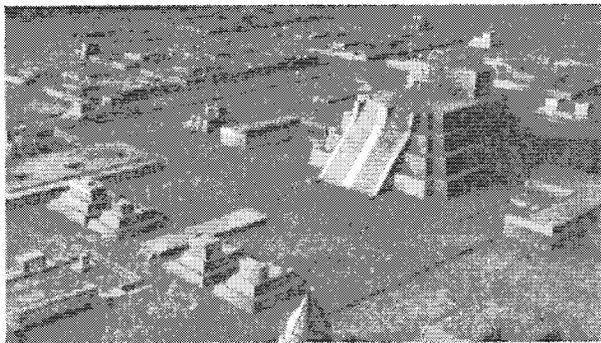


What were Aztec Architects doing on November 1, 1519?

A View of the Accomplishments of the Precolumbian Design Professions on the Eve of the Arrival of Hernan Cortés

ANTONIO SERRATO-COMBE

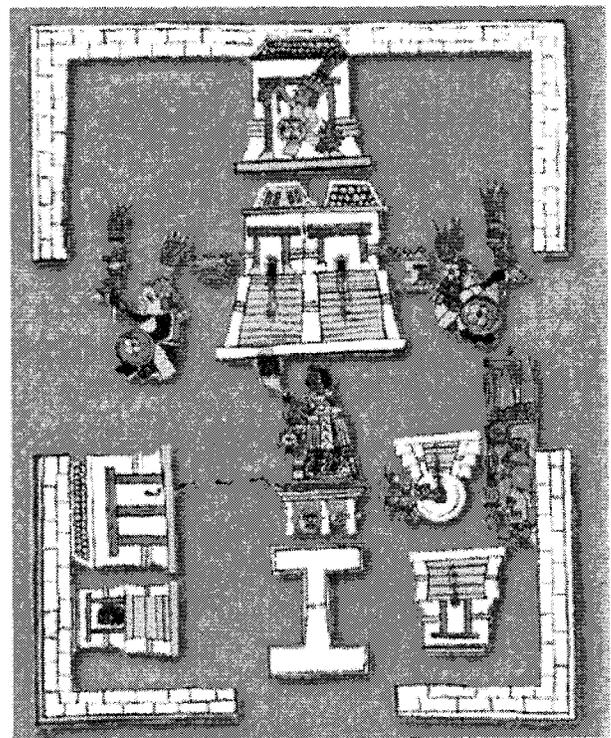
University of Utah



Aerial view of the Aztec Templo Mayor Precinct in 1519. The digital reconstruction is based on a) satellite imagery for building placement, b) recent data uncovered by the Templo Mayor Project by the INAH, c) historical sources (codices and manuscripts)(1).

PART ONE - BACKGROUND - THE AZTEC ORIGINS

While the official founding of Tenochtitlán took place in 1325, the region of the Basin of Mexico where Tenochtitlán was located had been the heartland of farming communities dating back to the Mesoamerican Pre-classic, or 2500-1250 B.C. The founding and rapid development of Tenochtitlán was facilitated by the complex economic and organization know-how of the early settlers of the basin, as demonstrated by their successful agricultural practices, the clever use of site planning principles, and their rapid construction of temples. These achievements could not have been developed in just a few years.



Site Plan of the Templo Mayor by Fray Bernardino de Sahagún, the most informative of the early plans of the Aztec Templo Mayor Precinct.

One of the first things we have recently learned is that the development of the capital of the Aztec empire and the production of exemplary design work by its citizens did not occur overnight. It simply could not have happened that way. It was the result of many centuries of steady development and not the simple dictum of Tlacaélel the Aztec vizier, as many historians have wanted us to believe. If one really wishes to understand the design accomplishments that the Europeans saw in the 1500's one has to fol-

low closely and meticulously cultural developments that began with the Olmec culture several thousand years earlier culminating with the Toltecs whom the Aztecs regarded as their cultural predecessors.

