MORPHOGENESIS OF URBAN "GLOCALISATION"[1]

by
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In this article, we shall introduce research which we have been developing for some years. The perspective of analysis is that of morphodynamic semiotics, and our subject of study is the deployment of globalisation and its impact on urban phenomena. The delimitation of this subject follows reflections concerning the four globalisations: terrestrial, maritime, aerial and virtual. We shall also show in this article how, in the space of a *cusp* (cf. Fig. 1) the city in its local (Fl) and global (Fg) dimensions is structured following the rhythm of each new technological development; by this fact, it confronts us with new modes of production of space[3] (b) and of time[4] (a) (cf. Fig. 2). The globalised city obliges us to reconsider the city itself in order for us to be capable to propose a new paradigm for its future. The technological fact mentioned above has penetrated a 'world in the World'; in other words, all of a sudden, the techno-scientific instruments arise as a 'virtual world' on the Web, provoking a double decomposition of the notion of space, such that the individual is no longer only represented in the concrete space of the territory – local – but also in the interactive space of communication – global. Consequently, this virtual world necessarily expresses a 'world of communication' and this world of communication is expressed in the space of our cities. As an example, I shall focus on the effects that this virtual world has on the concrete space of the city by using the example of Rem Koolhaas's *Harvard Project on the City*.
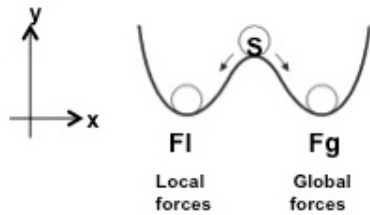
Fig. 1: Internal space (x, y) of the cusp.

1. The Morphodynamic semiotics and globalisation

If we consider that the globalised city obliges us to reconsider the city itself, then we must treat all the strategies of the 'urbanistic project' together, as a semiotic problem of the telematic era. This question of the meaning of the globalised city has been raised by several authors, but, according to us, Gabriel Dupuy's work *L'urbanisme des réseaux* stands out from the others because it highlights the fact that the new urbanism must grapple with the question of the meaning of, and in, the networks (1991: 157). It is at the core of these complex problematics that we inscribe the working hypothesis to be explored in the sequel, namely that **to think urban globalisation, is to consider a new relationship with space and time**.

In order to explore this hypothesis, we have chosen to work within a semiotic and morphological perspective, since it founds and establishes the relation between the morphology of semiotics and the intelligibility of the world. According to Per Aage Brandt, this conception introduces a principle of modelling the constitutive link between forms and forces:

> The form 'state of things' is seized in a variable context of forces which determines its intelligible behaviour, a modal context which enables us to think in terms of time which we locate in space […]; the signifiers are inscribed in paradigms on the map of time, so that their signified bring the form to the variation of the forces which the dynamism renders possible. (1990: 3-4)
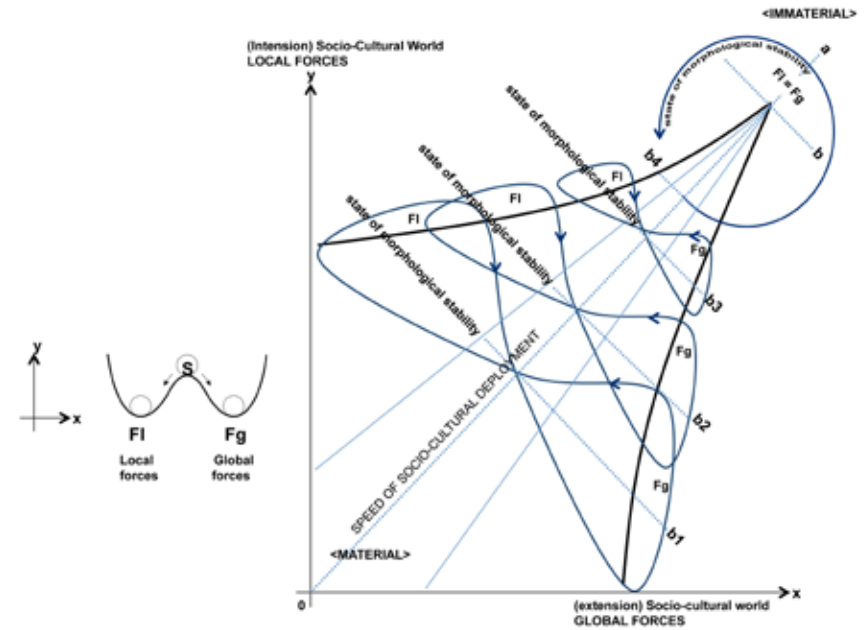

Fig. 2: On the polynomial $y = x^4 + ax^2 + bx$, we have represented the local (Fl) and global (Fg) forces being in conflict within the internal space (x, y) and the external deployment (a, b) of the material and immaterial forms with their four paths (three paths in a loop and a cyclical path of hysteresis)[5].

