

Anales de Antropología

Volumen 38

2004



INSTITUTO DE INVESTIGACIONES ANTROPOLÓGICAS
UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

Anales de Antropología

FUNDADOR JUAN COMAS

CONSEJO EDITORIAL

Lyle Campbell, Universidad de Canterbury

Milka Castro, Universidad de Chile

Mercedes Fernández-Martorell, Universidad de Barcelona

Santiago Genovés, Universidad Nacional Autónoma de México

David Grove, Universidad de Illinois, Universidad de Florida

Jane Hill, Universidad de Arizona

Kenneth Hirth, Universidad Estatal de Pennsylvania

Alfredo López Austin, Universidad Nacional Autónoma de México

Joyce Marcus, Universidad de Michigan

Katarzyna Mikulska, Universidad de Varsovia

Kazuyazu Ochiai, Universidad de Hitotsubashi

Claudine Sauvain-Dugerdil, Universidad de Ginebra

Gian Franco De Stefano, Universidad de Roma

Luis Vásquez, CIESAS Occidente

Cosimo Zene, Universidad de Londres

EDITORES ASOCIADOS

Yolanda Lastra, Universidad Nacional Autónoma de México

Rodrigo Liendo, Universidad Nacional Autónoma de México

Rafael Pérez-Taylor, Universidad Nacional Autónoma de México

Carlos Serrano Sánchez, Universidad Nacional Autónoma de México

EDITOR

Lorenzo Ochoa, Universidad Nacional Autónoma de México

Anales de Antropología, Vol. 38, 2004, es editada por el Instituto de Investigaciones Antropológicas de la Universidad Nacional Autónoma de México.

Ciudad Universitaria, 04510, México, D.F. ISSN: 0185-1225. Certificado de licitud de título (en trámite), Certificado de licitud de contenido (en trámite), reserva al título de Derechos de Autor 04-2002-111910213800-102.

Se terminó de imprimir en octubre de 2005, en *ENACH, S.A. de C.V.*, México, D.F. La edición consta de 500 ejemplares en papel cultural de 90g; responsable de la obra: Lorenzo Ochoa; la composición la hicieron Martha Elba González y Ada Ligia Torres en el IIA; en ella se emplearon tipos Tiasco y Futura de 8, 9, 11 y 12 puntos. La corrección de estilo en español estuvo a cargo de Adriana Incháustegui, la corrección de textos en inglés estuvo a cargo de Nicolás Mutchinick; la edición estuvo al cuidado de Ada Ligia Torres y Hélida De Sales. Diseño de portada: Francisco Villanueva. Realización: Martha González. Fotografía de portada: Bordado de Juchitán, Oaxaca. Adquisición de ejemplares: librería del Instituto de Investigaciones Antropológicas, UNAM, Circuito Exterior s/n, Ciudad Universitaria, C.P. 04510, México, D.F., tel. 5622 9654, e-mail: libreria@servidor.unam.mx

ARTÍCULOS

THE LAKEBED HYPOTHESIS IN OAXACA'S ARCHAEOLOGY: A REAPPRAISAL OF THE CENTRAL VALLEY ECOSYSTEM

Bernd Fahmel Beyer

Instituto de Investigaciones Antropológicas, UNAM

Resumen: La geomorfología de los valles centrales de Oaxaca ha sido causa de largas discusiones sobre las condiciones en las que se desarrolló el pueblo zapoteco prehispánico. Mientras que en la tradición oral se habla de extensos lagos y de un modo de vida adaptado a éstos, la estructura de los aluviones depositados a lo largo de los ríos favorece la propuesta de una cuenca fluvial. Sin embargo, la red de los cauces y su desagüe hacia el Pacífico no explican la morfología general de los valles y su proceso de formación. Sólo una visión comprensiva del mesoplano oaxaqueño, ligada a los efectos que en él tuvieron los movimientos tectónicos y el vulcanismo reciente puede aclarar dicha situación y dibujar el contexto ambiental en el que se fundó la antigua ciudad de Monte Albán. Partiendo del análisis de la cartografía regional se concluye que las dos hipótesis expuestas son válidas si se les ubica dentro de un marco temporal que da cabida a procesos de larga duración. Además, se demuestra que la manera de percibir el entorno hoy en día ha condicionado la forma en que se interpreta el registro arqueológico, y que el significado de éste debe ponerse en función del paisaje tal y como lo concibió la gente en el pasado.

Palabras clave: Arqueología del paisaje, mesoplano zapoteco, valles de Oaxaca, Monte Albán, cultura zapoteca.

Abstract: The geomorphology of Oaxaca's Central Valleys has been the cause of long discussions about the conditions under which Prehispanic Zapotec people developed. Oral tradition often alludes to lakes and their importance for everyday life, while alluvial structures along the rivers favour the streambed hypothesis. The river system in itself, however, does not explain the valley's general morphology and its formation processes. Only a comprehensive view of Oaxaca's midlands, linked to the effects of recent tectonic movements and vulcanism, may shed some light on this situation and illustrate the environment in which the old city of Monte Alban was founded. Through an analysis of the region's cartography it is possible to conclude that both arguments are valid if placed within a broad temporal perspective. Moreover, it becomes clear that the archaeological record has been interpreted in terms of modern perception, and not in the way ancient people looked at their geographical setting.