Without question, the most significant architectural, planning and urban design contribution was the design of the Aztec city itself. And, it is very unlikely that the plan of the city was laid out without an overall visionary master scheme – by any standard, a major achievement. From an urban design standpoint, Tenochtitlán was the product of two development periods. The first phase began with an extremely modest settlement and ended when the Aztecs had established themselves more firmly both militarily and politically, probably during the reign of Moctezuma I. The second phase began when the Aztecs undertook ambitious infrastructure projects such as aqueducts, control of the salinity of Lake Texcoco, and the construction of large temples and shrines. It ended with the arrival of the Spanish.

While we don't know for sure what came first, the main temple precinct with its three causeways organizing further development of the city, or a layout where authorities organized the master plan of the island-city according to a cruciform plan that placed the ceremonial complex at the intersection of the axis, it is clear that either scheme was truly innovative for it allowed the creation of a city that eventually housed anywhere from 3 million to 6 million people depending on who is doing the count.(3).



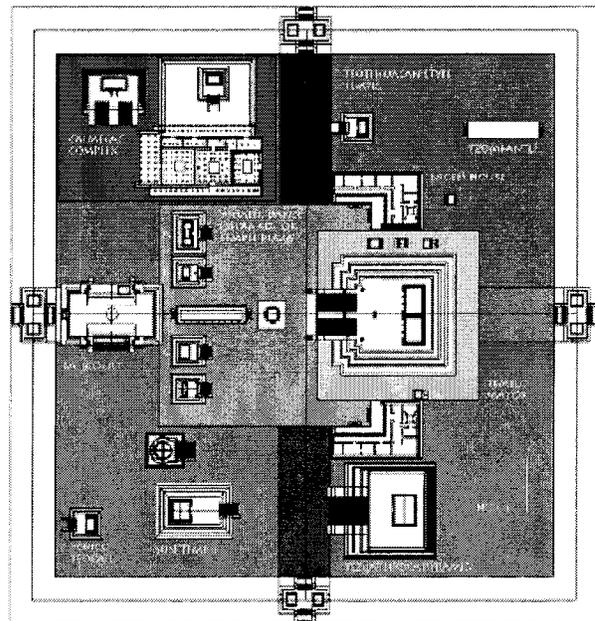
View from the top of the Templo Mayor looking west. The West Gate is shown opening to the West Causeway or Calzada.

Recent discoveries have now put forward a more definitive plan of what the ancient city may have looked like. The overall planning of Tenochtitlán used in general a rectangular grid system. But one can also see, in addition to the four major cardinal

causeways beginning at the Templo Mayor, other straight avenues running diagonally. These wide causeways or calzadas linked visually major centers by straight visual lines. This device is almost identical to those used by Roman settlements like Timgad and urban regeneration plans by Haussman in Paris and other cities in Europe. The first grand causeway linking the island of Tenochtitlán with the Lake Texcoco outskirts was the Tenayuca Causeway. This straight-line causeway linked with mathematical precision the top of the main temple at Tenayuca with the main temple at Tlatelolco.

Although the overall planning for the city included other major orthogonal causeways running along cardinal points, the city also included quarters where strict orthogonal schemes were not the rule. Tenochtitlán apparently also had the equivalent of a zoning code, where land uses as well as building sizes and heights were tightly controlled. Multilevel construction apparently was allowed only for special uses and for key individuals.

THE AZTEC TEMPLO MAYOR PRECINCT – URBAN DESIGN AND PLANNING CONTRIBUTIONS



Site Plan of the Aztec Templo Mayor according to most recent available archaeological data.

How did the Aztec architects and planners approach the design solution for their main ceremonial center and housing precincts? What was the taxonomy of buildings and spaces? The archaeological record of the site as well as recent satellite imagery reveals that Aztec urban designers planned their center with a careful and systematic approach. There clearly was a specific symbolism attached to the location of each building and open space with regard to the whole. More specifically Aztec planners developed and applied three key concepts:

1 – Building alignment. In the tradition of many Mesoamerican sites, probably most if not all shrines, temples and open spaces followed a specific orientation that fell into one or a combination of the following three categories. First, the orientation was tied to directional and astronomical observations. Second, the linkage may have had a visual component connecting the specific building with a feature of the surrounding natural environment. The third type of alignment was reflective of specific myths and rituals.