We have chosen to observe the 'states of morphological stability' of urban globalisation from Antiquity until the present day (cf. Fig. 2) by establishing the link between the techno-scientific genesis (cf. Figs. 3, 4, 5 & 6), the genesis of space production systems (axes b1, b2, b3 & b4 in Fig. 2), and the speed of socio-cultural deployment during the course of time (a). Our description starts by identifying a conflict between two elements of the city: being a 'citizen (here)' in **Local Society (Fl)** vs. being a 'foreigner (elsewhere)' in **Global Society (Fg)**. In Fig. l, the actant (S) is a generic position embodying the resolution of the permanent conflict between (Fl) and (Fg); the techno-scientific innovations introduce new possibilities of spatial configurations and

socio-cultural deployment (a) and enable in the course of time the anchoring of a new state of morphological stability (b). Considering that the city, in its local (Fl) and global (Fg) dimensions, is a spatial system which is deployed in time (axis a), if we place these three elements (Fl), (Fg), (S), in a *cusp* space, that is to say in the internal space (x, y) of the polynomial $y = x^4 + ax^2 + bx$, the deployment shows two minima separated by a threshold limit, elements controlled by the two external variables a and b, in such a way that the two types of forces (Fl) and (Fg) occupy their minimum, whereas the actant (S) is on the threshold limit between the two forces (as we can see in Fig. l). The *cusp* of Fig. 2 will help us all along in this research to explore the principal phases of urban globalisation, its dynamics, its states of morphological stabilities and the new links with space and time.

2. The techno-scientific genesis as a significant discontinuity

In Fig. 2, we observe, on the one hand, four states of morphological stabilisation of the city in its local (Fl) and global (Fg) dimensions, organised around the four axes represented by the four paths: the cyclical loops b1, b2, b3 and a cyclical path of hysteresis b4. On the other hand, before each state of morphological stabilisation, we observe that a moment of instability, punctuated by the emergence of several technological innovations, precedes it, represented in Figs. 3, 4, 5 and 6 around the axis a, which corresponds to the speed of socio-cultural deployment in the course of time (a). In order to be in a position to describe the different components of this system (the city in its local (Fl) and global (Fg) dimensions), in what follows we shall present the different internal and external states in the *cusp*. We postulate that technological innovation creates a context of forces – local (Fl) and global (Fg) – which enables the emergence of new forms of morphological stability. In other words, technological innovation becomes a context of forces, in a
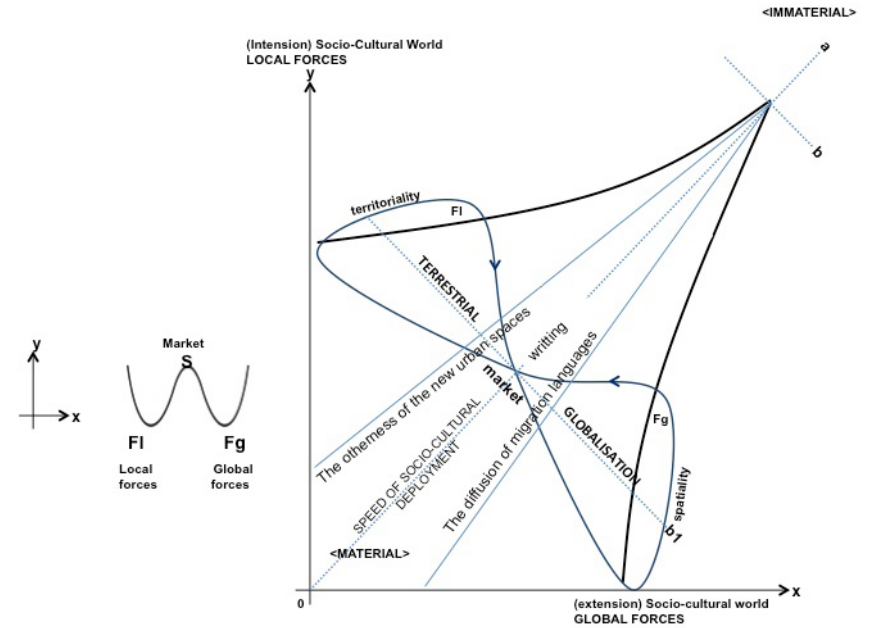

Fig. 3: Terrestrial Globalisation

society and in a culture, rendering new modes of production of space and time possible.

