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Ancient Mesoamerican Civilization

A long archeological sequence from Tehuacán, Mexico, may give new data about the rise of this civilization.

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A problem that has long interested the layman, the scientist, and the philosopher has to do with how and why civilizations arose. Any hypothesis or generalization about this social phenomenon must be based on broad comparative historical data. Specifically, one must compare long archeological sequences, from savagery to civilization, which have been uncovered in relatively independent areas. The ancient high cultures of Mexico and Central America (termed Mesoamerica) have always represented an interesting facet of this problem, for here were prehistoric civilizations which apparently arose independently of any of those in the Old World.

It is generally accepted that the development of agriculture is basic to the rise of village and urban life. And so, in our work in Mesoamerica, it was assumed that if we could but find the origins of agriculture—and in the New World this meant maize or corn—then we would be well on the way to finding out where and how civilization evolved in America.

After a number of years of investigation, it became apparent that the desert valley of Tehuacán (about 150 miles south of Mexico City) was the region in which evidence could most likely be uncovered about the beginnings of the domestication of corn (*1*). Precisely why we decided on this area is explained in an article by Mangelsdorf and others in this issue (p. 538), so I confine my discussion to the archeological researches recently undertaken in this southern Puebla valley.

In attacking such an all-inclusive problem, the project was most fortunate in having the cooperation of a number of scientists from a wide variety of fields. Obviously, I am extremely grateful to these various specialists, but I must confess that I say this with a sigh of relief, for at the beginning of the first field season we were far from convinced that the much-vaunted interdisciplinary approach was practicable. We know now that it can and does work, and thanks to our experts' endeavors we have gathered and interrelated specialized studies in botany, corn, beans, squash, human feces, pollen, zoology, geology, geography, physical anthropology, prehistoric textiles, ethnohistory, and ethnography (*2*). These investigations, of course, were in addition to the usual archeological researches carried out so ably by my field staff (*3*).

Before discussing what our diverse group accomplished in the Tehuacán Valley, let me briefly describe the valley itself. It is located in the southern part of the state of Puebla, and in the northernmost section of the state of Oaxaca, in the central highlands of Mexico (see Fig. 1). Efforts were concentrated in a relatively small area, about 70 miles long and 20 miles wide. Although the valley is considerably longer than it is wide, it has a basin-like appearance, for it is ringed by high mountains. The Sierra Madre Oriental is to the south and east, while to the north and west are the Mixteca Hills. Both rise considerably above the Tehuacán Valley floor, which is 1500 meters above sea level. Because of these precipitous mountains the valley is in a rain shadow and extremely dry. Most parts of the valley floor receive less than 600 millimeters of rainfall a year, and some parts receive less than 500 millimeters. Moreover, most of this rain falls during a 2-month period. Needless to say, the resultant vegetation is xerophytic. Thus, the Tehuacán Valley has all the characteristics of a desert.

Intensive archeological investigation in this region has now been under way for 3 consecutive years; in addition, I spent a brief 10 weeks in the area in 1960. Archeological reconnaissance has resulted in the discovery of 392 new sites or prehistoric habitations. These range from small temporary camps to large ruins of cities. At about 30 of these sites test trenches were dug. These were superficial, but even so, one sounding yielded stratified remains with five occupational floors, one above the other. Twelve test trenches in other sites revealed deep stratified remains. Excavations in these particular sites were expanded into major digs and became the basis for establishing a long prehistoric sequence of culture.

In these 12 sites of major excavation (selected from the original 392 sample sites), 140 stratified floors and occupational zones were unearthed. Five of these were open sites or middens, while seven were caves or rock shelters, or both.

Because of the extreme dryness of the area, in over 55 of the floors in the five caves everything had been preserved: foodstuffs, feces, and other normally perishable human remains and artifacts. This type of refuse not only allows one to make an unusually com-

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Fig. 1. Tehuacán area of Mexico.

plete reconstruction of the way of life of the ancient inhabitants, but gives considerable information about subsistence, food habits, diet, climatic changes, and, in many cases, even indicates which months of the year the floors were occupied.

Although our studies are a long way from completion (it has taken much time to even count and catalog the 750,000 specimens so far uncovered), preliminary results have been most encouraging. Some of these I summarize briefly in the following paragraphs.

Ajuereado Phase

The earliest assemblage of artifacts is called the Ajuereado phase (*4*). In the caves, we uncovered evidence of seven different occupations, while surface collections have yielded four more sites of this cultural complex. As yet we have only three dates, obtained by the carbon-14 technique, on the final stages of this phase, but another five are being processed. The phase seems to have ended by at least 7200 B.C., and it may have come into being 3 or 4 millennia earlier. Examination of these floors indicates that in this period the inhabitants were grouped together into small, nomadic families or microbands who changed their camps three or four times a year with the seasons (see Fig. 2). As means of subsistence they collected wild plants and they hunted and trapped. Although they hunted such animals as horses and antelope of now-extinct species during the earliest part of the phase, even then most of their meat came from smaller game, such as jack rabbits, gophers, rats, turtles, birds, and other small mammals. In the later part of the phase they trapped only species that exist today. These people, in the so-called "big game hunting stage" (*5*) or "mammoth-hunting period" (*6*), were far from being the great hunters they are supposed to have been. As one of my colleagues said: "They probably found one mammoth in a lifetime and never got over talking about it."

