The Dynamics of Urban Form
With a View of Sixteenth Century Lisbon[1]

by Isabel Marcos

"The essential is thus not to distinguish the 'real' from the 're-presented', the historical from the mythical, the fact from the legend, nor to reduce the one to the other or the other to the one, these being simple exercises, *the essential is to see the generation of differentiated spaces*. The essential is to see that there is not only one space whether real or represented (a particular conception), but any number of spaces, imbricated ones on the others, inextricably. This is difficult to imagine, at present: the multiplicity of spaces"[2] (Michel Serres).

A MONG THE MANY DIFFICULT CHALLENGES presented by reflection upon the spaces of our architectural conceptions is the search for the mechanisms underlying the generating mecanisms of the urban form, the city as such, as a spatial unfolding. Michel Serres proposes perspectives on how space is generated from a multiplicity of differentiated spaces, interrelated somehow through threads of relations:"*the multiplicity of spaces*". He also reminds us of all the difficulties with which this way of thinking confronts us.

It is within a space fully impregnated with memories, with reverberations of a multitude of historic experiences, that we, as architects, are called to *mettre la main à la pâte, "to put our hands to the dough"*, to make our creative, practical contribution. Michel Serres insists upon the fact that unique space and unique time exist only in the realm of the absolute. We must ask the question: In what kind of "dough" are we then to put our hands? What are the characteristics of the natural and cultural spaces of our history and of our time, in which we position ourselves?

In order to answer this question, we propose that we imagine the basis for our historical reality as a landscape where various 'his-

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torical events' and different time-spaces are intermingled. But how do we differentiate between them in order to understand this landscape? Let us begin by imagining a "figure" observing from a distance this landscape comprising a varied multiplicity of time-spaces. This "figure" scrutinizes the intertwined threads of relationships and their respective rules of passage. Thus we arrive at a key point: *the dynamics of passage.*

Here another question must be asked. What is the possible space of communication between one who puts his hands in the dough (the creative practician) and one who remains at a distance (the contemplative theoretician)? In fact, both must take many "steps" inside such a space of communication. This problem of a *multiplicity of spaces* is first and foremost a problem of intercultural communication. Only a real 'dialogue' between these two positions, the practical-creative and the theoretical, can provide new perspectives on urban space. I here propose *this text* as one more of many possible spaces where such a communication can be established. After these short interrogative remarks about possible topological positions, let us now carry on to establish the procedures for the comprehension of the *city* conceived as a *multiplicity of spaces.*
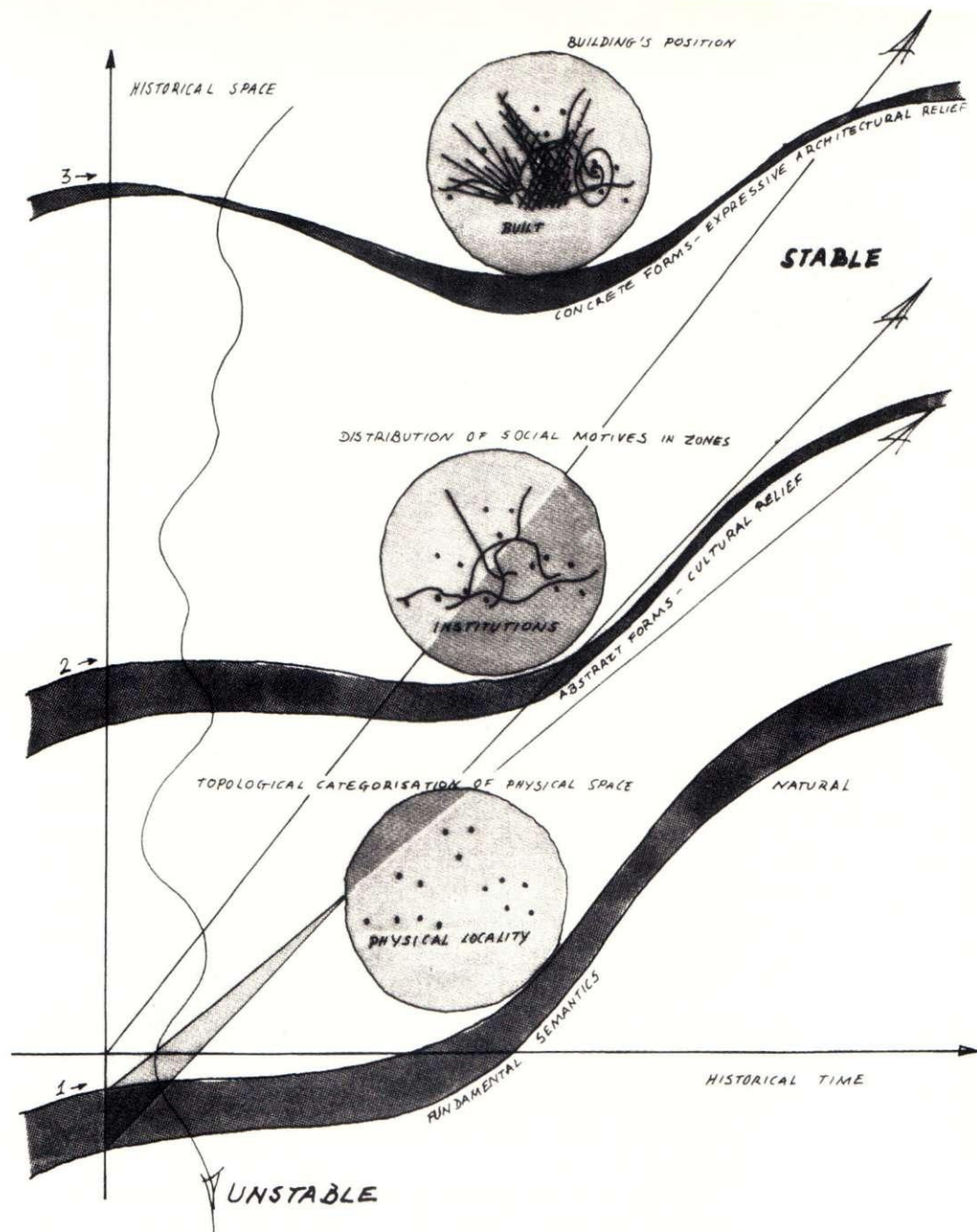
Morphogenesis and semiogenesis[3]