Keywords: Landscape Archaeology, Zapotec Midlands, Valleys of Oaxaca, Monte Alban, Zapotec culture.

INTRODUCTION

For a long time now, people from Oaxaca have regarded the central valley region as an environment that traces its origins to a series of lakes that no longer exist. Not only do the ETLA and Tlacolula basins look like the bed of extended water bodies, but words in Zapotec also allude to their existence. Often times, however, the dry steppes of the Atoyac and Salado drainages make onlookers wonder about the veracity of oral tradition. The valleys' geomorphology also challenges these ideas, showing that nothing but marshlands could have existed along its rivers (figure 1). In order to clarify this situation, the literature and cartography of the area were revisited, allowing the conclusion that the stream system is quite recent, and that in geologic times the valley region was closed, with a good part of it standing under water. Why this is important for archaeology, and for our understanding of traditional village life, will be discussed in the light of recent contributions on the nature of human landscapes and preliminary results of a survey carried out in the San Dionisio-Chichicapan area.



Figure 1. *Panoramic view of the Valle Grande de Oaxaca.*

The first thing to avoid when in the field is the delusion that modern man can perceive the Zapotec midlands in the same way its old inhabitants did. As Mercedes Fernández Martorell (2002: 156-157) puts it, “we are individual beings of the human species, with little or no genetic baggage regarding laws of behavior that would allow us to survive as human beings, and thus we are destined to live in society and to continually ‘invent’ and recreate our way of living. This individual genetic situation relates to our capacity to symbolize ourselves, and to create groups which understand themselves as a human species. Furthermore, this way of living assumes that creation is perennial because it occurs as a process that depends on all possible ecosystems, and these are modified in themselves and through human intervention. As the interaction of people from different cultures and ways of life is inevitable and constant, cultures are prone to change”. Once landscapes are domesticated, tensions between the inside and the outside lessen until something disrupts the way nature, culture and society usually interact. The reason why and how these changes occur varies from one case to another. At the moment, however, it would appear as if a wider road system and a more detailed cartography of the state of Oaxaca are responsible for a new perception of its Valley Region, and our ideas of how the old Zapotec system came to link and develop the numerous and different realms that are to be found within it.

ANTECEDING STUDIES

In his *Archaeological Synthesis of Oaxaca*, Ignacio Bernal (1965) wrote: “Although not yet proved geologically, indications point to the former existence of a lake, or at least large swamps, in the valley. Today there are swamps, now largely dried up, which, doubtless, were bigger at some point. Representations of aquatic animals and swimmers appear persistently on Monte Alban I pottery; deeply rooted legends tell that lakes or swamps once existed here. Not only do ancient writers speak of projects by Zapotec sovereigns to drain the valley, but the belief persists in the folklore of today. I have collected legends to this effect in a number of places” (Bernal, 1965: 794-795). In Bernal’s days, the lack of evidence of Preclassic and Preclassic cultures in the valleys was explained by reference to that lake: “According to one view, Monte Alban I culture had developed at Monte Negro, a mountaintop center near Tilantongo in the Mixteca Alta, and spread into the Valley of Oaxaca after an earthquake opened an outlet for the lake and drained the valley. For those who didn’t believe in

a Mixtec origin for Monte Alban I, there were the Olmecs” (Flannery, Marcus and Kowalewski, 1981: 50). John Paddock based his own view on experts who referred to “several still existing swamps and ponds and a number of former shorelines, fan-shaped deposits, and other evidences of an ancient lake. If the lake really was there, and was drained when the present southern outlet was formed, it would be easy to imagine why the early population left traces only on the slightly higher lands –such as the Mitla area– around the edge of the valley, and why a culturally advanced population moved in suddenly and only relatively late to inhabit the fertile valley bottoms” (Paddock, 1966: 95).