Preliminary studies of the pollen and animal bones seem to show that, in this region, the climate of the terminal Pleistocene was only very slightly cooler and wetter than the climate today. The vegetation was probably xerophytic, but not like the present-day desert vegetation in the Tehuacán Valley—it probably was more like the mesquite grasslands of western Texas.

The manufactured tools of this group were not numerous, and all were made by chipping flint. They include a series of bifacially leaf-shaped knives and projectile points, keeled and ovoid end scrapers, flake and bifacial choppers, side scrapers, gravers, and crude prismatic blades struck from even cruder polyhedral cores. No ground stone was utilized, and the floors held few perishable remains, hence we know nothing about the weaving industry or the traps and perishable tools of these peoples. No burials have been found, though there is one fragment of a charred human bone.

This complex (represented by many more artifacts than have been previously found for this time period) seems to be related to the earliest remains found elsewhere in Central America. It must be noted, however, that even at the earliest stage these peoples were not primarily dependent upon hunting and should be called plant and animal collectors rather than hunters. Further, the material culture of the Ajuereado phase continued unchanged even though the Pleistocene fauna became extinct and gave way to modern fauna.

El Riego Phase

Gradually the Ajuereado phase developed into one which we call the El Riego cultural phase. This is extremely well known, for we have dug up 24 floors and have found 14 open camp sites. Ten dates, obtained by the carbon-14 method, allow us to estimate the time of this cultural phase fairly accurately. It seems to fall between 7200 and 5200 B.C. These peoples were seasonally nomadic like their predecessors, but there had been a definite increase in population and some changes in the settlement pattern seem to have taken place. The sites are almost equally divided between very small camps, which obviously represent the family groups or microbands of the dry seasons, and much larger sites, representing camps of related families or macrobands which gathered together in the spring and wet seasons. The means of subsistence was basically plant and animal collecting, supplemented by some hunting—not very different from the previous period, although these peoples seem to have hunted deer in-

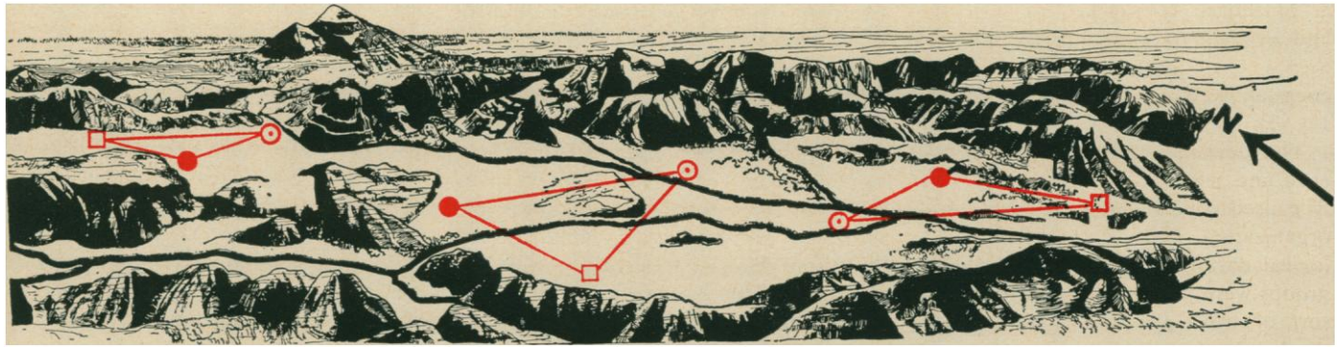

Fig. 2 (hypothetical stage 1). Ajuereado and early El Riego phases. *Community pattern:* Wandering microbands that changed residence seasonally, that is, groups that went from wet-season camps (●) to fall camps (□) to dry-season camps (⊙) in an annual cycle. *Population estimate:* Three microbands of four to eight people (the original population). *Estimated age:* Before 6800 B.C. *Subsistence:* Food collectors who hunted and trapped and gathered wild plants. *Occupations found:* About 11.

