

# A Geometric Model Applied To Urban Order

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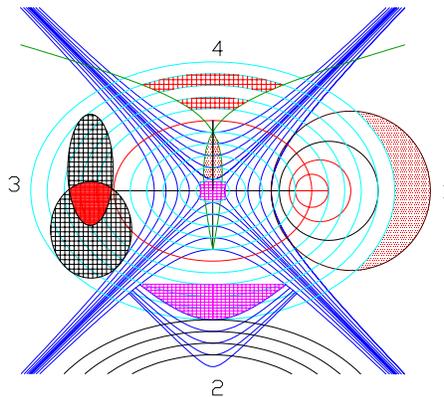
## Abstract

We understand that Geometry is the instrument that “orders the disorder” of the urban transformations, those which generally respond to partial planning or to random dispositions. Geometry designed models allows to work with the urban complexity, on possible variants, searching the cohesion in intentional heterogeneous terms between central and periphery areas. In this work, we propose a morphologic criterion concerning urban development and its relationship with the geometry of its plan. It is a proposition of urban strategic planning in terms of orderly alternative design. We have verified the relationship between the theoretical and the analytical proposition compared with the existing situations. The problematic is situated in periphery of urban sectors and proposes, according with the results of the case studied, new possibilities of interpretation.

## Selecting the field of study

This work is part of project a research cooperation of the AECI. In the first phase, 2005-06, we proposed the study of different alternatives to solve complex situations such as urban periphery expansion or interstitial areas, free from the general system. Mathematics and urban design according with their own specific task, work as complements of each other. This formulation has an interdisciplinary point of view and at the same time is *transversal*, concerning urban design. An exploratory research methodology is applied:

1. Precise the subject of the intervention: the field of study should be defined with precision.
2. Clarify the “problem”, in order to understand it from a “real” point of view.
3. Examine the theory criteria that gave origin to the actual situation.



**Figure 1:** *Combination of the rectangular, hyperbolic and elliptic systems.*

The mathematic approach in the research in architecture and urban design is being proposed further than its application in predetermined patterns. We develop, see figure 1 and [1] for details, a proposal that overlaps several geometric systems: a **rectangular system**, which corresponds with the old historic city

centre; **two** orthogonal and concentric **hyperbolic systems**, as a first extension of the rectangular system and a concentric **elliptic system**, which surrounds the rectangular system and meets the hyperbolic systems creating new possibilities of urban growth. The intersections of these systems allow, on one hand joining to the new system different urban agglomerations, that before were disconnected from the centre, and on the other hand the creation of new urban areas connected between them. Let us note that this proposal permits the incorporation of close urban agglomerations to the system preserving their particularities and the creation of new poles of growth and extension of the centre. A comparative study between two cities is being done, looking at both “problems” from direct experience and observation and through the plan pattern in each case. Our field of study is the cities of Valladolid in Spain and Rosario in Argentina because both cities play a similar role and are models in their respective countries.

There, we could verify the possibility of assimilate, in real cases, our proposal of alternative patterns. The existing complexity requires applying analysis criteria, considering the co-existence of conditioning factors in reference to urban problematic. Our work refers only to shape alternatives; the 2D plan can give as result different structures and connexions according to an order with strategic sense. Comparative analysis of the morphology and growth of cities is possible using geometric models in urban design.



**Figure 2:** *Both cities present irregularities in their limits. In the case of Valladolid, that irregularity corresponds to its own generative development. In the case of Rosario, there is a certain contradiction between the peripheral roads and the general orthogonal plan.*

“There is such a difference between the problems of the American City with respect to those of the European City, so that implies specific and concrete resolutions when focussing their study. This attitude must be understood, even if it is rare in our study methods” (free translation from [2] p. 9, 3<sup>rd</sup> paragraph).



**Figure 3:** *Valladolid on the left and Rosario on the right.*

Until now, we have outlined a position with regards to the evaluative framework. To delimit the field of study in that framework and to confirm its sense, we assume a typical city to be the result of an original orderly plan distorted by uncontrolled randomness. The layouts resolved in an orthogonal plan, now is placed in crisis by its own simplifying difficulty as opposed to that of complexity. Abstract planning is

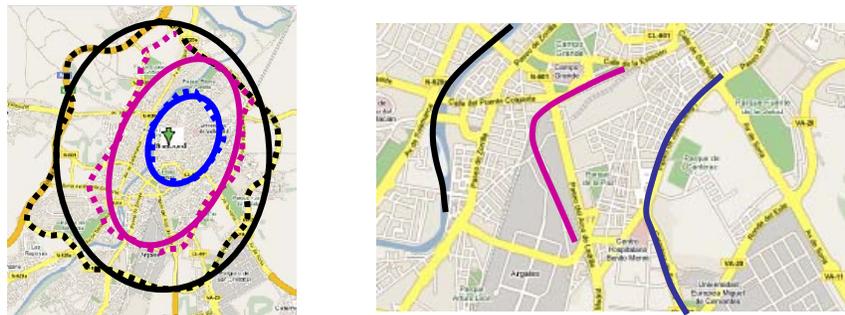
indifferent to growth and to the transformation that alters a pre-established order by the orthogonal framework.

The presence of a river is a common characteristic: Pisuerga River in Valladolid and Paraná River in Rosario. The coast as origin and as a limit in Rosario and the urban continuity trough the river in Valladolid. The analysis reveals different criteria regarding the growth of the city. In one case the orthogonal pattern grows as an indefinite geometric matrix. On the other case there are no evident patterns but different criteria regarding each particular situation.