In order to illustrate this postulate, we have chosen four periods of instability, as they very clearly mark the phases which precede the spatio-temporal deployment of the city in its local (Fl) and global (Fg) dimensions (see Fig. 3).

This first moment of innovation diffusion precedes what quite some centuries later, would be called the 'terrestrial globalisation' (cf. Fig. 3). It originates in the difference between 'living here', being a citizen – the link with the local territory – and 'living elsewhere', being a foreigner – the link with global spatiality. This moment of the diffusion, during a very long period of time, of innovations is anchored in urbanisation and in language, as we have demonstrated
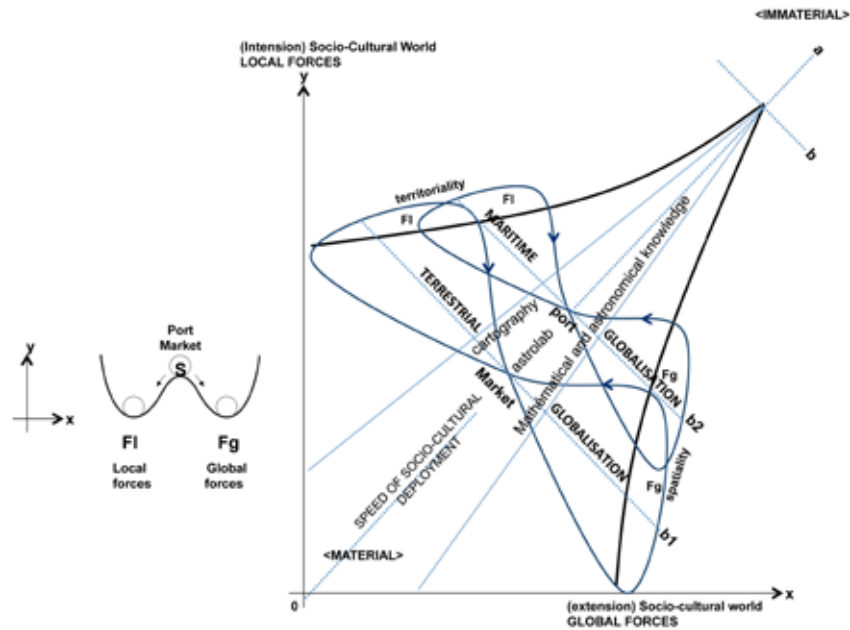
Fig. 4: Maritime Globalisation

elsewhere (1996).[6] By the end of Antiquity, innovations such as writing, the propagation of languages through migrations, the alterity in the new urban spaces, etc., enabled the thinking of the link between the local society where the market exists, and the global society from where come the goods and the foreign merchants. In Fig. 3, the loop (bl) represents in the external space the path of an internal conflict between the attractors: (Fl), the local forces, and (Fg), the global forces. The 'market' (S) emerges as the resolution of the conflict between (Fl) and (Fg). At the intersection of the loop, the two forces cooperate through the space of the 'market' and constitute a state of morphological stability of the whole balance of forces.

The second moment of techno-scientific diffusion marks the passage between terrestrial globalisation and maritime globalisation (cf. Fig.

4): the 15th century abounds with innovations such as cartography, the astrolabe, knowledge of mathematics and astronomy, etc. The whole of these innovations creates a context of forces, which enables the emergence, a few decades later, of a new system of organisation and exploration of hitherto unknown territory, which allows us to **introduce the notion of continuous mobilisation**. In Fig. 4, a 'catastrophic jump' is observed towards a new state of morphological stability where the system begins to function also elsewhere. In other words, after the period of instability introduced by techno-scientific innovations, the 'port' (S) emerges at the intersection of attractors (Fl) and (Fg), and the loop (b2) represents, in the external space, the path of an internal conflict between attractors (Fl), the local forces and (Fg), the global forces. At the intersection of the loop (b2), the two forces cooperate and coexist through the space of the 'market' and of the 'port', thus constituting a new state of morphological stability.