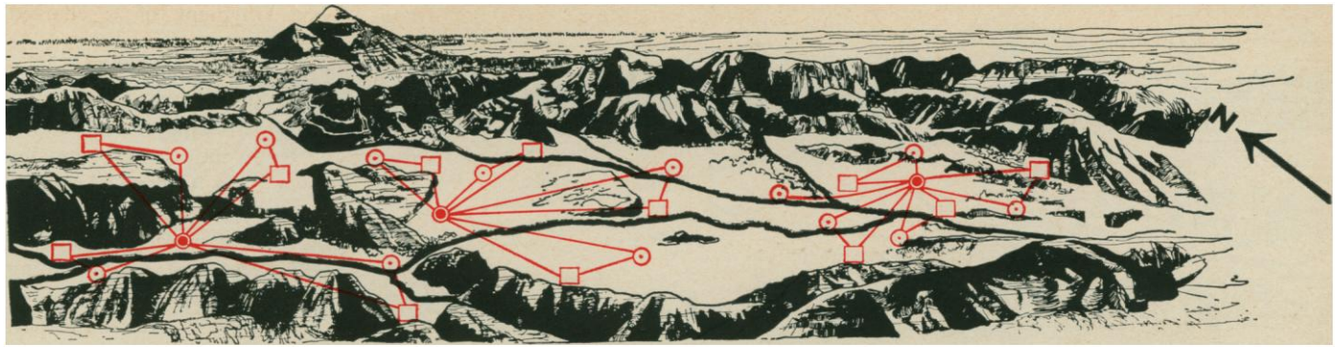

Fig. 3 (hypothetical stage 2). El Riego and early Coxcatlan phases. *Community pattern:* Microbands that coalesce once a year to form seasonal macrobands, that is, microbands that went from fall camps (□) to dry season camps (⊙) to join others at spring macroband camps (◉). *Population estimate:* Four times the original population. *Estimated age:* 6800 to 5000 B.C. *Subsistence:* Plant collectors who occasionally hunted and trapped, and used squash and chili. *Occupations found*: About 40.

stead of horse and antelope, and the cottontail rabbit instead of the jackrabbit.

As for their hunting and trapping activities, there were no fundamental changes; nor do they seem to have been "forced by the changing climatic conditions that followed the end of the Wisconsin Glaciation to make readjustments" (*5*). The preserved plant remains, however, seem to show that plant collecting was even more important than it had been in the previous culture. Nevertheless, it was only a seasonal affair. During the dry season, apparently, people still hunted and trapped in small groups and probably nearly starved, but when the spring came, and later the rains, a number of microbands seem to have gathered together in larger groups to live off the lusher vegetation. There is evidence that they were collecting a large variety of plants, and I would guess that this was the period when they finally conceived the idea that if you drop a seed in the ground a plant comes up. This concept is, of course, basic to any beginnings of agriculture. Further, these people were eating some plants which later became domesticated. These included one variety of squash (*Cucurbita mixta*), chili, and avocados. It is also possible that they were gathering and consuming wild corn as well as utilizing cotton (see Fig. 3).

The development of such a subsistence and settlement pattern undoubtedly caused some changes in their social organization. From comparative ethnological data one might guess that these groups were patrilineal bands with some sort of weak temporary leadership in the hands of a male, and perhaps some sort of concept of territoriality (*7*). Further, there apparently were shamans, or witch doctors, who had considerable power in both the medicinal and the ceremonial fields. These, of course, would not have been full-time specialists.

The tools we dug up gave considerable evidence about the industrial activities of these peoples. For example, they manufactured a number of varieties of contracting-stemmed and concave-based projectile points which were very neatly chipped and were probably used to tip atlatl darts used in the chase. The most prevalent artifacts were, however, the large plano-convex scrapers and choppers chipped from pebbles or nodules of flint. These could have been used for preparing skins, but it seems more probable that they were used for pulping various plant remains. Some blades, burins, and end scrapers of types found in the previous horizon were still made and utilized. The most noticeable change in the material culture was the use of ground-stone and pecked-stone implements. Mortars and pestles were particularly numerous, and there were many milling stones and pebble manos. Tools of both types were probably used to grind up plant and animal remains into some sort of palatable (or unpalatable) stew.

In addition, it is in this period that we found the first evidence of weaving and woodworking—knotted nets, a few small fragments of twined blankets and coiled baskets, fragments of dart shafts, and pieces of traps.

To me, one of the most surprising findings for the El Riego cultural phase was evidence of relatively elaborate burials, which indicate the possibility of complex beliefs and ceremonies. We uncovered two groups of multiple burials. In the first were the skeletons of two children; one child had been ceremonially cremated. The head of the other child had been severed and roasted, the brains had been removed, and the head had been placed in a basket on the child's chest. The other multiple burial included an elderly man, an adolescent woman, and a child of less than 1 year. There was evidence that the elderly man had been intentionally burned, and the heads of both the woman and the child had been smashed, perhaps intentionally. These findings could certainly be interpreted as some sort of human sacrifice, but the correctness of such an interpretation is difficult to prove. In both these burials the bodies were wrapped in blankets and nets and were richly furnished with basketry. Is it not possible that the ceremonialism that is so characteristic of the later Mexican periods began at this time?