But the truth is that a valley survey done by Jose Luis Lorenzo in the late fifties found no geological evidence of that lake. On the contrary, Lorenzo singled out some rock shelters near the town of Mitla as possible Preceramic sites (Flannery, Marcus and Kowalewski, 1981: 50). In his publication of 1960, he points out how the profiles of different regions in the valleys gave him knowledge of local soils: “It could be observed that in no one of the visited places there existed horizons characteristic of lacustrine sediments or of sirogleys which in part develop under water... The idea that there existed large water bodies in the valley seems to derive from Esteva’s (1913) misinterpretation of marine fossils which show up in Cretaceous outcrops, and therefore do not relate to more modern lacustrine environments. Furthermore, the existence of perhaps four well developed longitudinal river terraces also precludes the existence of a lake” (Lorenzo, 1960: 57-58). Similarly, Kent Flannery and his associates surveyed the area and never found the evidence of a recent lake. The supposed lake shoreline, they explain, “is not horizontal but varies in elevation by over 200 meters within a distance of some 40 kilometers. What it really consists of is the break in slope formed where the steeper fan gravels meet the valley alluvium. The fan gravels are clearly fluvial in origin, and no lacustrine deposits or fossils have been found”. Based on these observations they describe a typical cross-section of the valley and its four distinct physiographic zones: “(i) the ‘low alluvium’, or present river flood plain; (ii) a zone of ‘high alluvium’, which is mainly an abandoned flood plain of Pleistocene-to-Recent age, formed by the Atoyac River and its tributaries when they flowed at a higher elevation; (iii) a piedmont zone flanking the high alluvium, and (iv) the surrounding mountains. The river channel is incised no more than 1 to 2 meters into its present floodplain, which is only locally present and nowhere more than 600 meters wide. The main part of the flat valley floor, which varies from 1 to 15 kilometers in width ... is formed by the high alluvium” (Flannery *et al.*, 1967: 446-448).

Now then, if the situation that prevailed during the last 10,000 years has been well analyzed and described, there still exists a huge gap in our understanding of what happened earlier in the region. According to Flannery and his associates (1967: 447-448), "With the rejection of the lake hypothesis, other explanations should be suggested for the Valley of Oaxaca's unusually wide and flat floor. It is known that relatively arid climates favor alluvial-fan deposition, and this tendency toward alluviation in combination with the inability of the upper Río Atoyac to downcut (because of the high resistance of rocks in the Ayoquesco gorge) could explain the great width of the valley. Furthermore, this extensive deposition could have been initiated by downfaulting, since local deformation of Miocene (but not later) sediments shows that some late-Miocene/Pliocene dislocations have occurred in the valley. Thus three factors—aridity, downfaulting, and a low rate of stream degradation—all may have contributed to the alluvial expanses which make the Valley of Oaxaca unique among its neighbors". In other words, "apparently a resistant sill at the entrance to the Ayoquesco Gorge where the river leaves the valley has prevented the normal downcutting of the Atoyac and allowed it to form a broad valley in the area of shallow gradient" (Smith and Hopkins, 1983: 13-14).

But how could that be? If the valleys were filled with trillions of cubic meters of eroded material, why wasn't that sill cut away by all the stream water during the sweep of time? If we look at Jose Luis Lorenzo's survey data again, we read that "there exists no factor of geologic character that allows us to consider the existence, even if possible, of a lacustrine basin for there are no evidences of any dike-like element that would have restrained the natural flow of the Atoyac and permitted the development of permanent water bodies" (Lorenzo, 1960: 57-58).

A NEW PERSPECTIVE

Thirty years before Lorenzo walked the region, Oscar Schmieder had already studied the Río Salado valley and suggested that "The key to the problem probably lies in the south where the Río Atoyac, the main stream of the great valley system of Oaxaca, leaves the wide aggraded basin and crosses the mountains of Miahuatlan through a narrow canyon, flowing as the Rio Verde into the Pacific. Only a recent uplift of these southern coast ranges could have blocked off the Oaxaca Valley system and caused it to become drowned by fill" (Schmieder, 1930: 5).

This statement opens a new direction in the discussion, and the need to consider tectonic movements and major changes in the physiography of the region. The first question is when the uplift mentioned by Schmieder would have happened. If we look at the geologic sequence, and especially at the period between the Pliocene and today, it is clear that Miocene vulcanism was followed by a series of bedrock adjustments that tilted Oaxaca's midlands in several directions. Considering an average rise of 0.1 cm a year, and a timespan of 2 million years, a 2 km uplift of the pre-existing landscape should have happened and be visible somewhere—unless homeostasis and erosion worked together to even out the landscape (personal communication, T. Hernández, 2003). Geologic and topographic maps clearly show extensive alluvial deposits on the basin's northern and southern fringes, indicating that in the course of all those years the Central-Valley-Region (Rodrigo Álvarez, 1998) was isolated from other fluvial or lacustrine systems and shaped as a distinctive geomorphological feature (figure 2). The second question concerns the nature of this basin. As a series of igneous materials of Miocene-Pliocene age were deposited on vast expanses of this landscape, several mountains built up and earlier depressions were filled in. That some sort of lake existed within its confines can be asserted on the basis of all the blue-green ignimbrites (rhyolitic piroclasts with high contents of chlorite) which formed after volcanic ashes were deposited and kept submerged in standing water. Spanish authorities quarried these materials to construct most of Oaxaca's buildings, albeit including the yellow and pink varieties which formed on dry elevations.

While discussing agricultural practices in some valley areas, Jose Luis Lorenzo not necessarily denied the existence of a lake that was drained long ago. In his 1960 article he says, "Geologic and edaphologic evidence discards the existence, *in recent periods*, of a lake or lacustrine system that would have occupied parts or all of the valley floor. However, there are bogs and marshes that inundate seasonally and maintain high water tables the rest of the year. These allow for pot irrigation and represent an economic potential that was certainly used by prehispanic people" (Lorenzo, 1960: 58-60). Later on, Kent Flannery took up this idea in most of his writings, developing it to explain the origin of social complexity and the rise of the Zapotec state.