The aim of this project is to open up a new conceptual horizon. Let us outline the fundamental concepts of this structural model of the emergence of spatial urban form:
  i)   the organisational strata;
  ii) the morphogenetic and the semiogenetic processes;
  iii) the constitutive modal dynamics.

I shall begin by conceiving the structural engendering of urban form in the context of the theories which inspired this view, primarily as concerns modal dynamics and the definition of the fundamental stratum (the physical categorization). I have from the outset been influenced by the following theories and models:

- first, the semiotic and morphodynamic theory of Per Aage Brandt, from which I retain the following concepts: morphodynamics, semiophysics, chorematics and modalities theory;

- second, Gilles Ritchot's theory of urban form, based on the conceptual distinction: concrete forms versus abstract forms;

- third, the morphogenetic model applied to urban form by Gaëtan Desmarais, from which we retain the following concepts: morphogenetic path, abstract morphological structure and internal dynamics;

- fourth, Algirdas Julien Greimas's semiotic theory, from which I retain the main concepts: generative process, fundamental semantics, structure and modality.

HISTORICAL SPACE

BUILDING'S POSITION

CONCRETE FORMS - EXPRESSIVE ARCHITECTURAL RELIEF

STABLE

BUILT

3→

DISTRIBUTION OF SOCIAL MOTIVES IN ZONES

ABSTRACT FORMS - CULTURAL RELIEF

INSTITUTIONS

2→

TOPOLOGICAL CATEGORISATION OF PHYSICAL SPACE

NATURAL

PHYSICAL LOCALITY

FUNDAMENTAL SEMANTICS

HISTORICAL TIME

1→

UNSTABLE

These theories and models, applied simultaneously and in concert, will open up a conceptual horizon, which will later enable us to organize the multiple facts and artefacts of urban space.

We will begin by making explicit the principal articulations of the *morphogenetic* and the *semiogenetic processes*. The *morphogenesis* of "human establishment" is a complex process of spatial differentiation and of semiotic structuration. This differentiated space, on the other hand, unfolds the semiogenesis and hereby actualizes

Figure 1. The multiplicity of spaces that constitutes history; its internal metabolism. This stratified model functions by a modal dynamics which is stable when the process is in its phase of differentiation and structuration of space, and instable in its phase of actualization.

the signifying superstructure that convokes at the same time the physical substratum and a fundamental semantics; these constitute the fundamental strata that now "position" the other, upper strata as presupposing the former. The functioning of this model is due to a constitutive dynamics, whose nature is modal; it proceeds in the following manner (cf. fig. no 1):

- it manifests the semiotization of the urban space and emphasizes the constraints that operate by the modal constitution of the three strata;
- it actualizes the signifying superstructure;
- it morphologically collocates abstract forms;
- it positions spatially the concrete forms.