2 – Axis alignment along midpoints of entries, stairways or building masses. Local architects seemed to have been intrigued by midpoints and centerlines of structures and stairways. There was a clear design intent at linking building masses through this mechanism.

3 – Planning emphasis and alignment based on corners of open spaces and buildings. This ordering and relation system, also present in the placement of offerings, may have been used to connect buildings with open spaces or to apply emphasis to important locations through the placement of large monoliths or other symbolic sculpture.

Observing the three approaches listed above, and checking how they were *physically applied*, it becomes clear that from an overall point of view, the design intention is remarkably similar to planning approaches developed by ancient sites such as Heiankyo (Kyoto) in Japan, Ch'ang-an in China, or Timgad which Mumford considered to be an 'excellent example of Roman planning art' (4).

ARCHITECTURAL IDEATION

Art and architecture history books are full of prejudicial arguments stating that Precolumbian architec\

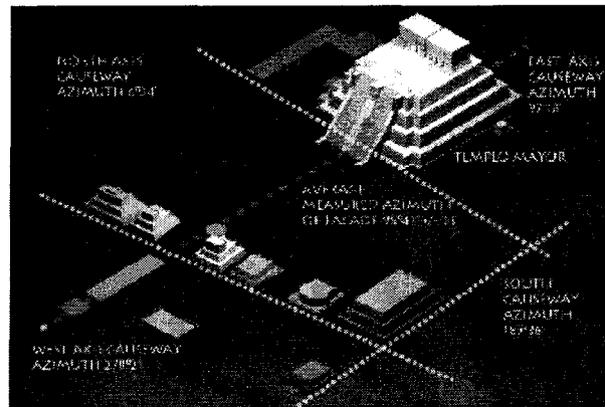


Diagram showing the orchestration of structures in front of the Templo Mayor

ture in general and Aztec architecture in particular was not very innovative. However, a closer look at recent archaeological data brings out a completely different picture. Consider the case of the Aztec Templo Mayor, a structure of which we now have ample information of. First, one has to consider the timing factor. When Cortés saw the Aztec Templo Mayor, Aztec architecture was in its early stages. Only 130 years had gone by from the very humble beginnings of the temple to the time the Spanish arrived. Which world culture achieved this state of development in such a short span? Actually, if one considers the time span from Moctezuma I to the time of arrival of the Spanish, then there were only sixty-five years of design exploration. Second, most of the design energies during the early stages of development of Tenochtitlán were spent in consolidation of the fragile island terrain rather than in developing architectural styles. Third, recent archaeological data reveals that there was a clear evolution in both techniques and use of construction materials. But, perhaps most important is the issue of equating architectural quality with technological achievement. Some have stated that Henry Moore's sculpture can probably be reproduced with the basic tools used by Aztec sculptors, but Mies van der Rohe's simplest design cannot possibly be executed with Aztec technology. But the point has to be made that we simply cannot devalue the great work of Henry Moore because he used Neolithic-age techniques.

The following list of design achievements is certainly not final, but gives a good idea of what Aztec design-

ers proposed and achieved in just a few decades:

1. Orientation of buildings and in some cases building elements according to particular landscape, environmental, or cosmological considerations,

2. Design of elevated multi-level platforms,

3. Architectural definition of open and closed worship spaces atop multi-level platforms,

4. Use of *dados* or decorative elements terminating the sides of grand staircases, or *alfardas*,

5. Vertical and sloped masonry testing the structural properties of andesite, basalt, tezontle, lime, and adobe wall construction,