In terms of wider implications, the El Riego phase seems to be related to early cultures occurring in Northern Mexico, the U.S. Southwest, and the Great Basin areas which have been classified as being of the "Desert Culture Tradition" (*8*). The later preceramic phases that follow the El Riego phase in the Tehuacán Valley are difficult to classify in this tradition because they have incipient agriculture and the numerous large choppers, scrapers, and milling stones decrease in importance. In addition, these Mesoamerican cultures developed their own distinctive types of grinding tools, baskets, nets, projectile points, blades, and other implements—all unlike artifacts found in the Desert Cultural manifestations.

Coxcatlan Phase

The phase developing out of the El Riego phase was termed Coxcatlan. About 12 radiocarbon determinations indicate that it existed from 5200 to

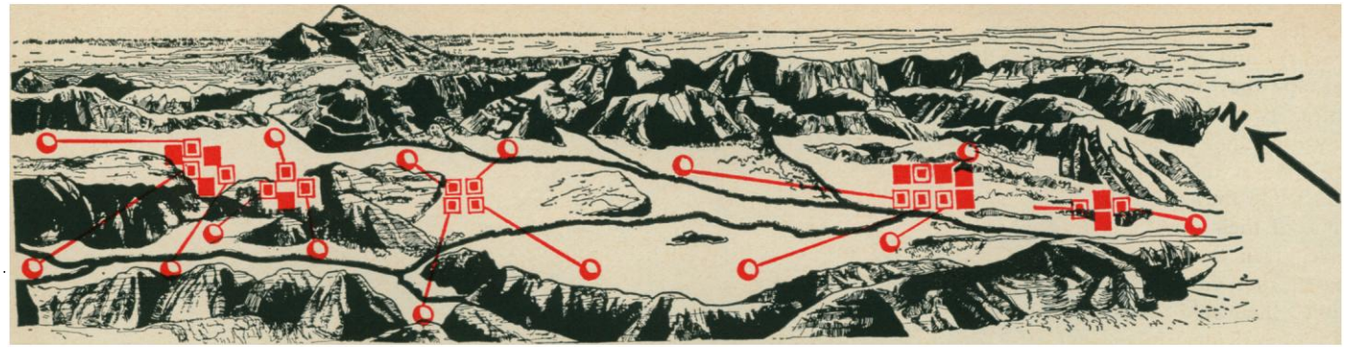

Fig. 4 (hypothetical stage 3). Coxcatlan and early Abejas phases. *Community pattern:* Semisedentary macrobands that had wet-season fall camps (■) or annual camps (▪) but that often separated into dry-season microband camps (◒). *Population estimate:* Ten times the original population. *Estimated age:* 5000 to 3000 B.C. *Subsistence:* Plant collectors who did increasing amounts of agriculture due to new domesticates (first chili and squash then corn then beans and gourds). *Occupations found:* About 30.

3400 B.C. Twelve components of this phase were uncovered in cave excavations, and four open camps were also found. Although fewer occupations were found than in the El Riego phase, most of them were larger. However, the way of life may have been much the same, with nomadic microbands in the dry season and macrobands in the wet season. The macrobands seem to have been larger than those of the earlier phase, and they seem to have stayed in one place for longer periods. Perhaps this was due to their rather different subsistence pattern (see Fig. 4).

While the Coxcatlan people were still basically plant collectors who did a little animal trapping and hunting, all through this period they acquired more and more domesticated plants. Early in the period they began using wild corn, chili, avocados, and gourds. By the middle of the phase they had acquired amaranth, tepary beans, yellow

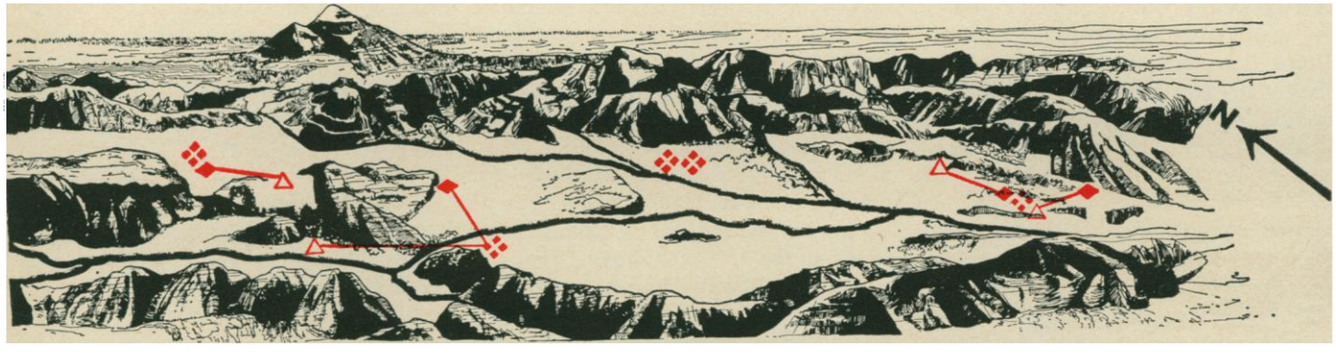

Fig. 5 (hypothetical stage 4). Late Abejas, Purron, and possibly early Ajalpan phases. *Community pattern:* Semipermanent villages (❖) composed of a number of microbands living together that occasionally made camps for hunting or planting (△) or collecting (◆). *Population estimate:* Forty times the original population. *Estimated age:* 3000 to 1500 B.C. *Subsistence:* Full-time agriculturists who planted an increasing amount of domesticates. Plant hybridization may have begun. *Occupations found:* About 15.