The third moment of techno-scientific diffusion marks the passage from maritime globalisation to aerial globalisation (cf. Fig. 5): the 19th century, all the way to the beginning of the 20th, is a fruitful period of new inventions such as the transatlantic cable, electricity, the telephone, the aeroplane, etc. All of these innovations create a context of forces enabling the emergence, some decades later, of a new system of organisation and of a new conception of space and brings about a new **notion of interaction**. In Fig. 5, we see a more important, catastrophic 'leap forward', no doubt due to the increased speed of socio-cultural deployment and the instability introduced by the techno-scientific innovations around the axis (a). In other words, after the moment of instability introduced by the techno-scientific innovations, the airport (S) makes the resolution of the conflict between attractors (Fl) and (Fg) possible; the loop (b3) represents, in the external space, the path of an internal conflict between the attractors (Fl), local forces and (Fg), global forces. In the internal space, the 'market', the 'port' and the 'airport' coexist. At the intersection of loop (b3), the two forces cooperate and coexist
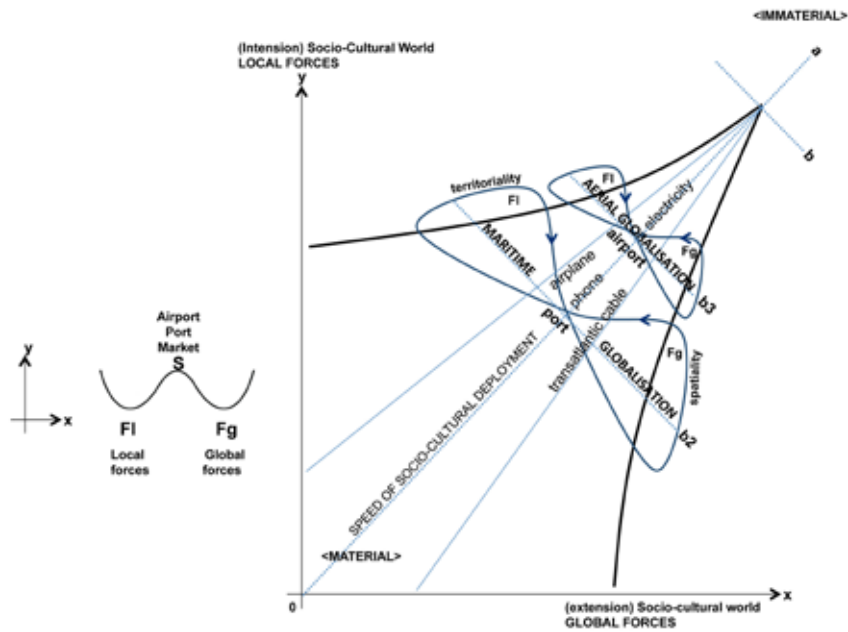
Fig. 5: Aerial Globalisation

Fig. 6: Virtual Globalisation

through the space of the 'market', the 'port', and the 'airport', thus constituting a new state of morphological stability.

The fourth moment of techno-scientific diffusion marks the passage from aerial to virtual globalisation (cf. Fig. 6): it emerges during the last decades of the 20th century, with new technologies such as the Internet, the mobile telephone, the Web, the blogs, Facebook, etc. All of these innovations create a context of forces which enables **a transfer of the notion of space:** the individual is no longer just represented in the concrete space of territory (local) but also in the interactive space of communication (global) experienced in the virtual reality of the Web. In Fig. 6, we observe a catastrophic 'leap forward' towards the organising centre, forming a cyclic path of hysteresis which sets up around the *cuspoïd* system's point (a =
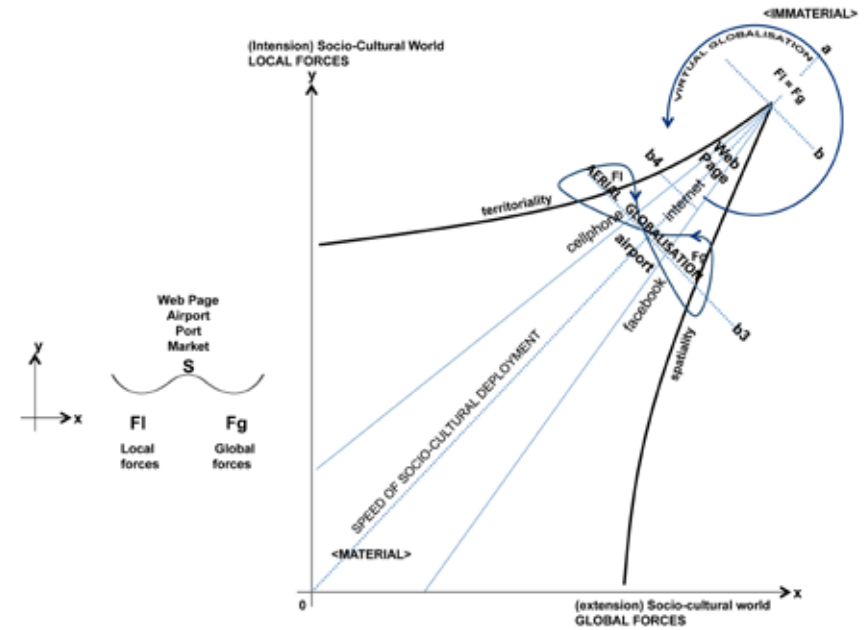
b = 0); this path depends on all of its previous evolution and not only on parameters as currently described. We can see that the space is retracted to the Web page and that time becomes instant, the balances of forces merge, and local and global change into 'glocal': (Fl) = (Fg).