The determination of the strata and especially of their modal dynamics makes it possible to integrate the multiple effects of meaning that emerge from habitated space.

From this perspective, a new relationship between form and meaning is proposed, in the case where the object of investigation is a city, an urban form.

In this semiotic and morphodynamic approach to urban space, I apply a topological methodology. The method is topological in the sense that *density* is related to position of different strata or "reliefs" (cf. fig. no 1); this methodology is interested not only in one strata but in a "density" of meaning effects. In this way, we can begin to describe and explain some elements of these dynamics strata. These strata are generated over time and correspond to a structuration of the urban form: 3. the stratum *ad quem* corresponds to the manifestedly BUILT; 2. the middle stratum is the CULTURAL; 1. the stratum *ab quo* corresponds to the PHYSICAL categorisation. We conceive the urban form as such a density of meaning effects.

These three strata can be defined as follows:

1. The "physical categorisation" is the topological distribution on the site[4] of fundamental semantic categories (life / death – nature / culture – sacred / mundane – etc.); in other words: the appropriation of natural physical spaces (water and ground: hills, river, plain, etc.);

2. The co-localization of social motives in the "abstract morphological structure" corresponds to the distribution of values of a status system: institutions of power and authority, or the cultural thematizations on the topological (soil) surface, according to the physical categorization and the modal dynamics. This social motives articulate relations of forces, in a catastrophe theoretical sense (attraction / repulsion), that generate the qualitative discontinuities;

3. The allotment of the architectural configurations is in fact the positioning on the site of the "concrete forms" in the city (streets, buildings, districts, squares, and monuments). The spatialization

of this (expressive) architecture depends on the other two strata, which constitute its grounding.

The three standard strata are semanticized throughout the course of the historical periods. This dynamics is caracterized by two trends, the one ascending, called *morphogenesis* (operative by a deep dynamics), and the other, descending, called *semiogenesis* (operative by a surface dynamics).

The *morphogenesis* is the process of *general* spatio-temporal stratification: it is developed through the contact of the strata 1, *more determined*, with strata 2 then 3, *less determined*, (in the sense of a decreasing determination). The morphogenesis is structurally stable, because in a topological sense it "resists" to the minor deformations that concrete forms might introduce on the urban form; this movement represents the internal phase in the metabolism of form. It is related to a *dynamic topology, which is of the morphogenetic type.*

The *semiogenesis* is the inverse process of *local* spatio-temporal stratification: it is developed through the contact of the strata 3, *less determined*, with strata 2 and then 1, *more determined*, (in the sense of an increasing determination). The semiogenesis is structurally unstable, because in a topological sense it is an attempt to actualize and realize virtual values from the concrete history of a period. The semiogenesis corresponds to the *deciphering of the configuration of the form*. It is related to a *dynamic topology, which is of the semiogenetic type.* It permits us to inscribe the urban forms both in their specific spatial condition and in their (stratified) internal form metabolism (cf. fig. no 1).

To follow the way in which the space of our actions is constituted is no simple endeavour, because the structural generation of stratified urban form, and the interrelations of the three strata, change over time and throughout history.

Let us proceed then to examine the topological genesis in more detail through the example of the city of Lisbon.

The topological aspect[5]

The city topology is developed throughout its history.

Let us concentrate primarily on the *semiogenesis* of Lisbon during the Renaissance. By following this evolution we can observe the way in which it convokes and emphasizes the structuring role of the *morphogenesis.*

The Renaissance is a period of great changes in the equilibrium of diverse social positions. These positions regroup themselves according to their *constitution*, as well as to the *morphological scheme of categories*. One can have access to these categories through certain social "figures". These "figures" are organized according to their function, by syntactic morphologies.