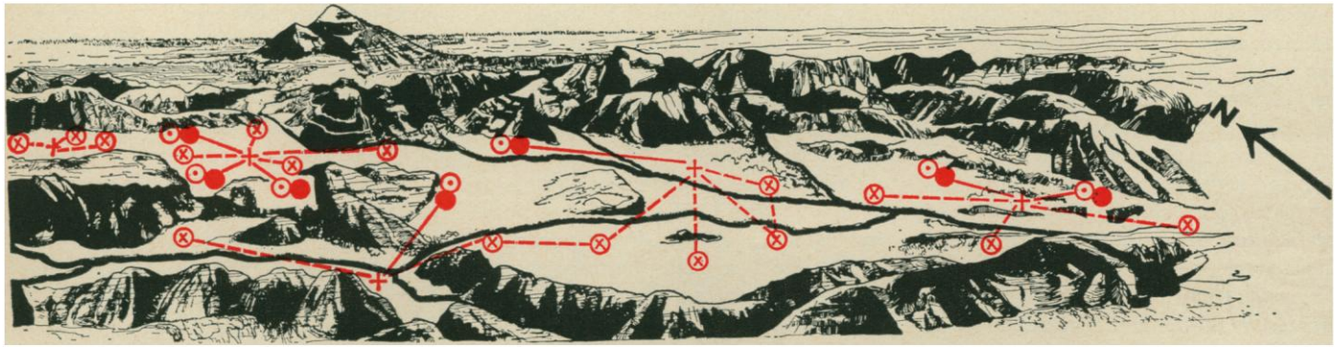

Fig. 6 (hypothetical stage 5). Ajalpan and St. Maria phases. *Community pattern:* Ceremonial centers or villages with temples (✚) with ceremonially affiliated villages (⊗) and seasonal camps (●⊙). *Population estimate:* 150 times the original population. *Estimated age:* 1500 to 200 B.C. *Subsistence:* Full-time agriculturists using many hybrid domesticates. Irrigation may have begun. *Occupations found:* About 60.

zapotes, and squash (*Cucurbita moschata*), and by the end of the phase perhaps they had black and white zapotes. It seems that microbands still came together at some favorite collecting spot in the spring, and it may be that while they were there they planted some of their domesticates. This would have given them food to continue living at that camp after they had consumed their wild foods. As the numbers of domesticates increased, the group could, of course, have stayed together as a macroband for longer and longer periods. But with the onset of the dry season and the depletion of their agricultural "surpluses" they would have broken up again into nomadic microbands.

The changing subsistence and settlement pattern may have been connected with changes in social organization. The bands may still have been patrilineal. But one wonders whether the use of gardens and the more sedentary way of life might not have resulted in bands having definite collecting territories and ideas about property "garden rights." Moreover, a greater dependence upon agriculture (and rainfall) may have made the shaman even more powerful, not only in medicine and in birth and death ceremonies but also in regard to rituals connected with plantings and harvestings. In addition, the more sedentary life involving larger numbers of people may have resulted in some kind of macroband leadership, more stable than just that vested in the oldest or most powerful male in a family.

The industrial activities of the group were not vastly different from those of their predecessors, although different types of tanged projectile points were manufactured. Blades were more delicately made, scrapers and choppers were of new types, and true metates, with manos, were replacing the mortars, pestles, and milling stones. Some minor improvements were also made in the manufacture of nets, coiled baskets, bags, and blankets.

The most distinctive aspect of the Coxcatlan phase is its incipient agriculture. However, I do not want to give the impression that Tehuacán was the only early center of plant domestication or agriculture. In fact, our accruing archeological data having to do with the beginning of New World plant domestication seem to indicate that there was no single center, but, instead, that domesticates had multiple origins (*9*) over a wide area of Nuclear America and the southern United States. For example, while tepary beans and corn may have been first domesticated near or in the Tehuacán Valley, pumpkins seem to have been domesticated in northeastern Mexico, sunflowers in the southwestern United States, potatoes and lima beans in the highlands of South America, common beans in still another region, and so on (*10*).

Abejas Phase

The Abejas phase follows the Coxcatlan phase, and we estimate, on the basis of eight carbon-14 determinations, that it existed from 3400 to 2300 B.C. Thirteen occupations have now been uncovered, and eight sites were found in reconnaissance. We are now making plans to excavate what seems to be a pit-house village of the Abejas phase.

