Central Mexico. If they act as explanations elsewhere, why not here? Like all state societies, that of the Aztec was internally differentiated in its economy—division of labor was based upon geographic region and social class as well as merely age and sex—in a fashion systematically affecting production, distribution, and consumption; this fact necessarily calls for modification of concepts such as population pressure when applied to such systems in contrast to their application to egalitarian ones.

Intensification of all sectors of such an economy (including, in the agricultural sector, both intensification and shift) is generally associated with increased complexity of social stratification, exacerbation of warfare between polities, imperial expansionism, and greater degrees of political centralization (the formation of larger, more internally complex political units). Because the sixteenth century Basin of Mexico remained a land-based agrarian economy, competitive stresses may be predicted not only between polities but within them, specifically within the upper classes. These are paralleled in comparably organized societies otherwise disparate in time and space. These stresses in turn intensify activity in other economic sectors—long-distance trade, taxation (thus imperialism and warfare), state-sponsored redistribution (in which cannibal victims comprised merely one class of goods, and by no means the most systemically interesting one). Increased activity in these economic sectors had little direct effect on local carrying capacities: the goods involved were primarily luxuries. Warfare was one means of obtaining such goods; the supply of all of them increases expectably with intensification—explicable on grounds cited above—of the warfare pattern.

It is clearly difficult to summarize in linear form what is obviously a system of elements constantly in interaction and exhibiting constant feedback interrelations. For the Aztec a largely positive feedback is consistently involved; the system, far from achieving equilibrium, was growing larger and more complex (deviations from any postulated equilibrium were being amplified rather than corrected). Nowhere is this more apparent than in demography and the demographic strategies of the state. Regardless of the argument concerning precise population estimates, there is a far more profound disagreement between Harner and myself concerning demographic processes, particularly in complex societies with highly differentiated productive systems. Just as population pressure cannot be diagnosed on a basis of raw densities alone without reference to technoeconomic regime, it is unwise to do so in blanket fashion without reference to the particular labor needs of various specialized sectors of the economy. It is undeniable that the population of the Basin of Mexico was larger in the sixteenth century than it had been at any time in the past; subtracting the modern Mexico City conurbation and speaking of rural population, we would find that it was larger than it is today.

Not surprisingly the mode of production in the sixteenth century was similarly at its most intensive. An increased incidence of famine suggests some strain upon the population/production system. Reference to the operation of that system, however, reveals that far from a demographic surplus, there were constant and increasing demands for labor, both in agricultural intensification and as cannon fodder in the intensification of warfare. Demographic pressure did not seem to have been general but appears instead to have been concentrated particularly in one group—young males of the peasant class who were what we would call of draft age. Such pressure was less upon the food supply at large than upon a land tenure system increasingly circumscribed by the rapacity of an

ever more entrenched upper class. A simultaneous need to stimulate and to inhibit population growth led to establishment of a series of state practices that seems equivocal and inconsistent but possessed a tactical flexibility of probable short-run adaptive significance. The behavior of the famines in this ecosystem does not differ markedly from their known behavior in comparable ecosystems elsewhere; thus famine cannot be used to generate or to explain a supposedly unique practice or institution.

To operationalize the concept "important" in the materialist paradigm it is necessary to state the definition in terms of observable repercussions of the trait or complex upon the system as a whole: the greater the magnitude of the effect, the more significant the cause. The greater the number of contexts in which a phenomenon appears, the more important it can be assumed to be within that system. This procedure derives from the stated significance of energy harnessing and flow as the core of the paradigm. By deduction, anything significantly involved in the harnessing, distribution, and utilization of energy should be expressed materially in some form. Note that this procedure differs in its implications from simply accepting the importance of a piece of behavior because its existence is documented by Spanish chroniclers. They are hardly the first—or the last—to be swayed by overreliance upon the emic, including a fascination with the sensational for its own sake.

Quite obviously, furthermore, not all material manifestations are of equal analytical importance, in that they incorporate differential amounts of energy; some, such as the type of differences we call stylistic, incorporate very little. Such distinctions resemble Steward's (1955) core-superstructure distinction but differ somewhat in that the present concept explicitly predicts a continuum rather than the contrasting categories implied by Steward.

Thus the present model has not dealt explicitly or at length with the fact of the cannibalism per se. What it has shown, if in a sense negatively, is that the trait is unimportant in itself, capable of interpretation virtually as "stylistic." Unlike the warfare complex (of which it is a part) or even the human sacrifice (of which it is also a part), the ultimate fate of the victims has little demonstrable effect upon the state of the system. For the protein deprivation ostensibly addressed by the cannibalism there is no independent evidence; had it ever been important this situation should not obtain. The principal feedback linkages of the cannibalism are with the centralized redistribution of sumptuary goods (in which the meat follows an already established pattern that its presence does not explain). Because the meat is not our only, or even our best, documentation of this sector of the economy and does not absorb the bulk of the labor commanded by this sector, it can hardly be reconstructed in any sense as causal. Cannibalism appears an artifact of a more general pattern of internal political stresses, warfare, and imperialism, the explanation of which lies elsewhere in the system. It follows accordingly that explanations based upon cannibalism are necessarily low in inclusiveness and restricted in scope; invoking this factor to underwrite a theory of state dynamics and expansion is a dubious epistemological procedure.