But then there are other indications that the region harbored an old lacustrine environment. In 1930 Oscar Schmieder pointed out, that "It seems as if the valley floor was once covered, at least in part, by shallow lakes, which have been slowly dried out and drained. The surroundings of Guelavía, in particular, are famous for the salts which the upper sediments contain. Place

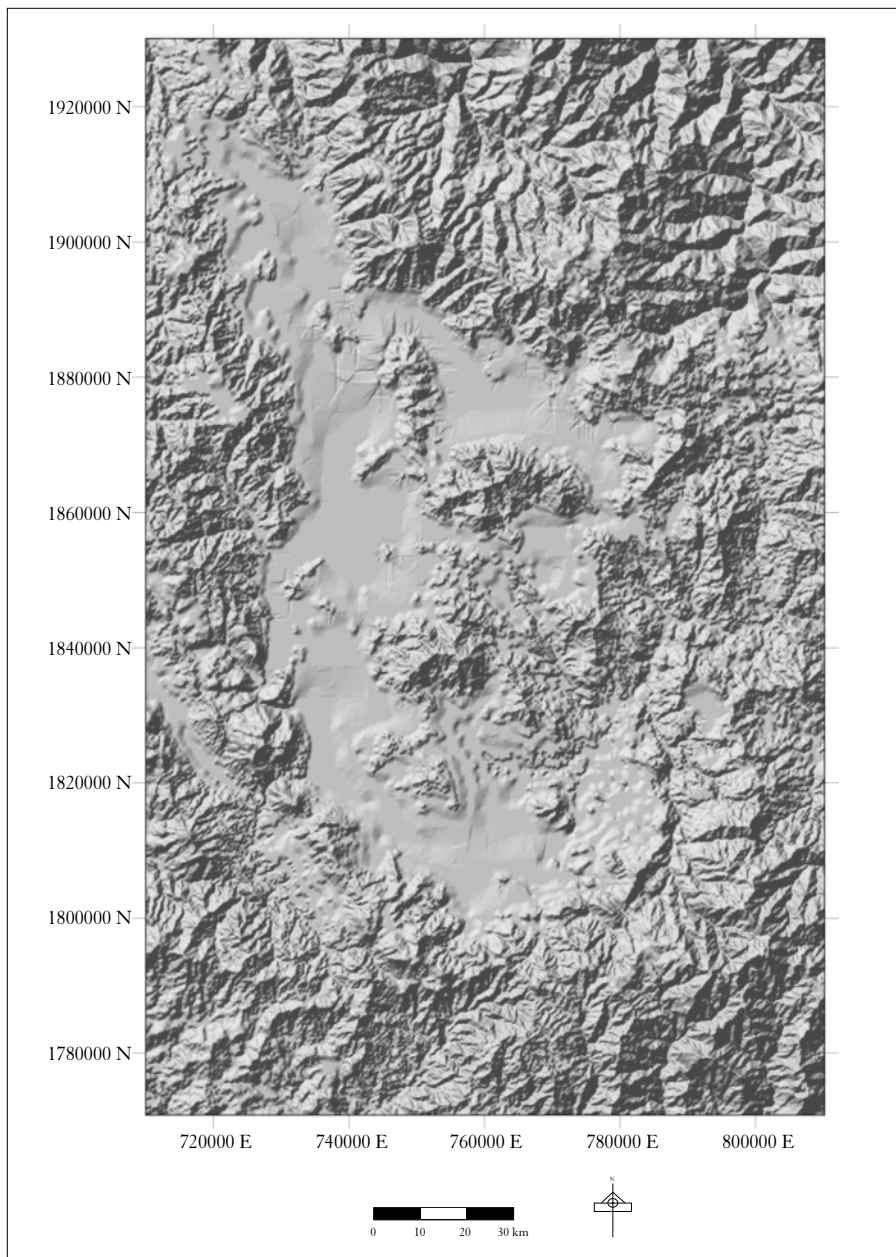


Figure 2. *Tridimensional Model of Oaxaca's Central Valleys* (taken from INEGI's topographic charts, plotted by Javier López Mejía).

names and tradition still mark such places. The natives distinguish between *tierras saladas* and *tierras amargas*, salty and bitter soils” (Schmieder, 1930: 2-3, 5). Several outcrops are mentioned in Colonial documents, and many others have recently been found by geologists searching for fractures in the valley floor, suggesting that underneath the Pleistocene deposits there are major concentrations of salt. José Luis Lorenzo (1960: 56, 62) and Kent Flannery also mention the increasing amount of carbonates and salts in the valley’s soils: “The flat valley floor and the thick alluvial deposits offer clear advantages as a site for early agriculturalists, but these factors are partially offset by the relative aridity, which limits both available water and soil fertility. Soil profiles are poorly developed, and the alluvial structure is retained almost unaltered below the A horizon. Prismatic structure and some salt accumulation is found in the B horizon. Most valley floor soils belong to the Brown Soils group, but they tend toward Gray Desert soils in the most arid areas (Flannery *et al.*, 1967: 448-449).