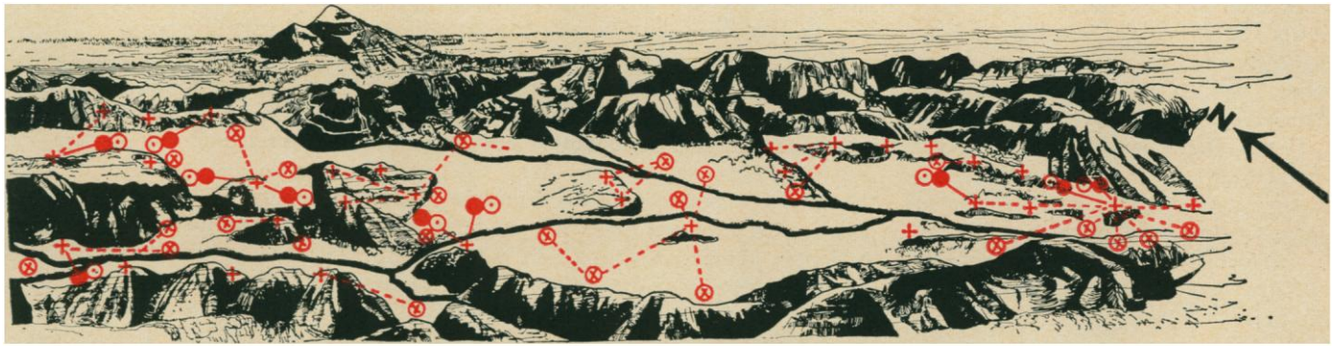

Fig. 7 (hypothetical stage 6). Palo Blanco phase. *Community pattern:* Sacred cities or ceremonial centers (✚) with villages (ceremonially and politically) affiliated (⊗) and camps (●⊙). *Population estimate:* 1000 times the original population. *Estimated age:* 200 B.C. to A.D. 700. *Subsistence:* Full-time agriculturists with irrigation. *Occupations found:* About 160.

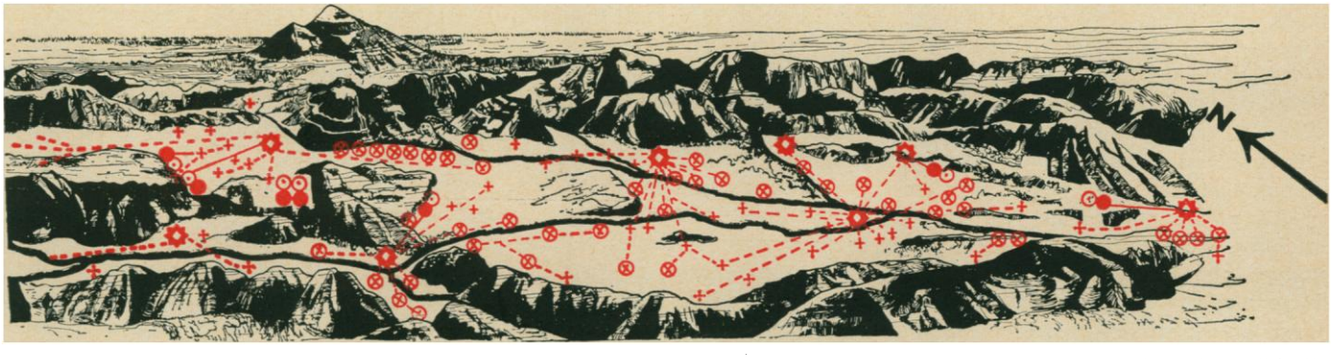

Fig. 8 (hypothetical stage 7). Venta Salada phase. *Community pattern:* Secular cities or towns (✿) with (religiously, politically, and economically) affiliated ceremonial centers (✚), villages (⊗) and camps (● ⊙). *Population estimate:* 5000 times the original population. *Estimated age:* A.D. 700 to A.D. 1500. *Subsistence:* Full-time agriculturists and irrigation as well as commerce. *Occupations found:* About 210.

The settlement pattern seems to have changed significantly during this period. Ten of the cave occupations were hunting (dry-season) camps of macrobands, while eight of the macroband settlements were on river terraces in the Valley. The latter appear to have been larger settlements (of five to ten pit houses), and some of them may have been occupied all year round (see Fig. 5). This even more sedentary way of life was made possible by more efficient food production. This was accomplished with plants already known and, in addition, with domesticated canavalia and perhaps pumpkins (pepo) and common beans, as well as some varieties of hybrid corn with teosinte introgression. The people also used cotton and had dogs. However, even with this increase in domesticates, botanical studies and studies of feces reveal that more than 70 percent of their foods still came from wild plants and animals.

Again, many of the older techniques of artifact manufacture continued, though the types are a little different. Some of the types which carry over into much later times originated during this period. These include: split-stitch basketry and the manufacture of stone bowls and ollas, oval metates and large plano-convex manos, obsidian blades made from long cylindrical cores, and other objects.

If this phase provides evidence of a Marxian "Neolithic revolution," the revolution came long after the first plant domestications; the population showed no sudden increase in size, and the artifacts were little better than those of the preceding phase (*11*).