6. Structural reinforcing elements made of heavy timber,

7. Quoined construction to define and strengthen building edges,

8. Use of columns and lintels to define entrances,

9. Use of stucco as a finishing building material, with polychrome treatments and three-dimensional reliefs and carved panels,

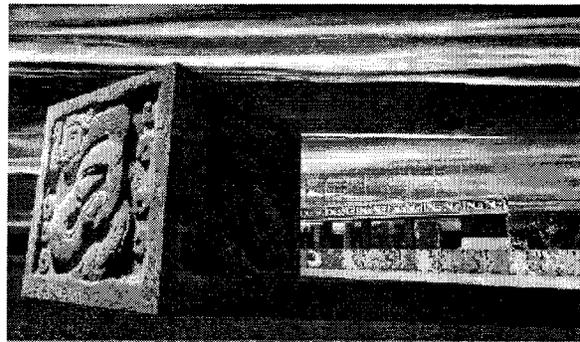
10. Andesite and basalt stone interior altars,

11. Sacrificial slabs,

12. Use of decorative stone as paving material,

13. Embedded sculpture in walls, and

14. Sophisticated drainage systems covering very large open spaces like the Templo Mayor precinct itself.



Sculpture in the foreground with a relief based on the Seven-Serpent Stone. It is set atop the spectator galleria of the ballcourt. Its inclusion here does not mean to imply that this particular stone was located in this location. The idea is to illustrate that the numerous tablets and monoliths recently uncovered by archaeologists must have been placed in key locations, such as the ballcourt.

Other significant architectural design and planning contributions include:

1. Design of hypostyle halls with impluviums surrounded by peristyles or colonnades,

2. Extensive use of colonnades, some with decorated columns,

3. Columns with serpent beginnings and terminations,

4. Frequent iconographic depictions of deities and rulers in military or symbolic garb,

5. Chronological assignment of structures through special tablets embedded in the main body of the building or through associated ceramics,

6. Decorated vestibules or porticoes as approaches to buildings, with freestanding or attached sculpture,

7. Decoration of walls with alternating geometric patterns and death allusions,

8. A variety of small square-shaped altars or *adoratorios*,

9. Use of freestanding sculpture in the form of animals for utilitarian purposes, standard bearers, sacrificial receptacles, and incense burners,

10. Design of ballcourts that eventually led to the popularization of the game,

11. Creation of terribly looking scaffolding structures called *tzompantlis* where thousands of skulls were placed for public view,

12. An extensive system of burials and caches guarding remains and precious objects of all kinds.

Seen from a larger historical perspective it must be noted that the architects of the Templo Mayor inherited, applied, and refined the work of many centuries of design creativity, which included the following major construction concepts and devices:

1. Evolution of systems of construction that moved from simple earth mounds to the extensive use of modular pre-fabricated sun-baked adobes,

2. Removal, hauling, dressing, and assembly of stone with a high level of precision,

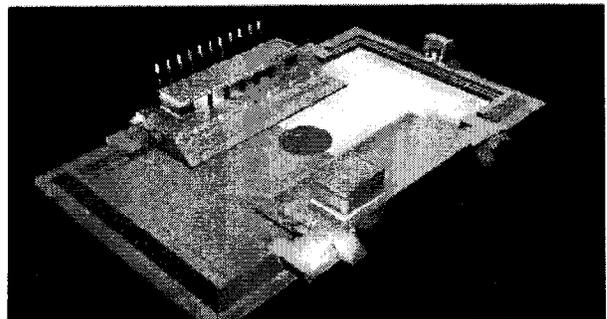
3. Invention of masonry admixtures such as lime-based mortar and stucco,