So, what does all this mean for our understanding of cultural development in Oaxaca? Does the acknowledgement of the lakebed hypothesis change our view of the valley system in an important way?

IMPLICATIONS FOR THE ARCHAEOLOGICAL RECORD

Among the many authors who have studied the way human beings perceive their environment there is a consensus that cultural landscapes change through time. The way individuals place and mirror themselves in their surroundings not only relates to the ecological niches they exploit, or to the routes that communicate them with nearby and long distant neighbours, but to their creation myths and the way they understand the world’s transformations (Criado and Villoch, 1998: 64-65). As social systems evolve and allocation strategies for survival change, ideas about culture and nature are necessarily put into new perspectives. Rational thinking not only accumulates impressions, but also analyzes and stratifies them to comprehend the causes that underlie the social, cultural, political and economic development (Lagopoulos, 1998; Fernández Martorell, 2002; Schávelzon s.f., 2002).

From a historical perspective, the area generally identified with Hernan Cortes’s landgrant, known as the Marquesado del Valle de Oaxaca, became but a part of the “Central Valleys” during the following centuries (figure 3). These, in turn, were recognized as one of seven regions that configurate this

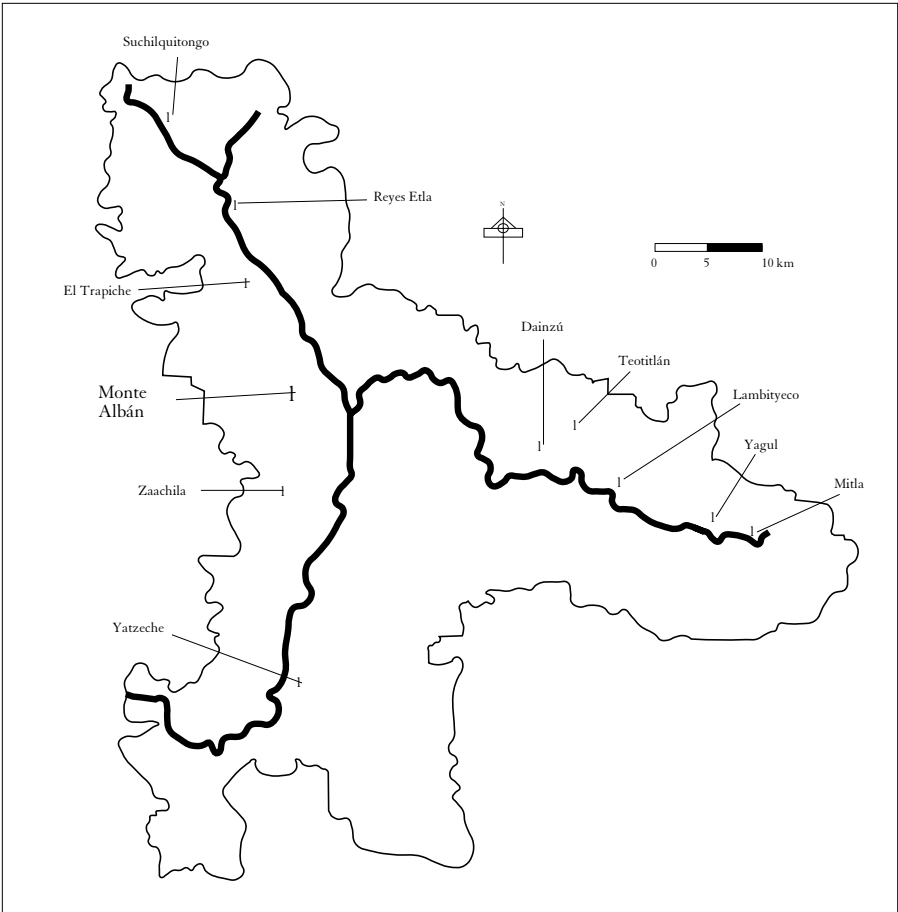


Figure 3. *Portion of Oaxaca's Central Valley Region usually known as the Valleys* (taken from J. Marcus & K.V. Flannery 1996, drawn by César Fernández Amaro).

topographically diverse state. During the XXth century the “Central Valley Region” came to incorporate the Etna, Tlacolula, Zaachila and Zimatlán areas, including the flatlands of Ejutla and San Vicente Coatlan to the south, and the mountains and valleys of Zoquitlan, Totolapan and Quiatoni to the east. A good portion of the Miahuatlan and subsidiary valley area to the south and southeast, however, was set apart and incorporated into the Southern Sierra Region (Rodrigo Álvarez, 1998). For this and other reasons, that portion of the Oaxacan midlands has shown little development and poor relations to the entity’s capital (figure 4).