One type of conflictive situation is that of the **urban vacuum**. New urban-architectural projects are proposed there as mega-undertakings. Their layout is generally autonomous and only connected by access roads to the city. Other proposal is to consider the possibilities of generating those projects starting from layout criteria considered from the point of view of the city, so that the project is carried out not only in possible terms of difference, but also of **integration**.

The situation of the **urban periphery** is one of the most controversial questions regarding the problem of rapid growth of cities. It is in this point where the different town-planning positions are most clearly evident, as regards the directions that this growth adopts. From our evaluative framework, the idea is that of generating new peripheral centres, as an emerging concept of the real circumstances in the periphery, starting from layouts that form the **partial structures**, but at the same time continuous with the city. These structures would constitute **new urban centres** whose growth is foreseen in a similar way to their generation: *i.e.*, their limits become diffuse or permeable and allow the generation of **centres on another scale**. The identity of the “whole” depends on the significant constants and not on the mere repetition. This implies making the unpredictability of the variables compatible with the systematic constancy.

### Valladolid city and Rosario city



**Figure 4:** *Concentric traffic rings and hyperbolic branches on the southeast of Valladolid.*

Valladolid city is the capital of the Autonomous Region of Castile and León. The city develops from a centre, mainly radial. Its periphery high way is a limit that does not define a clear cut between the in or the out of the city. The urban situations are heterogeneous as there are different structures in the areas marked by the concentric traffic rings, see figure 4 left. The perspective is always closed or broken which is a strong characteristic in the city morphology. The central area (historic foundation) is surrounded by the Pisuerga River and the railway. It is the first ellipse, the inner ring on figure 4 left. The second concentric ellipse, larger than the first is determined by North outer road, Juan Carlos I Avenue, Daniel del Olmo Street, Mieses Street and Castile Channel. The third ellipse is delimited by the Castile high way, Manuel Giménez Alfaro Street, Zamora Avenue and East and North outer roads. There is also a hyperbolic development order to the southeast, see figure 4 right. The first hyperbolic branch, the one on the left on figure 4 right, corresponds to part of Pisuerga River. The second branch, the one in the middle on figure 4 right, is determined by the railway, part of Juan Carlos I Avenue and Segovia road.

The order between the first and the second ellipses could be assimilated to our proposition, see [1] and figure 1. In this situation the quarters of Pajarillos Bajos, Pilarica and Belen make a group. This is the

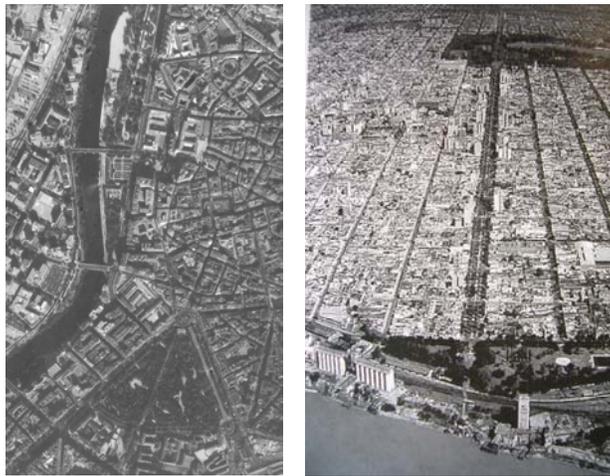
case given as an example in the quadrant 2 of the presented theory. The west area, Huerta del Rey, Girón, La Victoria y La Maruquesa, corresponds to the example in quadrant 3. Parquesol is between the second and third ellipses on figure 4, similar to quadrant 1. Quadrant 4 is represented by Delicias and Pajarillos.

”From the very beginning, the American city was a door, an entrance to the territory, never a wall. It could be a port, where those arriving from the pampa found a sort of “end of the road.” ([2] pp. 21-48)

The main order is an orthogonal pattern, no limited and with no distortion, abruptly cut by the river. The traffic ring alters the homogeneous grid that passes through and continues as the “Gran Rosario”. It defined the “in” and “out” of the city; concepts that changes when the city grows, absorbs former periphery.

## Conclusions

This work points out a certain problematic concerning urban design. Actually the subject “city and its development” is a priority due to the acceleration in all the processes concerned and the failure of the urban plan and the applied criteria.



**Figure 5:** *Valladolid on the left and Rosario on the right.*

Apart from the natural orthogonal grid expansion, Latin American cities have two main ways of development: spontaneous illegal settlements in the periphery and, on the contrary, autonomous settlements (social and legal property) called “barrio cerrado”, with its own configuration. The periphery is the result of the continuity of urban grid, the random settlements and the closed “urbanizaciones” that appears as autonomous entities, plus the non solved, generally empty, interstitial areas.

European cities, example the foundation origin and late growth, so that new urban-architectural projects are proposed there as mega-undertakings. Their layout is generally autonomous and only connected by access roads to the city.

In Valladolid Pisuerga River is a “cut” in the city, see figure 5 left, but bridges and the use of the coast as urban parks makes it part of the urban landscape. The dimension of Paraná River determines its use and makes it coast and limit, see figure 5 right.

The strategic planning is the actual criteria in urban design. This implies to plan partial structures, which present difficulties in great scale planning. The key could be coordination of partial structures.

## References

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[2] *Ciudades 9*, Journal of Instituto Universitario de Urbanística, Universidad de Valladolid, 2005-06.



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