4. Multilayer construction with caissons to prevent bulging of heavy structures,

5. Exterior finishes of structures with harder stone and/or stucco to protect them,

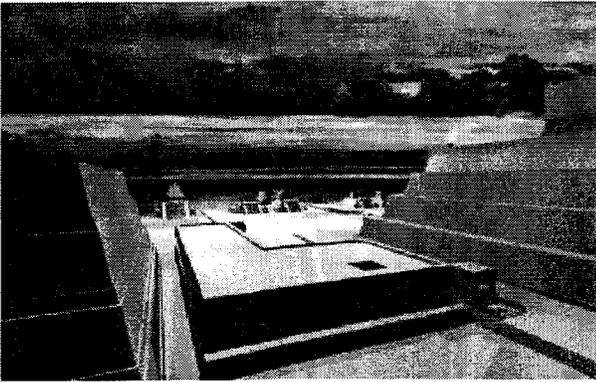
6. Development of hybrid masonry-and-wood building systems, including multistory construction,

7. Development of infrastructure: streets, water supply, and drainage systems for a very large population.



Aerial view of a prototypical ballcourt. Its design is based on existing ballcourts found at the Tula Toltec archaeological site.

In terms of architectural ideation the following concepts were generated:

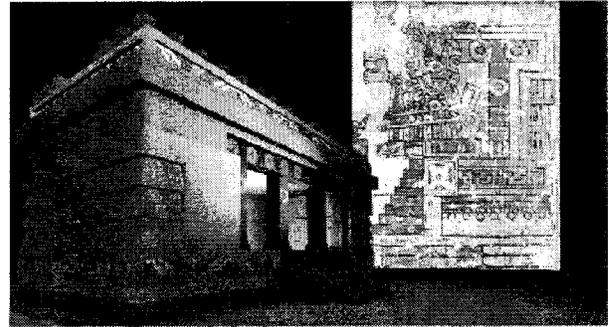


View of the space on the South side of the Templo Mayor showing the massive scale of structures and spaces which must have prompted its designers to develop solutions as listed above.

1. Development of columns, colonnades, porticoes, hypostyle halls, impluviums and staircases with lateral elements,
2. Evolution of residential, ritual, religious, and funerary architectural typologies from small, simple schemes to large urban complexes,
3. Definition of spatial hierarchies to denote specific uses of spaces,
4. Integration of sculpture and painting with architecture,
5. Evolution of the open-space/temple-pyramid concept as the centerpiece of religious/ceremonial building typology and,
6. Linkages between the built environment and cosmological concepts.

In order to orchestrate and execute the concepts and ideas listed above, architects developed ways of testing on *amate* (fiber) paper and through architectural models the final schemes that were eventually built. Several architectural models have been

found, indicating that designers were concerned about building scaled prototypes before construction began. It is also quite likely that these designers worked in close harmony with astronomers and priests. It is not conceivable that the precise alignments of buildings with particular celestial events occurred by chance. And too, the schemes featured strong bonds with symbolism, as has been pointed out by numerous research studies (5).

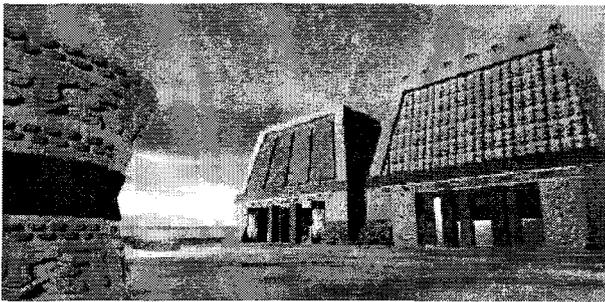


Reconstruction of a prototypical structure based on pictograms such as the one in the background.

Precolumbian codices also include numerous architectural representations. A very interesting example of architectural illustration where the mastery of the perspective technique is clearly shown is a drawing in the codex Mendoza where Moctezuma II is drawn seated in his throne on the second level of his residence while his councilors meet on the ground level. Here it must be noted that perspective drawing as we know it began to be expressed in European painting not till the Renaissance, some 300 years later. This particular structure had three courtyards and consisted of a whole series of buildings: those on the upper level housed the ruler and his entourage, while the ground level served as administrative center and was probably occupied by officials of the government.