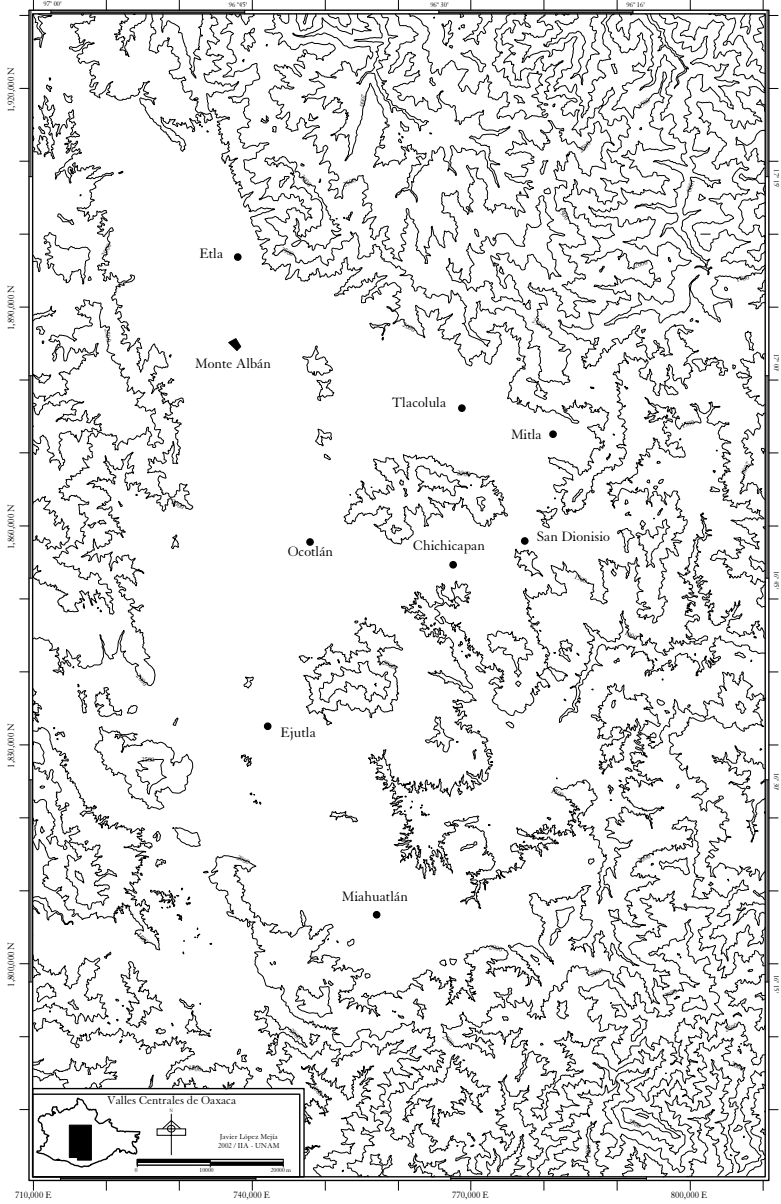


Figure 4. *Digital Elevation Model of Oaxaca's Central Valleys and the Zapotec midlands* (taken from INEGI's topographic charts, plotted by Javier López Mejía).

Now then, if archaeological research relies on these subdivisions and on the dynamics observed by ethnographers, what kind of conclusions will it obtain about the past? Should we not ask whether the elites at Monte Alban partitioned the landscape the way modern administrators did, and if they didn't, start doing research on how they conceived of it? In order to do so archaeologists need to understand that the three "Central Valleys" usually seen as the hinterland of Monte Alban are but a part of a much wider region, and that dynamics emanating from the capital city probably had an impact on all of the Zapotec midlands and beyond. The constant discovery of new archaeological sites, and their linkage to the already known settlement network, makes clear that many areas considered marginal played an important role in the valley's economy as a whole (Markman, 1979; Spencer, 1982; Feinman and Nicholas, 1990, 1999; Balkansky, 2002; Balkansky *et al.*, 2000).

Although great emphasis has been laid on the valley's recent riverine geomorphology, the location of prehispanic settlements relates both to geologic lakebed features and to lineal structures left behind by erosion. The diversity that resulted from Zapotec adaptation to this environment is remarkable, and certainly forms part of the accounts that have attracted people from abroad to visit the region (Augur, 1954; Diskin, 1976). More specifically, it is the basis of the valley's intricate economic systems and the way its people have overcome resource limitations and climatic uncertainties. In spite of these circumstances, the common archaeological discourse still neglects to acknowledge the existence of lakes as mentioned in legends and traditions. It is likely that in recent times only marshes and swamps were available to people, but a series of hunting, gathering, fishing and later herding traditions show that humid areas were incorporated into everyday village life long ago. Moisture or pot-agriculture certainly forms part of these activities, and probably explains the accumulation of wealth in the past within emerging societies.