As we have shown, the deployment of techno-scientific genesis advances has produced significant discontinuities – the 'market', the 'port', the 'airport' and the 'Web page' – each discontinuity indicating a new balance of local (Fl) and global (Fg) forces and successively engendering a state of morphological stability. In Figs. 3, 4, 5, and 6, we have been able to mark the four important types of globalised urban networks (worldwide network types: terrestrial, maritime, aerial and virtual) as well as their significant disconti-

nuities (the network nodules: 'market', 'port', 'airport' and 'Web page'). The **notion of network**, as we have employed it here, is supported by its diversity and heterogeneity relative to time and to space (Dupuy 1991: 108); even so, we still have to identify the network nodules. These significant discontinuities or 'territorial nodules',[7] are places of power and of reference, "discontinuities in a spatial or spatio-temporal continuum"(Dupuy 1991: 108). In order to show the mechanisms of spatialisation engendered by the network's significant discontinuities, I shall start by aligning two historical moments that are structurally analogous, viz., the 15th – 16th centuries and the 20th – 21st centuries; they are organised in the following manner:

1. diffusion of multiple techno-scientific innovations;
2. creation of new infrastructures;
3. the mechanisms of double spatialisation;
4. constitution of another relationship with space and with time.

2.1. Mechanisms of spatialisation of the first global market

In order to understand the foundations of the urban globalisation, João de Barros, a 16th century chronicler, is an indispensable source. Referring to the major Portuguese[8] 'invention' of the period, the 'maritime globalisation', he asserts that all the socio-cultural relations, as of that moment, are constrained by trade and merchandise. But what are the consequences of this assertion?

My research has demonstrated that the maritime routes link all four parts of the world as it was then known: Europe, Africa, Asia and America. In other words, the Portuguese Empire is maritime, in the sense that it is based on a maximum of spatiality, and it is commercial, in the sense that it is based on a minimum of territoriality (Barreto

2000: 51). This minimum of territoriality, whose only function is to organise commerce, will give birth to a new conception of the city as regards its infrastructures. As a matter of fact, these maritime routes, linking the four corners of the world, depend on hundreds of towns, and thus enable the organisation of the first worldwide market. Here is how this historic period, from which the first worldwide/globalised market emerges, is structurally organised:

1) The 15th century is marked by the diffusion of multiple techno-scientific innovations: cartography, the astrolabe, mathematic and astronomic knowledge, etc.
2) In the 16th century, a whole maritime infrastructure was created which enabled the linking of the four parts of the world: maritime routes, ships, ports, towns, etc.
3) As regards its mechanisms, the global market of the 16th century possesses a double spatialisation:
– **The first space is** an unlimited space, it is the space of the network. This network of maritime routes links the four corners of the world. This world is yet to be discovered, due to the fact that at the time, it was not yet a defined territory whose limits could be set; hence **this network from then on becomes a horizon to be discovered**.
– **The second space is** not undefined and unlimited, it is 'explorable' and 'closed': **it is the space of each city inside of which commerce is organised,** set up along the African, Indian, Asiatic, American coasts where each ship is loaded with merchandise.
4) Space becomes global and the times are those of travels throughout the world.

In Fig. 4, we may observe the passage[9] between these two types of network – the one of terrestrial globalisation and the one of maritime globalisation; both of these globalisations are articulated around significant discontinuities, 'market' and 'port'.

2.2. The mechanisms of spatialisation on the Web.[10]

Going back to the notion of network which we have just defined, but now applying it to the Web space, a Web site is a reticular nodule and at the same time the actualisation of a particular position in the network space. The actualisation of this position in the network is called a 'site' (from the Latin *situs),* that is to say a localisation and a point in an unlimited space. The two spaces on the Web page and the network appear and converge on an interface, the computer screen. The page/screen acts as an interface between the unlimited or undefined space of the network and the more enclosed space of the site (Lellouche 2003).