Purron Phase

The next phase, Purron, is dated by six carbon-14 determinations which place it between 2300 and 1500 B.C. It is the least clearly understood phase in the sequence and was represented by only two floors in excavation. The excavated materials include a few plant remains, early tripsacoid corn cobs, manos, metates, scrapers, fine obsidian blades, and a number of very crude, crumbly pieces of broken pottery. The pottery, the earliest so far found in Mesoamerica, has the same vessel forms as the stone bowls and ollas of the previous period. This pottery may not be the first modeled in Mexico but only an imitation of still earlier pottery (as yet unfound) in some other area. One might surmise that the subsistence and settlement pattern and social organization of the Purron phase was much the same as that of the Abejas phase.

Ajalpan Phase

The following phase, Ajalpan, dated by 18 carbon-14 determinations, is much better understood. It is placed between 1500 and 900 B.C. Seventeen floors were found in the diggings, and two open sites were found during survey. These Ajalpan people were full-time agriculturists; they planted early hybrid corn, mixta, moschata and pepo squashes, gourds, amaranths, beans, chili, avocado, zapotes, and cotton. They seem to have lived in small wattle-and-daub villages of from 100 to 300 inhabitants. Whether they built religious structures is not yet known, but their figurines, mainly female, attest to a complex religious life. Male priests and chiefs certainly must have had considerable power, although the rich female burials and the figurines hint that kinship and property ownership may have had a matrilineal emphasis (see Fig. 6).

Many stone tools of the older types were still made, but one of the more notable industries of this period was pottery making. The pottery, though well made, is usually unpainted, although a few examples of monochrome specular-hemitite red ware are found. A limited number of forms were modeled; the tecomate, or small-mouthed seed jar, is the dominant type of receptacle.

In terms of cultural relationships, the pottery, large figurines, and rocker-dentate stamp decoration are like those found in the earliest cultural manifestations in lowland Mesoamerica—that is, Veracruz, Chiapas, Pacific-lowland Guatemala, and the Pacific coast of Oaxaca (*12*, *13*). This does not, however, mean there was a migration, diffusion, or relationship only from the coast to the highlands, for remains from periods of comparable age have not yet been found in highland Mexico. In fact, Ajalpan could well be but a local manifestation of an early widespread horizon in Mesoamerica. Spinden, many years ago, concluded that such a horizon existed, and he called it the Archaic. More and more evidence confirming his original hypothesis is being accumulated (*14*).

Santa Maria Phase

In the subsequent Santa Maria period the pottery still shows resemblances to pottery of the Veracruz coast. But in addition to these resemblances it shows resemblances to the earliest pottery remains in Monte Alban (*15*), the Valley of Mexico (*16*), and other highland regions.

Thus, we have good evidence for correlating a number of sequences from a number of areas, not only with Santa Maria but also with each other. Twenty-three carbon-14 determinations indicated that the Santa Maria period lasted from just before 900 to about 200 B.C. The culture is well known, for we have excavated 38 components and have found about 15 surface sites. The settlement pattern reveals that the people lived in small wattle-and-daub houses in villages which were oriented around a single, larger village having ceremonial structures.

These people were full-time farmers, using all of the plants previously known, although many of these plants had been developed into much more productive hybrids. This may be the period in which irrigation was first used.

Although a few new types of chipped stone tools, woven cotton fabrics, and new kinds of ground-stone tools appear, the great majority of the materials we uncovered consisted of pieces of broken pottery. These vessels were well made. They were mainly monochrome (white or grey), though there were a few bichromes. About half of all the vessels found were flat-bottomed bowls; the rest were ollas, water-bottles, composite silhouette bowls, and other forms. Decoration was usually achieved by incising on the interior bottoms of bowls or on the rims or lips, but a few of the vessels have plain rocker stamping, negative painting, and engraving.

Perhaps it was during this period that Mesoamerica became divided into two units, each with a distinctive cultural development (*12*). One development, in the lowlands, may have been based on milpa (slash-and-burn) agriculture and have culminated in the development of ceremonial centers, run by a priestly hierachy. The other development may have been based on irrigation agriculture and have culminated in the rise of secular cities. The Tehaucán sequence would be an example of this second type.

Palo Blanco Phase

This Santa Maria phase developed into the Palo Blanco period, dated between 200 B.C. and A.D. 700 by eight radiocarbon determinations (see Fig. 7). On the basis of information and materials from 17 excavated components and from about 150 sites found in survey, we are able to make the following reconstruction about the way of life of the people of this phase. They, too, were full-time agriculturists, and they systematically used irrigation. Besides the previously known domesticates, they had acquired tomatoes, peanuts, lima beans, guavas, and turkeys. They lived in wattle-and-daub villages or hamlets either oriented toward or adjacent to large hilltop ceremonial centers having elaborate stone pyramids, plazas, ball courts, and other structures. Some of these ruins covered whole mountain tops and, in terms of population, might be considered cities, albeit sacred cities. Perhaps these centers were under the authority of priest-kings; if so, the priest-kings certainly must have been assisted by full-time specialists and a hierarchy of bureaucrats, at least to run the irrigation works.