Taking the Zapotec midlands as a regional unit, and considering its actual ecological and social diversity, one shouldn't wonder that in early days it became a landscape of differential economic growth and increased complexity. Within this fragile system, Monte Alban would have applied all sorts of diplomatic strategies to tie in people and extend its influence beyond its immediate surroundings. This process took about thirteen centuries, and during each of its archaeological phases the natural, cultural and social setting must have changed considerably. As of today, not all of these phases nor all of these settings have been studied in depth by anthropologists, and thus the picture we have of the past is still fragmentary (*cf.* Kowalewski, 2003). Recent

research in San Baltazar Chichicapan and San Dionisio Ocotepec, for example, is beginning to show that the valleys located to the southeast of Monte Alban participated very actively in the regional market system (figure 5). Not only are they placed in the center of the Valley Region, but also in a strategic position that certainly wasn't marginal to the capital city, as it seems to be the case nowadays. As a bridge to the southern parts of the basin and a gateway to the Isthmus of Tehuantepec, its inhabitants must have channelled a series of foreign products into the Zapotec midlands and allowed for transit and commerce with the Maya highlands. Particular aspects of the people's daily living, including their architecture and landscape design, undoubtedly formed part of a larger mosaic known as the Zapotec culture (*cfr.* Feinman and Nicholas, 1999). Some evidence found within already surveyed settlements, however, points to specific forms of adaptation and the use of symbolic codes to place society within nature. Whether these sites interacted separately with Monte Alban, or contributed to the notion of a common landscape is another matter. Even in small valleys cognitive maps of human habitation sites and

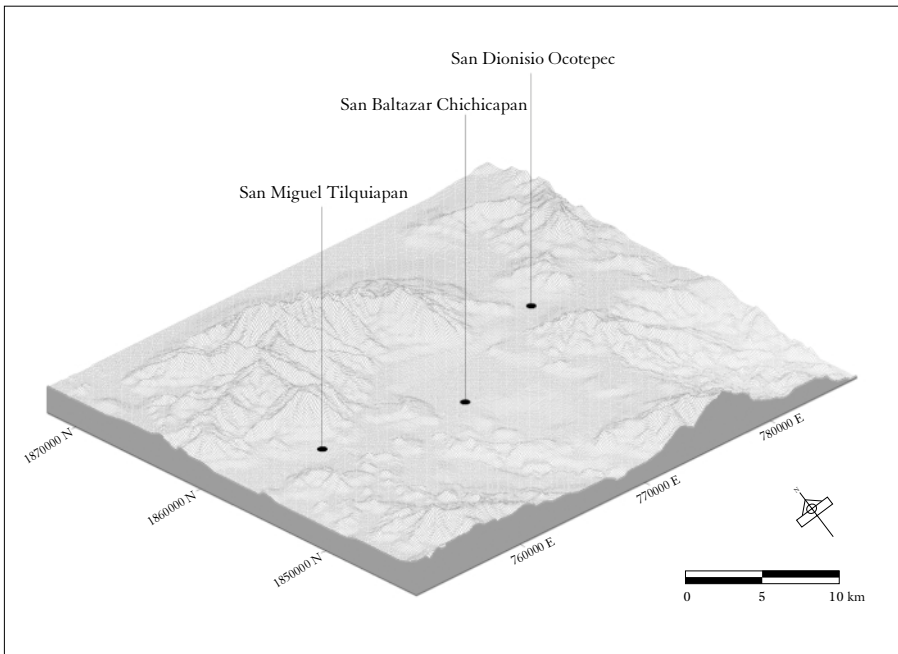


Figure 5. *Tridimensional Model of the Chichicapan-San Dionisio Valley* (taken from INEGI's topographic charts, plotted by Javier López Mejía).

resources change through time considerably, depending on each settlement's interests and geographical position. Nevertheless, if the right questions are asked, future fieldwork may elicit how the Zapotec midlands were perceived by the people of Chichicapan and San Dionisio, and how this knowledge was handled by the elites to secure a place in the Valley's dynamics.

To conclude, it should be emphasized that archaeology is not only a means to reconstruct the past of our own species and its different ways of living. As a window to worlds long gone, it can also show how ancient cultures managed to survive within changing conditions (Jochim, 1981). Change in itself, however, is not interesting if it does not furnish a deeper understanding of the world and the possibilities of society to transcend its limitations.

REFERENCES

AUGUR, HELEN

1954 *Zapotec*. Doubleday & Company, Inc., New York.

BALKANSKY, ANDREW K.

2002 *The Sola Valley and the Monte Alban State. A study of Zapotec Imperial Expansion*. Memoirs 36, Museum of Anthropology, University of Michigan, Ann Arbor.

BALKANSKY, ANDREW K. *et al.*

2000 Archaeological Survey in the Mixteca Alta of Oaxaca, Mexico. *Journal of Field Archaeology* 27 (4): 365-389.

BERNAL, IGNACIO

1965 Archaeological Synthesis of Oaxaca. R. Wauchope (general ed.) & G.R. Willey (volume ed.) *Handbook of Middle American Indians. Archaeology of Southern Mesoamerica*, University of Texas Press, Austin 3 (2): 788-813.