Figure 2. Relief of the historical center of Lisbon, from which one can distinguish three hills: the hill of *São Jorge*, the hill of *São Francisco* and the hill of *Sant'Ana*.
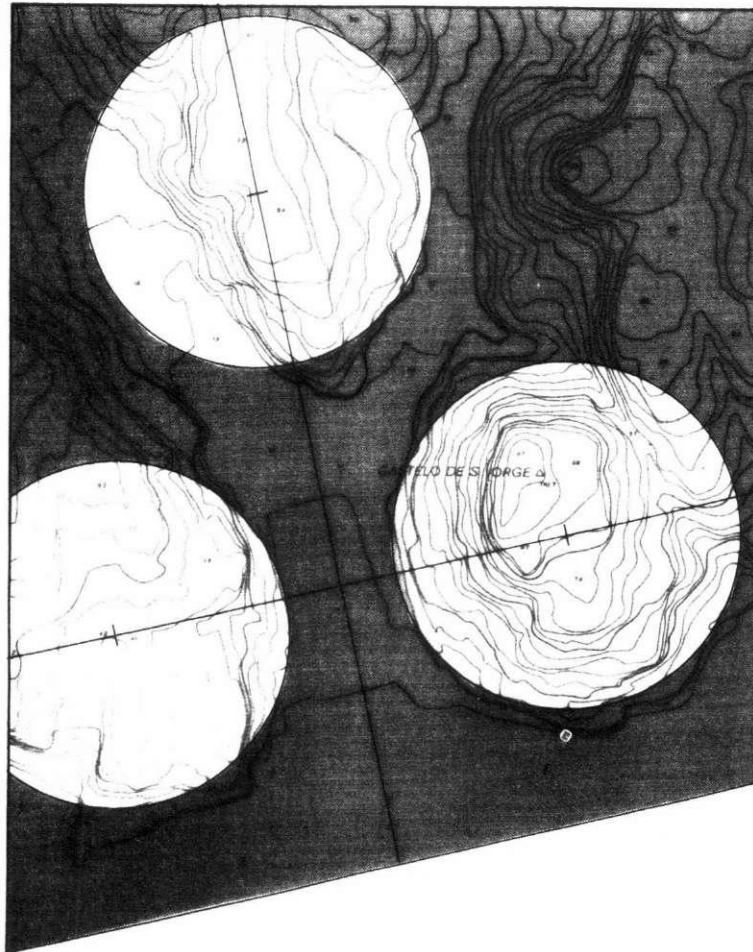
Let us now define each such "figure".

• "*Political*" (P) – the King and the Military, as had been the case in earlier historical periods, remained positioned on the heights of the hill *São Jorge* with its palace and fortified castle, in spite of the construction of another palace which later became the main Royal Palace. Together, the two palaces correspond to the *core of authority*.

• "*Religious*" (R) – the main location of the Church continued to be the Cathedral *Sé* on the hill *São Jorge*. A new Archbishop's Palace was established on the *Baixa* before the Cathedral, North of the new Royal Palace. The Archbishop's Palace and the Cathedral, these buildings also correspond to the *core of authority*.

• "*Common People*" (Pe) – the "*masses of common people*" are essentially producers (farmers, livestock breeders, fishermen, etc). These people are placed into the interstices of various city positions. The *Ribeira*, essentially on its east bank continues to be a densely populated region. The Discoveries of the New World will stimulate the arrival of a modest rural population which will be located in relation to the formation of the *productivity axis: the axis North-South*.

Figure 3. Perspective of the domain of authority, organized by the "Political" figure. In the foreground we see the *Ribeira* Royal Palace and Square of the seventeenth century. This print is attributed to an unknown artist from an English School, and published by the Câmara Municipal de Lisboa.

• "*Merchants*" (C) – this group corresponds to the new bourgeoisie. They settle in a central city position. Jews, constituted before the merchants' group and their expulsion, left an empty space in the new centre of the city. They were exiled to other countries or relocated in peripheral areas; those who remained were christianized.

At this time in history, the financial *bourgeoisie* and the commercial *bourgeoisie* are not clearly differentiated. We call this new group the "*merchant bourgeoisie*". They came from the common people, from the nobility and the foreign merchants. One can note that – since the formation of the *bourgeoisie* during the Middle Ages, this group had continually occupied the same spatial position in the city of Lisbon: the region between the three hills, the valley of the *Baixa – Ribeira et Rossio*).