Structurally, this historic period where the virtual online world emerges, is organised as follows:

1) A certain number of technological innovations have spread out during the last decades, such as the Internet, the mobile telephone, the Web, blogs, Facebook, etc.
2) According to the 'logic of instantaneous time', the Internet emerges as an infrastructure of this new virtual world.
3) The double mechanism of spatialisation:
   – **The first space** is an unlimited space, it is that of **the network described as a 'world', a virtual world** without defined territory and without visible limits. It is impossible to have at one's disposal an a priori representation, either of its content, its extension, or its structure.
   – **The second space**, rather than being undefined and unlimited, **is explorable and 'closed': it is the space of the site**, or rather of the web page and its postings at a given moment.
4) Space is retracted and time becomes instant.

At present, there are cities which thoroughly embody this continuous mobilisation in interactive space of territory, as illustrated by the *Harvard Project on the City* (directed by the architect Rem Koolhaas).

The diverse cities studied by this project have a point in common of being run by the dynamics of commercial value and regrouping populations of over 10 million inhabitants. These 'mutant' cities reveal certain mechanisms of spatialisation, which will enable the constitution of a new paradigm of the contemporary city:

- Lagos, the capital of Nigeria, is a *Shopping* city, in which the *Oshodi* Market symbolises the city's identity; the degree of permanence of the commercial infrastructure in this city is linked to its capacity for mobility. Lagos, according to Koolhaas, is a city at the 'avant-garde' of globalising modernity.

2.3. The mechanisms of spatialisation of the 'mutant' city.

The African city obliges the rethinking of the city itself. Knowing that the numerous tendencies of modern western cities are expressed in Lagos in a hyperbolic form, it is understood that writing on the African city, it is writing on the future condition of Chicago, London or Los Angeles, it is examining the city elsewhere, in the developing world, it is reconsidering the modern city and proposing a paradigm for its future. (Koolhaas 2000: 653)

Lagos is a city of constant change, having a mobile character as far as its limits and its proprietorship are concerned. One should be aware that according to the local law of custom, proprietorship has a collective character. "Despite the existence of the national cadastre and the data on territorial land occupation recorded at the regional level, it has never been possible to fix or to define a physical limit to the Lagos urban centres"(Koolhaas 2000: 662). In this sense, Lagos is a city where mobilisation continues to engender an 'unlimited' urban space: it is the space of the global commercial network to which we cannot assign limits.

- Shenzen, on the banks of the Pearl River in China, is also considered a mutant city. Within 10 years, it passed, from being a fishing village, to a city of 10 million inhabitants. In 1993, it possessed 450 high-rise buildings and in less than 10 years this number has doubled. It seems that in the course of their projects, Chinese architects have to face constant changes, even the complete modification of their building programmes. The architecture itself is also mutating. For example, in Shenzen an architect may start by building a hospital, but while carrying out his project, see it reconverted. In the same way, a building initially planned as a parking garage can serve at least 45 different functions.

The mutant cities that we have just mentioned are only the consequence of this global market, which has urbanised real time and de-urbanised real space. The new technologies provoke 'telepresence', but also speed and absolute control. Here is how the mutant cities are organised structurally:

1) The new technologies engender a 'telepresence' of the global market in the space of these cities.
2) According to the logic of instantaneous time, the Internet emerges as the infrastructure of this new virtual world. In the face of a continuous mobilisation, where urban changes are very rapid and often governed by the global market, we notice that all change in this floating city is determined by the flux of goods. As a working hypothesis, we can suggest that the Lagos system of infrastructures is pretty much reconfigured as a Web network, where the hallucinating speed of urban change corresponds to aleatory choices in the global market – 'aleatory' if considered from the point of view of 'classical' urban organisation. Lagos thus becomes a sort of 'city enterprise', subject to the laws of the market.

3) The mutant city, being determined by the global market as far as its mechanisms are concerned, possesses a double spatialisation:
   – **Its infrastructure amounts to an unlimited space, it is the network space of the virtual world of communication which is expressed in the space of our cities.** This network is described as the global market's 'virtual world', without a defined territory and whose limits we are unable to fix. In a way, the entire city underlies this tendency.
   – **Lagos, pre-eminently a 'global city' as a Web site, is a nodule in the global market network;** at the same time, it is the actualisation of a particular position within the space of this network. The actualisation effectively depends on the decisions taken in this network. They appear and converge on the Lagos space at an ever-accelerating speed.
4) The conjunction of the global and the virtual markets sets in motion the urbanisation of real time and the de-urbanisation of real space; the result is what we have called the 'mutant' city. Thus, space has retracted (in the sense that it has lost its historic dominions) and time becomes instantaneous. "The contemporary urban condition, mobile reality, fluctuating from Asia to America, from Africa to Europe, is the melting pot of the great energies which travel throughout the world and the product of a society which has radically changed in scale"(Koolhaas 2000: 662).