Explanation must ultimately be systemic, stated in terms of the mutual interaction and repercussion of traits and entire complexes and of the extent to which these traits and complexes permeate the system as a whole. This procedure is fundamental (see above) in operationalizing the concept of relative or differential importance and basic to empirical application. Mere assertion, or even demonstration, of linkage between any two single parameters represents an essentially nonsystemic model of explanation and of causality, one that incurs considerable risk of arbitrariness and oversimplification. An arbitrary model is one prompting the questions: why those parameters and not some others? Why that linkage? How does one know this? How do we know the importance of

either parameter, or of the link between them, relative to alternative possibilities?

Science is hierarchical in the organization of its thinking, and, within the level, competitive. At the highest level of generalization is the paradigm—a broad statement of intellectual priorities and procedures that generates research strategies and theories at lower levels of inclusiveness. None of the last is permitted to contradict the higher-order statement, even in the instance of special-case theories. A paradigm provides consistent canons of verification and falsification. Contemporary anthropology is characterized by the competition of at least two distinct paradigms, plus various degrees of eclecticism (combining theories, explanations, or procedural canons from more than one paradigmatic source).

The materialist paradigm, from which both my model and Harner's derive, holds that causality is most efficiently and parsimoniously sought by the consistent search for links between any observation or phenomenon and the material conditions of life; the exigencies of adaptation to these conditions set forth the probabilities of human behavior. Competing with this paradigm is the idealist one: that beliefs, values, symbols, traditions, and ideas generate behavior, which must accordingly be examined and explained in terms of such mental templates. Adherents of the latter paradigm will quite obviously disagree with both Harner and myself, and will do so at the most profound and fundamental epistemological level possible. The hierarchical principle suggests, in fact, that a given paradigm is capable of generating a number of theoretical or explanatory models, of greater or lesser degrees of inclusiveness. Some of these will be complementary, others competitive. The differences between Harner's model and the one developed here are at this lower epistemological level; the two are competitive rather than complementary.

This hierarchical principle, moreover, permits the deduction that facts do not displace existing theories—only more powerful theories will do that. Because theory is inherently probabilistic, the single observation, the isolated fact, does not falsify. The more powerful theory, therefore, is one that engenders higher correlations than its competitors. It explains more, or does so more economically, than those competitors. It is also one that has more and stronger systemic ties, vertical and horizontal, through the network of theory. In a very real sense, theory can be said to generate facts, by conferring upon them an importance that they inherently lack; it does so by stating the systemic, feedback links among observations. By these operations, the observations are turned into data: they have been accounted for by some theory.

Still in consequence of the principle of hierarchy, it may be deduced that some facts are going to have more explanatory significance than others. Previous treatment of the subject of differential importance is relevant here. This paper suggests that Harner has assigned to his observations an inflated hierarchical position unwarranted on any but an arbitrary basis. It certainly follows that any implication of hushing up unbecoming ethnographic information is superfluous, not relevant even to the explanation of the lack of wide discussion of the Aztec human sacrifice/cannibalism complex. The alternative explanation of the silence is that it is not that important a problem, except as an interesting footnote, an epiphenomenon.

If the institution of mass human sacrifice is tested against the entire reticular system of technology, political economy, and social organization of sixteenth century Central Mexico, the institution is found to be not especially peculiar. Rather, it is found to be consistently, inextricably, and asymmetrically associated with far more ramifying and powerful parameters in that system. Because these more ramifying and powerful parameters can be shown to account capably and economically for the institution but are not themselves explained by it, the relationship is asymmetrical. Such asymmetry,

moreover, provides an additional basis for the hierarchical ordering of relative importance. With or without sacrifice/cannibalism tagging along, the feedback relations obtaining among parameters such as economic intensification, imperial expansion, warfare, political centralization, and increased social stratification fully explain behaviors possibly attributable to the operation of the sacrificial complex.

Any systemic ramifications of a postulated protein deficiency, more so in this time and place than in some others, seem sufficiently inapparent to justify the conclusion that they were weak: there is simply no independent evidence. To introduce such a hypothesis, in fact, based on the evidence of cannibalism, to explain only the cannibalism (since, as I have noted, there are strong explanations for the rest, explanations not impugned by the existence of cannibalism and demonstrably capable of accounting for the sacrifice complex also) is at best ad hoc and epistemologically superfluous, as well as a contravention of the law of parsimony.

Superficially, of course, my alternative model, not Harner's, apparently engages in unnecessary proliferation of entities by involving numerous parameters in interaction, rather than just one. At the same time, a far wider range of phenomena more complex than Harner credits is explained; thus additional range compensates, in a sense, for some presumed loss of simplicity. Furthermore, because the systemic interrelations of these numerous parameters are emphasized, my causal model is actually simpler in that "the cause" is not in fact multiple; rather, it is a unified system. This single system accounts in unified fashion for a larger body of data than is possible with the more linear (and simplistic) model of Harner, which can only fragment, masking instead of revealing relationships. With a systems model, moreover, no single parameter can be invoked to deal with only one element of the system. To do so is to confer a false uniqueness (along with a misleading appearance of simplicity) to the element so treated—a uniqueness that is merely an artifact of the reasoning isolating it.

In other words, the sacrifice/cannibalism complex is "unique" only in the details of its form—as is any institution if the analysis is sufficiently particularistic. This complex has been shown, in terms of the work it performs, to be consonant with other parts of the Aztec system and explainable on that basis as one of a number of institutions doing comparable work and reinforcing each other. It can be demonstrated to be a formal variant of political techniques encountered among other highly stratified, land-based, monarchically organized polities, all sharing common systemic problems. To emphasize its uniqueness is to rip it from the context within which it must be understood and in terms of which it is explicable: to enriddle it.

notes

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