At the time of the Renaissance, the urban central core was organized in the following manner (cf. fig. no 2, 3, 4):

• First of all, one finds a dynamic axis around which authority is spatialized. This area is dominated by the "*Political and Religious*" social groups. These "*figures*" represent the position of the "*form and substance of the law*", whose most important function is to structure and actualize the topological relationships of the human group as a whole. One can note that "*authority circulates*" on the "*pregnantial surface*" of this region defining abstract forms which are further determined by social motives. The region is structured spatially by "saliencies" that generally produce monuments, i.e. concrete forms which are expressive of architectural reliefs.
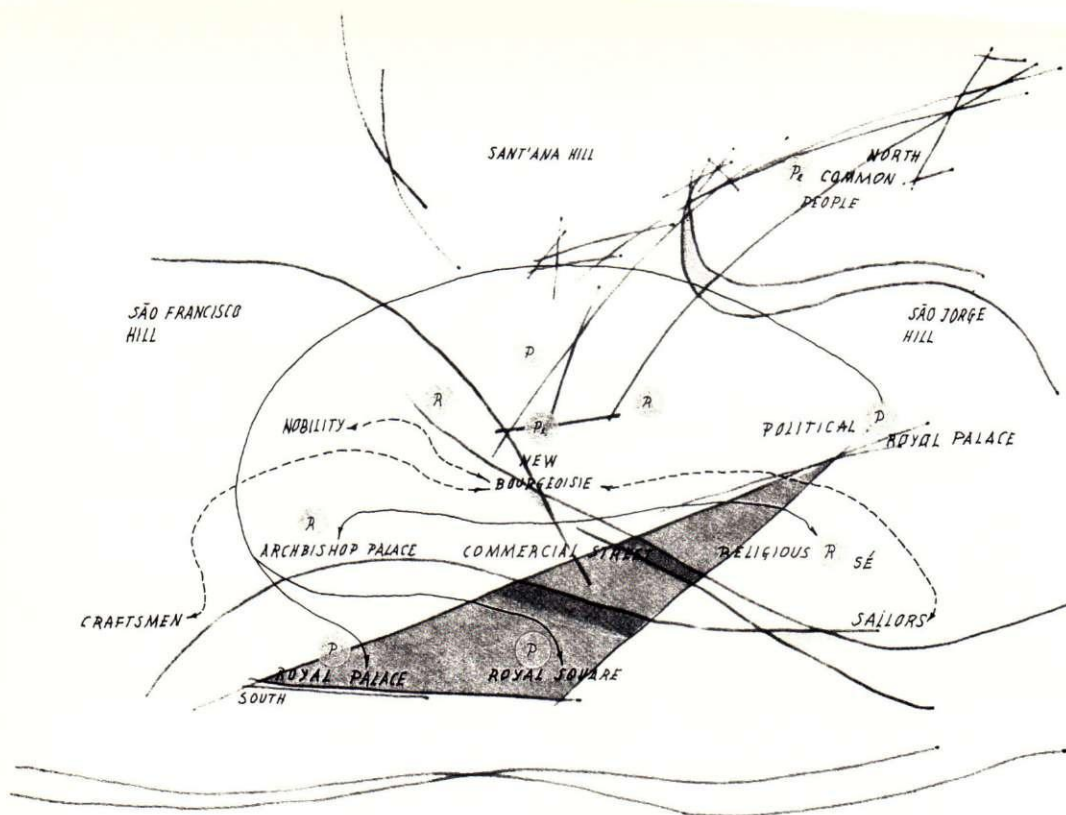
Figure 4. Topological scheme of sixteenth century Lisbon: surface dynamics.

• Secondly, one finds a dynamic axis around which productivity is spatialized, corresponding to the regions inhabited by the "*Common People*". This "*figure*" represents the position of the "*numerical force of masses*". Its function is essentially the production of agricultural commodities, livestock, fish, etc. One can note that "*productivity circulates*" on the "*pregnantial surface*" of this region. Its *saliencies* generally produce *Bairros*, districts where one makes objects in quantity.

Structuration of Lisbon at the time of the Renaissance[6]

In the preceding paragraph, we have defined the different "figures" involved in the topological structuration of Lisbon. Now let us briefly describe how the society of this period was able to balance various conflicing "*forces*". These "*forces*" led finally to a programme of urban monumentalization, which restructured the "*form*" of the city (cf. fig. no 5).

The "*merchants*" resettled much of the valley of the *Baixa*, establishing a stable new district in the city center. This district was to be completely reconstructed by King Manuel 1495–1521. By a political alliance, *the king guaranteed the private property of the new Portuguese bourgeoisie*, thereby encouraging its growth.