On a more subtle note and also proof of very sophisticated design talent is the fact that the Aztecs understood quite well the principles of synesthesia. The Aztec Templo Mayor was a perfect example where visual attention was of primary importance to the operation of drives, instincts, emotions, and feelings of human beings and thus to the well-being of the Aztec culture. The architectural design concept of having divine representations in dramatic appearances under the auspices of a powerful authority was central to the orchestration of architectural spaces within the ceremonial center. Placement

of structures, location of events, and addition of symbolic statements throughout did not occur by accident. It was the result of well organized and well thought out efforts in trying to understand the mentality of the masses and its relationship to the system of belief. A corollary here and an item that we all could learn from today is that the Aztecs did not compartmentalize the arts; for them design and artistic creation was more holistic. Their world combined urban design, architecture, sculpture, painting, costume, wall painting, sand paintings, pottery, masks, and amulets into one expression. In reality the Aztec state spent considerable resources toward the promotion of urban civic amenities, monumental architecture, civic sculpture, pictorial elements, and frequent ostentatious celebrations in what some have described as the squandering of local and regional resources on ephemeral decorations and celebrations (6).



View of the Human Sacrifice Platform atop the Templo Mayor. Most likely countless individuals lost their lives here.

PART TWO – THE HUMAN ANGLE

There is no question that for us today it is quite difficult to understand the complexity of Precolumbian Art and Architecture. Many have tried to get close to Precolumbian design in order to 'read' the design messages brought by the ancient inhabitants of the Americas. For the most part those efforts have proved inconclusive and quite frustrating. However, two recent events have made the task somewhat more accessible. First, the efforts of a new school of thought that has begun to translate and interpret ancient indigenous manuscripts and second, recent archaeological discoveries augmented by digital technologies and visualization.

With Itzcóatl, one of the early rulers of Tenochtitlán, we find one of the earliest deliberate expressions of a desire to 'build temples' and that effigies of gods

be carved in stone as well as sculpture depicting earlier rulers (7). These efforts eventually led to the production of masterpiece sculpture such as the Coatlicue Stone, the head of Coyolxauhqui Stone, the Xólotl Stone at the Stuttgart Museum, the head in crystal rock at the British Museum and many more impressive findings.

While there is universal agreement that the work listed above is exceptional, we are just beginning to decipher its possible meaning. Why were all those pieces produced? What were the design goals? While attempting to answer these questions, it is useful to consider three elements: a) the data collected by Fray Bernardino de Sahagún through his elder informants at the time of the conquest, b) the concepts and personal characteristics that Aztec architects and artists had, and c) the different kinds of artistic production.

THE ACCOUNTS OF THE ELDERS THAT INFORMED SAHAGÚN

The elders that gave their testimony to the Spanish friar Sahagún just after the military conquest, reveal that like most world cultures, the origin of the design work was based on the accomplishments of their ancestry, which was considered 'great and beautiful.' It was from this way of thinking, without really knowing what the key principles or guidelines were as they were 'lost in history', that the 'Toltecatoyotl' concept was born. This concept or group of ideas was applied or derived from the Toltec world, a world that preceded the Aztec universe by several centuries. This is as far as we know, although it is easy to speculate that the Toltecs in turn had their own cultural ancestry to which they paid respects, and so on, till we find the roots with the Olmec culture, some millennia earlier.



Digital reconstruction of the main plaza of Tula, the ancient capital of the Toltecs

What makes the Toltec connection more fascinating other than the fact that we are beginning to understand what made it unique, is that the elder informants of Sahagún left us with a series of very expressive notes on the nature of the design process the Toltecs used. These informants first told Sahagún of everything they had seen and experienced around Tula, the capital of the Toltecs. Their first accounts were almost of a photographic nature as they described in great detail the accomplishments by the Toltecs.

Then, they began to explain the origin of all those creations, and in this way we begin for the first time to understand the ideal vision that design had for them:

The Toltecs were people with experience,

All their buildings were good, all of them straight,

All of them well built, to be admired.

Their houses were beautiful,

Their houses with embedded mosaics with turquoise,

Well polished, covered with stucco, marvelous.