The manufactured products were varied and more elaborate than those of previous phases. The fine grey and orange pottery, the obsidian working, the bark cloth, and the elaborately woven cotton fabrics are particularly distinctive.

In terms of relationships, Palo Blanco seems to be an extension of the Monte Alban III (and IV?) cultures of Central Oaxaca and shows similarities to cultures in the so-called "Classic Period" of Mesoamerica (*5*). Why this period in the highlands is considered more "classic" than the later periods has never been satisfactorily explained.

Venta Salada Phase

The final period, Venta Salada, is placed, on the basis of five carbon-14 determinations, between A.D. 700 and 1540 (see Fig. 8). Study of the records of early Spanish conquerors of the Tehuacán Valley should shed further light on this phase. Studies made so far reveal that these people were full-time agriculturists who had irrigation. Further, their economy was greatly supplemented by commerce with other regions. Local salt-making and cotton-processing industries made products for exportation. Politically, the Valley seems to have been divided up into a series of little kingdoms each of which had urban centers with surrounding hamlets. Among the manufactured articles were such distinctive artifacts as polychrome pottery, a wide variety of cotton fabrics, bark cloth, chipped stone tools, and arrow points. Since we have excavated over 15 occupations of this final phase and have found about 200 sites in surface surveys, and also have excellent ethnohistorical records available, it will eventually be possible to reconstruct a fairly clear picture of the culture of the final preconquest phase. So far this has not been done.

Conclusion

Obviously, our studies are far from complete, even though some tentative conclusions have been expressed in this article. As more of our data are analyzed and the results are correlated, the total history of the Tehuacán Valley will become better understood. At present, some 30 authors, including myself, are in the process of getting six volumes about our work in Tehuacán ready for publication. Certainly these final volumes will contain information which will permit more perceptive and specific comparisons to be made with other prehistoric cultural developments in Mexico and South America, as well as with sequences in the Old World. Such analysis should lead to more cogent and better documented generalizations about the how's and why's of the rise of civilization than have been expressed heretofore.

References and Notes

1. R. S. MacNeish, "First Annual Report of the Tehuacán Archaeological-Botanical Project," *Rept. No. 1* (Robert S. Peabody Foundation for Archaeology, Andover, Mass., 1961).
2. Drs. P. C. Mangelsdorf and W. C. Galinat of the Harvard Botanical Museum and E. J. Wellhausen and R. Hathaway of the Rockefeller Foundation studied the corn remains; Drs. T. Whitaker, senior geneticist of the U.S. Department of Agriculture, and H. Cutler, executive director of the Missouri Botanical Gardens, investigated the prehistoric cucurbits, and Dr. L. Kaplan of Roosevelt University studied the prehistoric beans. Dr. C. E. Smith of the U.S. Department of Agriculture made botanical studies in the Tehuacán Valley; Dr. R. Drake, at the University of British Columbia, identified the shells; and Dr. Eric C. Callen, of McDonald College of McGill University, analyzed the human feces found in the caves. Miss Monica Bopp, and later Dr. James Shoenwetter of the University of Southern Illinois, studied various pollen profiles in the valley to determine ancient changes in climate and vegetation. Dr. Carmen Cook De Leonard of the Centro de Investigaciones Antropologicas of Mexico aided us with her knowledge of the ethnohistory and ethnobotany of the Tehuacán Valley, and Mrs. I. Johnson of the National Museum of Mexico examined the textiles we found in the excavations. Kent Flannery, a student at the University of Chicago, identified the 12,000 archeological bones we uncovered; Dr. J. L. Lorenzo, chief of the Prehistoric Section of the Instituto de Antropologia of Mexico, and Dr. J. Moser of the Federal Department of Geology of Mexico surveyed the geology, and Dr. R. Woodbury of the U.S. National Museum, Dr. J. Anderson of the University of Buffalo, and D. Byers of the R. S. Peabody Foundation investigated, respectively, the ancient irrigation systems, the human skeletal remains, and the geography of the Valley. F. Johnson, also of the R. S. Peabody Foundation, carried out a program of dating the archeological remains by the carbon-14 method.
3. The Tehuacán field staff included Mr. Peterson, assistant director; Dr. M. Fowler of the University of Southern Illinois; F. Johnson of the R. S. Peabody Foundation; K. Flannery of the University of Chicago; R. L. Chadwick of Mexico City College; Angel Garcia Cook and A. Arbide of the School of Anthropology of Mexico; and Miss A. Nelken, a student of the Sorbonne in Paris, and her two "Tehuacanero" assistants in the laboratory, N. Tejeda and F. Molina.
4. The names of the various phases were taken from the name of the site or cave where these cultural complexes were first unearthed.
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