The reconstruction of the center of the city, from the south to the north, is organised by the King. In front of the river, he built:

Figure 5. The passage from the Medieval period to the Renaissance period: deep dynamics.
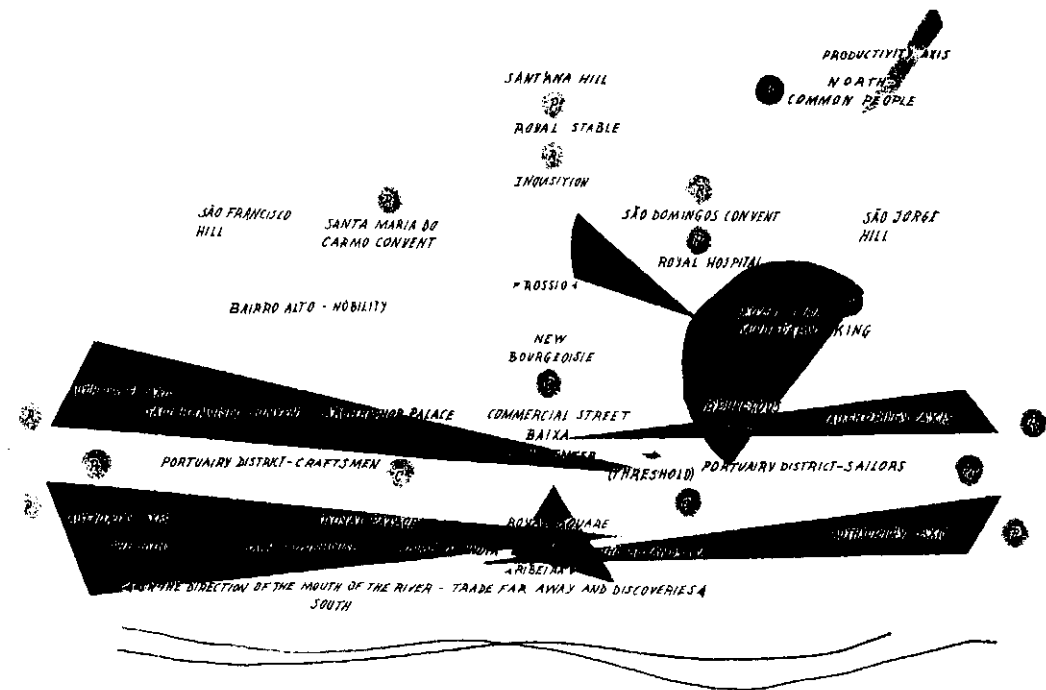
the Royal Palace, the Royal Square (*Terreiro do Paço*) and, to the right of it, the *Alfândega*. To the left of the palace and of the homes of the nobility are located the House of India, the Main Store-house, the Mint, House, and the General Schools. This part of the city becomes a "*authority domain*" around which the "*figure*" of the "*Political*" is organised.

The "*merchant figure*" occupied the interstices of this north-south "*axis of authority*". The commercial impetus of the New World discoveries gradually transformed the harbor districts (for-merly occupied by the "*Common People*") that extended in front of the river, the west, beneath the hill of *São Francisco*, and to the east beneath the hill of *São Jorge*. The western district, inhabited by "*merchants (craftsmen)*". The "*merchants' (sailors')*" district to the east intensified its port and merchant activities; the population, con-sisting primarily of sailors, grew and the district became increas-ingly dense through the concentration of this modest population.

Not far from there, along the river in direction of the cathedral (still in centre of the city) one finds the main commercial street, *rua Nova*. To the north, the *Rossio* square was monumentalized; it is limited to the right by the *São Domingos* convent and to the left by the future Palace of Inquisition. These reconstructions were in-cluded in a reconstruction programme for the city centre. These parts of the city become a domain marked by the influence of the