3. Conclusions: the acceleration of socio-cultural history

Aligning these two historic moments, being structurally and spatially 'analogous', shows that the urban globalisation of the 16th century is the 'real' expression of the **first global market**; the same mechanism emerges a few centuries later, on the Web, but this time in order to provide the new global market with the 'instrument of urbanisation' in real time. In other words, each techno-scientific innovation is the

progressive instrument of the acceleration of socio-cultural history: in the 15th century we have cartography, the astrolabe, etc.; in the 19th century, we find the transatlantic cable, the telephone, etc.; and during the last decades, the 'techno-scientific instrument' all of a sudden, emerges as a virtual world on the Web. This 'Web world' has caused a displacement of the notion of space, by which the individual is no longer exclusively represented in the concrete space of the territory (local), but becomes part of the interactive space of communication (global). Thus, **the virtual world inevitably expresses a world of communication, and this world of communication is expressed in the space of our cities.** The 'mutant' city, with its mechanisms of double spatialisation, is one of many possible examples of this new urban condition. These mutant cities enable us, amongst other things, to observe how presently, certain cities become nodules in a global commercial network where territoriality counts very little. The 'mutant' conditions of cities, societies, cultures, politics, all point towards a human condition which has radically changed in scale in our high speed world. To better understand the analytic path travelled, consider the *cusp* of synthesis illustrated in Fig. 7.

In this article, we have shown the dynamics of the urban globalisation and its link with a progressive acceleration of the socio-cultural history. This has enabled us to explicitly conceptualise the constitutive links between the different states of morphological stability of the networks (cf. Fig. 7 – (loops b1, b2, b3 and b4) in the external space) and between the effects of meaning of the nodules (cf. Fig. 8 – the actants (S): 'Market', 'Port', 'Airport' and 'Web page'). The significant discontinuities, represented by the network nodules (S): 'Market', 'Port', 'Airport' and 'Web page' articulate a certain logic of the world. They even seem to be polarised by the binary opposition of territoriality (sedentarity) vs. spatiality (nomadism). In other respects, we know that the simple alternative proposed by this binary opposition is not enough to account for the dynamism of urban globalisa-
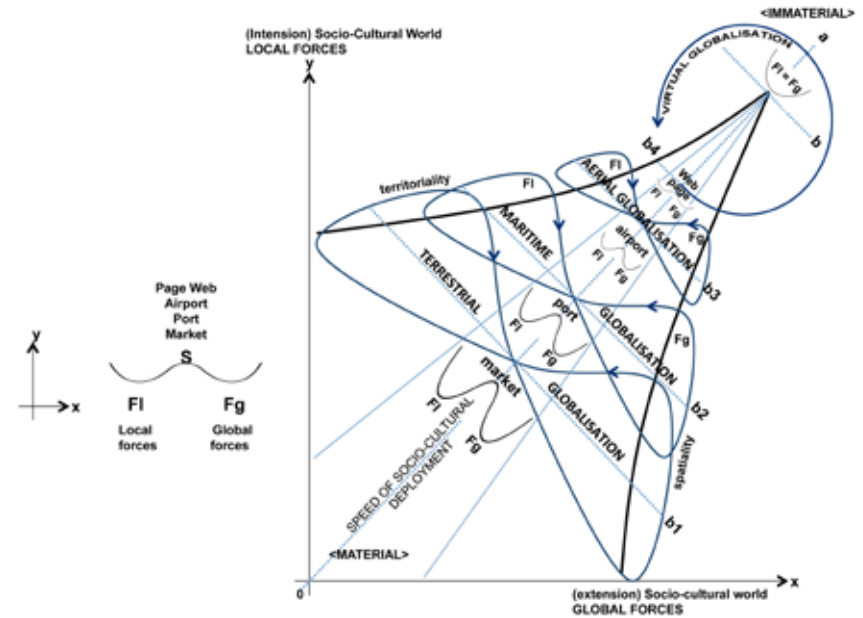