Painters, sculptors, stone masons,

Feather artists, potters, weavers,

Profoundly experienced in everything,

Discovered, became capable

In working with the green stones, turquoise (8).

The texts then go on to describe the necessary attributes of those involved in the creative process and the arts in general. Because Aztec designers had such high esteem of the work produced by the Toltecs, they equated 'artist' or 'designer' with 'Toltec'.

These Toltecs were certainly wise,

They often generated a dialogue with their own heart...

They knew how to play drums.

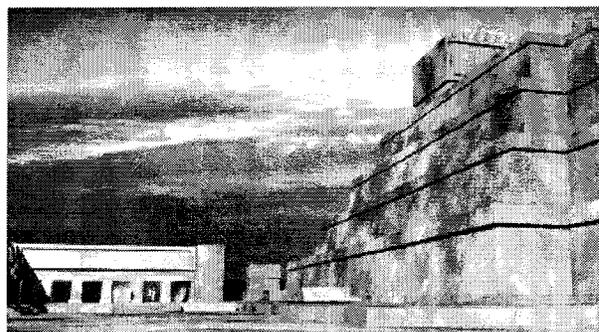
They knew how to sing, they wrote songs,

They played these songs

They retained them in their memory

And they made divine their chants with their heart

The marvelous chants they wrote.



Digital reconstruction of the North side of the Templo Mayor, where stylistic elements from the Toltec culture become evident.

Perhaps more interesting were the necessary traits that designers and artists had to have:

Toltecatl: the artist, disciple, abundant, multiple, not still.

The true artist: capable, learns, knows his craft;

Dialogues with his heart, finds things with his head.

The true artist everything he brings from his heart;

Enjoys what he does, makes things with calm, carefully,

Works like a Toltec, arranges things, works diligently, creates;

Fixes things, he makes them straight, he adjusts them.

Aztecs acknowledged that design and artistic creation had to be connected or linked to predisposition and personal traits of artists and designers. In the times of the Aztecs, like today, there seemed to be agreement that not anybody could be a good designer. For the Aztecs, many personal qualities were required to become an artist. In other words, the Aztec world put into practice the Latin dictum *Quod natura non dat, Salmantica non praestat* (what nature does not provide, Salamanca – a well known cultural center – does not supplant.)

Such way of thinking was very clearly spelled out by the *tiamatinime* (the elder informants). For them, in order to be like the Toltecs (or true artists), one had to be predestined to become a good designer. Further, predestination had to become manifest in two ways. First it was necessary to possess a series of qualities: most important of all, to be 'owner of a face and a heart', that is to have a well defined personality. Second, it was 'convenient' to be born at

specific dates according to divination calendars. But, such condition was closely tied to the premise that the artist had to take into account his or her destiny, takes charge of it, and learns to 'dialogue with the heart'. If not done this way, the artist would end his or her happiness, would lose the artist condition and would turn into a fool, an inane fake.



Digital reconstruction of the Templo Mayor Precinct as seen from the South Gate

Perhaps even more important was their concern toward what today we could label 'the moral foundation of design'. The texts actually speak about the necessity for designers to work prudently and always operate in good faith. Otherwise they were admonished they would suffer serious consequences. The elders transmitted their advice in the following way in regards to those that did not follow a 'moral code':

And, in regard to bad actions

They said that when some weaver (designer)

Broke her fasting

Looked like, merited

To become a public woman,

Such was her fame and her way of living,

To live like a public woman....