"*authority*" region. This domain of "*authority*" acts like a core whose principal topological transformations have already been emphasized. Some of the conflicts resulting from these transformations have also been noted here. They will arrive at a positional equilibrium. During the reign of King Manuel, Lisbon underwent some remarkable urban transformations. Eventually the discovery of the maritime route to India led to important economic and architectural changes, including the creation of a unique architectural style (*the Manuelino*). The "*emerging morphological structure*" thus stabilized the dynamic surface topology. *By the year 1521, Lisbon was no longer a medieval city.*
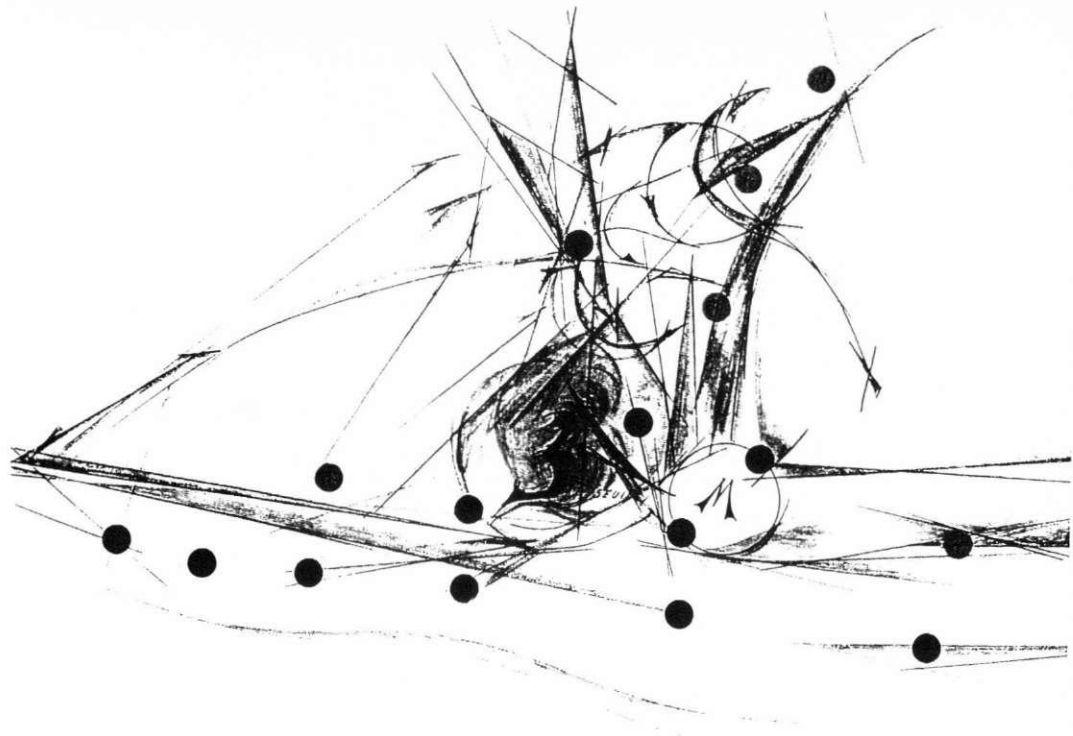
The void left by the forced exodus of the Jews was from then on occupied by the *new class of Portuguese financial merchants and bankers*, associated with discoveries and trade in the New World.

On an anthropological level, their success was based on the ability of the Christian Portuguese to grant usury loans, an activity previously restricted to Jews. To that end the Church made major theological concessions permitting the Portuguese Christians to conduct business formerly forbidden by theologians and canon law.

These concessions can be considered as a "repatriation 'here and now on earth' of the Christian 'economy' of salvation", according to the hypothesis introduced by Gilles Ritchot (1991) et Gaëtan Desmarais (1993). By the way of this "repatriation", the Portuguese Christian merchants can from this moment achieve their salvation not only in heaven but also on earth. This reasoning can be summarised in the following way. On the one hand, the Church permitted loans with usurious interest to Christians. But, on the other hand, usury is a serious sin in conflict with Christian theology. It is therefore necessary to amend this sin. The solution consists in giving, by will, this illicit money to the Church; the money in question is then used in the carrying forward of the monumentalization programme, and this domain (axis) is generated in parallel to the King's domain (axis), both located in front of the river.

The "repatriation 'here and now on earth' of the Christian 'economy' of salvation" involved has as a result an alliance between the King and the Archbishop. This alliance is reflected in the localisation of the commercial street, between the Archbishop's Palace and the Royal Palace to the west, and on the other side, the cathedral on the hill of *São Jorge* to the east. Another consequence of this "repatriation" is the transition towards a capitalist economy promoted by the New World Trade and the Great Discoveries.

This new concept of the salvation economy conditioned the spatial extension and the monumentalization of the "*axis of au-*

Figure 6. The emergence of morphological structuration throughout the centuries. We can observe a surperposition of concrete forms and abstract forms.

thority". We have noted that this axis is composed of the parallel domains of "*the Political and the Religious figures*", stretching from east to west, and that the "*Bourgeoisie*" flourished in the interstices of these domains. The axis of authority was manifested in a continuous series of places built by the representatives of the "*form and substance of the law*".