CRIADO BOADO, FELIPE Y VICTORIA VILLOCH VÁZQUEZ

1998 La monumentalización del paisaje: percepción y sentido original en el megalitismo de la Sierra de Barbanza (Galicia). *Trabajos de Prehistoria* 55 (1): 63-80.

DISKIN, MARTIN

1976 A Historical-Ecological Approach to the Study of the Oaxaca Plaza System. Scott Cook & Martin Diskin (eds.) *Markets in Oaxaca*, University of Texas Press, Austin: 235-245.

FEINMAN, GARY M. Y LINDA M. NICHOLAS

- 1990 At the Margins of the Monte Alban State: Settlement Patterns in the Ejutla valley, Oaxaca, Mexico. *Latin American Antiquity* 1: 216-246.
- 1999 Reflections on Regional Survey. Perspectives from the Guirún Area, Oaxaca, Mexico. Brian R. Billman & Gary M. Feinman (eds.) *Fifty Years Since Virú: Recent Advances in Settlement Pattern Studies in the Americas*, Smithsonian Institution Press, Washington: 172-190.

FERNÁNDEZ-MARTORELL, MERCEDES

- 2002 Crear seres humanos. Rafael Pérez-Taylor (coord.) *Antropología: Estudios de medio ambiente y urbanismo*, Universidad Nacional Autónoma de México, México: 155-172.

FLANNERY, KENT V., ANNE V.T. KIRKBY, MICHAEL J. KIRKBY

Y AUBREY W. WILLIAMS JR.

- 1967 Farming Systems and Political Growth in Ancient Oaxaca. *Science* 158 (3800): 445-454.

FLANNERY, KENT V., JOYCE MARCUS & STEPHEN A. KOWALEWSKI

- 1981 The Preceramic and Formative of the Valley of Oaxaca. Victoria Reifler Bricker (general ed.) & Jeremy A. Sabloff (volume ed.) *Archaeology. Supplement to the Handbook of Middle American Indians* I, University of Texas Press, Austin: 48-93.

HERNÁNDEZ, TEODORO

- 2003 Cinturones miloníticos, evidencias de grandes levantamientos geológicos en el sur de México. *Lecture held at the Instituto de Geofísica*, Universidad Nacional Autónoma de México, México.

JOCHIM, MICHAEL A.

- 1981 *Strategies for Survival: Cultural Behavior in an Ecological Context*. Academic Press, New York.

KOWALEWSKI, STEPHEN A.

- 2003 Scale and the Explanation of Demographic Change: 3,500 years in the valley of Oaxaca. *American Anthropologist* 105 (2): 313-325.

LAGOPOULOS, ALEXANDROS

- 1998 Spatial Discourses: Origins and Types. *Semiotica* 119 (3/4): 359-402.

LORENZO, JOSÉ LUIS

- 1960 Aspectos físicos del Valle de Oaxaca. *Revista Mexicana de Estudios Antropológicos* XVI: 49-63.

MARCUS, JOYCE & KENT V. FLANNERY

1996 *Zapotec Civilization*. Thames and Hudson Ltd., London.

MARKMAN, CHARLES W.

1979 *Cycles of Aggregation and Dispersal. The Dynamics of Settlement in Central Oaxaca, Mexico as seen from the Miahuatlan Valley*. Doctoral dissertation, University of North Carolina, Chapel Hill.

PADDOCK, JOHN

1966 Oaxaca in Ancient Mesoamerica. John Paddock (ed.) *Ancient Oaxaca. Discoveries in Mexican Archaeology and History*, Stanford University Press, Stanford: 83-242.

RODRIGO ÁLVAREZ, LUIS

1998 *Geografía general del estado de Oaxaca*. Tercera edición actualizada (1983), Carteles Editores, Oaxaca, México.

SCHÁVELZON, DANIEL

2002 Historia de la conservación en el valle de Oaxaca. Nelly Robles García (ed.) *Sociedad y patrimonio arqueológico en el valle de Oaxaca*, Instituto Nacional de Antropología e Historia, México: 19-32.

s.f. Las imágenes de la ciudad prehispánica: la cartografía de Teotihuacan. Manuscrito inédito.

SCHMIEDER, OSCAR

1930 *The Settlements of the Tzapotec and Mije Indians. State of Oaxaca, Mexico*. Publications in Geography vol. IV, University of California Press, Berkeley.

SMITH, C.EARLE JR. Y JOSEPH W. HOPKINS III

1983 Environmental Contrasts in the Otomanguean Region: The Valleys of Oaxaca, Nochixtlán and Tehuacán. Kent V. Flannery & Joyce Marcus (eds.) *The Cloud People. Divergent Evolution of the Zapotec and Mixtec Civilizations*, Academic Press, New York: 13-18.

SPENCER, CHARLES S.

1982 *The Cuicatlan Cañada and Monte Alban: A Study of Primary State Formation*. Academic Press, New York.