Put in other terms, not following 'moral foundations of design' was equivalent to prostitution. For those that followed good 'moral foundations' they offered these words:

But she who earned true worthiness

She that self admonished,

It turned out good;

She was well esteemed,

Wherever she was

She would be accepted by everyone

On earth

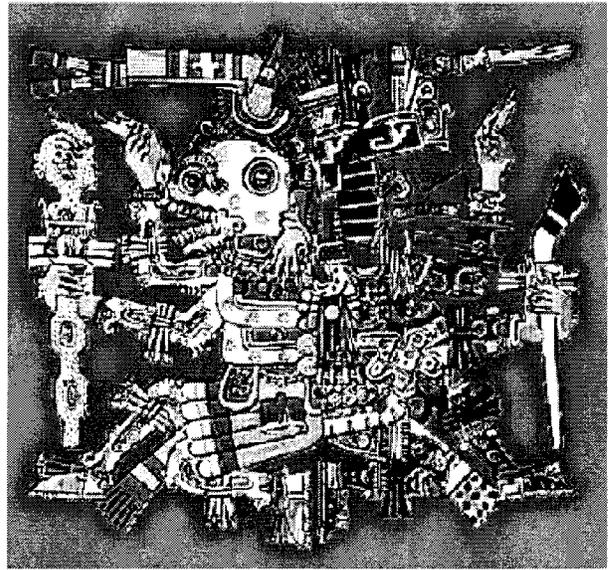
...and will give life to things

And will understand what her heart tells her

All of this, but only if she well self admonishes.

CONCLUSIONS AND FINAL OBSERVATIONS

So, what were the design professions doing on the eve of the arrival of Cortes? The answer is unequivocally 'quite busy'. Setting aside obvious problems on issues such as military and political organization, and systems of belief including sensitive themes like human sacrifice, one can come to the conclusion that the Precolumbian world had two faces very closely mirroring the key concept of duality that ruled their very existence. On one side



Pictogram of Mictlantecuhctli from the Codex Borgia, the deity of life and death. It clearly expresses the duality concept.

we can clearly see blood-thirsty actions and other very terrible expressions. But, on the other side, we can also clearly see a wonderful world full of noble feats and great design creativity. On this brighter side, the design and artistic manifestations were impressive. Architects, urban designers, and artists from all walks of life were struggling to come up with visions and realizations of a better world.

A goal that speaks very well of our design professions. Then and today.

NOTES

1. All the images were generated digitally by the author of the paper. The footprint of the Templo Mayor was based on archaeological information from the Templo Mayor Project, and especially the drawings of Victor Rangel in *El Templo Mayor: Planos, Cortes y Perspectivas* and Leonardo Lopez Lujan, *Las Ofrendas del Templo Mayor de Tenochtitlán*.

2. In his chronicle, *The Discovery and Conquest of Mexico*, Bernal Diaz del Castillo sounded like a child visiting Disneyland as he gushed about a New World metropolis that dwarfed Paris, Madrid or Rome. "Some of our soldiers even asked whether the things we saw were not a dream," he wrote, as the Spanish entered the capital in 1519, crossing a broad causeway that separated the lake of Chalco from the lake of Xochimilco.

3. Borah, Woodrow and S. Cook. *The Aboriginal Popula-*

tions of Central Mexico on the Eve of the Spanish Conquest. Berkeley: University of California Press, 1963.

4. Morris, A.E.J., *History of Urban Form*, Wiley and Sons, New York, 1979.

5. Boone, Elizabeth Hill, ed. *The Art and Iconography of Late Post-Classic Central Mexico*. Washington, D.C.: Dumbarton Oaks, 1982.

6. Aguilera, Carmen. *El Arte Oficial Tenochca, Su Significación Social*. México: UNAM, 1985.

7. Durán, Fray Diego. *The Aztecs: The History of the Indies of New Spain*, London: Cassell, 1964.

_____. *The Book of the Gods and Rites and the Ancient Calendar*. Norman: University of Oklahoma Press, 1971.

_____. *Historia de las Indias de Nueva España*, 2 vols. México. Editorial Porrúa, 1967.

_____. *Historia de las Indias de Nueva España y Islas de Tierra Firme*. 2 vols. México. Ed. Nacional, 1951.

7. _____ *Texts of the Informants of Sahagún*, ed. Facs. Paso y Troncoso, Vol. VIII, fol. 172. r.-v. AP I, 82.