To the west, we see the monumental reconstruction of the Chapel of the Martyrs and the Convent of *São Francisco*, and the construction of the Convent of *Jerónimos*, a masterpiece of *Manuelino* style. In addition, we see here the improvements to the fortresses and the docks along the waterfront, as well as a monumentalization of the "caravela" Shipyard situated not far from the Royal Palace of *Ribeira*.

To the east, the Convent of *São Vicente de Fora*, the Church of the *Graça*, the Church of *Madre de Deus*, and a number of new Convent foundations, were built or reconstructed in a monumental style. East of the central market, close to the waterfront and beneath the district of the *merchants/producers*, the Artillerie is established.

The main point to remember about this period of topological positioning is the considerable development of the authority axis[7] (east-west). This axis is organised by the social actors who settled

there, attracting the "*gathering*" of religious communities and superior classes further on in the process, ("*Political and Religious*"). Its development depends upon the repatriated programme of salvation economy on earth.

In parallel to the development of the *authority axis*, there is a development on the *productivity axis*, the "*concentration*" of "*common people*" in a northbound direction. The juncture of the two axis configures an emerging morphological structure, labeled by Gilles Ritchot and Gaëtan Desmarais a "*threshold configuration*". *This structure is produced by the internal dynamic topology within the urban morphogenesis. It is not conceived and planned externally by a social actor, but is instead the result of a general process of spatio-temporal stratification.* It is this general process of stratification that constitutes the "*morphogenetic path*" of the human establishment.

Both valorisation and edification were major morphogenetic processes during these periods. The morphological abstract structure is well in place at the end of the sixteenth century. As a consequence, the edification of "*concrete forms*" operates in full accordance with the positional values invested in "*abstract forms*" (cf. figure no 6).

Conclusion

The dispositives of analysis and the topological tools herein applied should be more precisely stated[8]. The topological methodology used comes from morphodynamic semiotics. This methodology conceives the generating and actualization of the structure of the urban form as a general stratification process; the interrelations among *strata* vary though the centuries. The Lisbon Renaissance epoch helps us to understand how some concrete forms can violently modify or on the contrary maintain the emerging structure throughout historical periods. This model depends on a double positional "*convocation*": the *morphogenesis* and the *semiogenesis*. We have called these trends *constitutive dynamics, of a modal nature*: deep and surface dynamics (cf. fig. no 3, 5, and 6).

Throughout this analysis, we have shown that the Renaissance marked a critical moment of the structuring of Lisbon. Compared to the Middle Ages, it was a time of topological reorganization of powers. This historical evolution underscores a moment of deep conflict within these two periods. On this unstable topological substrata, the social groups – Political, Religious, Common People and Merchants figures – form their fields of forces to establish an equilibrium in the society's global system. It is important to emphasize that this model of the genesis of urban form is a positional values system constituted by various force fields that over time position themselves in space.

Notes

1. This article takes up certain developments from my Ph.D. that will be presented in 1996 at Aarhus University, Denmark, under the direction of professeur Per Aage Brandt.
2. "L'essentiel n'est donc pas de distinguer le réel du représenté, le mythe de l'histoire, ou le concret du légendaire, ni de réduire les uns aux autres ou les autres aux uns, exercices faciles, *l'essentiel est de voir se former des espaces différenciés,* l'essentiel est de voir qu'il n'y a pas qu'un espace ou réel ou représenté, bataille à nouveau bien singulière, mais qu'il y en a de nombreux, finement imbriqués les uns dans les autres, inextricablement. Cela est difficile à penser, maintenant: la multiplicité des espaces" (Michel Serres, 1983:185).
3. In this section, we refer to concepts of stratification and dynamic topology developed by Per Aage Brandt in his numerous publications.
4. A site is a physical singularity already differentiated.
5. The historical and topological information in this article is the responsability of the *Olisipólogos* – historians specialised in the study of Lisbon, as well as the historical Lisbon maps (cf. bibliography). Through these documents I have reconstituted, within a new paradigm, the most coherent corpus possible, which we have consequently analysed.
6. In my Ph. D. thesis, the present study is of course more deeply developed.
7. This urbain axis is "endorégulé", to use the terminology introduced by Gilles Ritchot (1991) and developed further by Gaëtan Desmarais (1993).
8. For details of our model, I encourage the reader to consult my Ph. D. thesis (soon available).

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