Fig. 7: Constitutive links between the different "states of morphological stability" of networks (loops b1, b2, b3 and b4 in the external space) and between the effects of meaning of the nodules (S)

tion. It is therefore necessary to think in terms of topology, of zones, and of jumps to grasp this phenomenon. We shall propose two of the latter in particular: on the one hand, the extensional dimension of the socio-cultural world (that is to say of the world as represented either statically, in its amplitude or its narrowness, or dynamically, in its shrinking or enlargement); and on the other hand, the intensional dimension of the same socio-cultural world. The actant is inscribed in the dynamics of these two attractors: the extent of the world as a socio-cultural horizon (extension) and its (local) territoriality, the ground of its socio-cultural experience (intension). In the internal space of the *cusp* we place the constitutive forces (Local and Global)[11]: the (F1) – local forces (which can engender trajectories with a tendency

towards sedentarity and territoriality) and the (Fg) – global forces (which can engender trajectories with a tendency towards nomadism and spatiality). If we place (Fl), (Fg) and (S) in the internal space (x, y) of the polynomial $y = x^4 + ax^2 + bx$, the deployment is to two minima separated by a threshold, which is controlled by the external variables (a, b) so that the two forces (Fl) and (Fg) each occupy a minimum, whereas the actant (S) is on the threshold between these two. The resultant image will describe the behaviour of the actant (S) according to an increased mobility, tending towards sedentary (Fl), or to a reinforced mobility, tending towards nomadism (Fg), with the actant (S – 'Market', 'Port', 'Airport', 'Web page') corresponding to the structural nodules rediscovered progressively as the speed of socio-cultural deployments accelerates. We can say that this conflict between the global forces (Fg) and the local forces (Fl) presupposes an historic deployment of the conflictual movement between these two types of forces. As shown in Figs. 7 and 8, the depth of the minima is reduced as the speed of socio-cultural deployment increases and the existing conflict between the local forces (Fl) and the global forces (Fg) is weakened, until they merge on the Web page.

Following the development sketched in Fig. 8, the fusion (Fl) = (Fg) on the Web page would represent the zero degree of conflict between the two attractors. Regarding the new technologies, Paul Virilio (2001) and Michel Serres (2012) have elaborated contrasting hypotheses which enable us to better understand this fusion between (Fl) = (Fg) on the Web. For Virilio, the new technologies promote telepresence, but also absolute speed and absolute control. This tendency furthers financial interests and leads to the most dangerous forms of totalitarian regimes. Rem Koolhaas' example of Lagos and other 'mutant' cities is the very image of this new regime of absolute control; these cities organise themselves like nodules of a commercial network and regroup a population of over 10 million inhabitants; they undergo constant change, their identity is governed
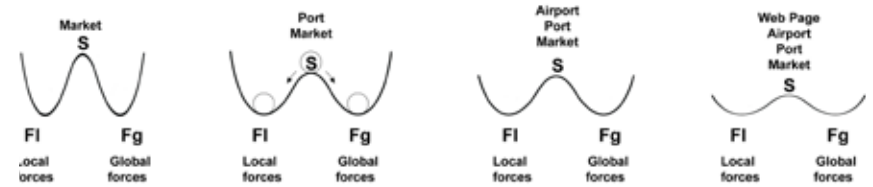

Fig. 8: Internal space (x, y) of the cusp.

by commercial value; we are witnessing the de-urbanisation of real space. Serres, for his part, pinpoints three great revolutions in our society: the first is the passage from oral communication to writing, the second is the passage from writing to printing, and the third is the passage from printing to the new technologies. Each of these revolutions is accompanied by political and social changes. They are also periods of crisis, like the one we are experiencing today. The urbanisation of real time by the same new technologies leads to a major revolution where the subjects[12] are reinventing ways of living together, new ways of being and of knowing, and so on. According to Serres, a new era is dawning in which we will see the victory of the anonymous multitude over the well-recognized ruling elites, the victory of knowledge discussed over doctrines taught, and the victory of a freely connected, virtual society over the material society of one-way entertainment. "For the first time in history, we can hear the voice of all. Human speech murmurs in space and through time"(Serres 2012: 58).

The globalised urban networks (as part of the globalised networks of the territorial, maritime, aerial and virtual type) as well as their significant discontinuities (in the shape of the network nodules: 'Market', 'Port', 'Airport' and 'Web page') enable us to shape the present notion of urban globalisation. Outlining such a spatial and temporal system has made it possible for us not only to follow the 'states of morphological stability', but also to identify the emergence

of innovations as conditions for the modal renewal of meaning. The three great revolutions identified by Michel Serres on the one hand, and the global acceleration in Paul Virilio's vision on the other, carry with them political, social and cognitive changes. Urban globalisation, in this perspective, is a gathering of increasingly richer forms and trends – forms that are more and more diversified, more and more foreign to our culture, to our sensitivity, to our life experience and to our understanding of the 'Global World'[13]. These forms and their expressions strike the sensorial Subject machine, strike its very basis and experience. We are mutants ourselves, actants in a world so real and yet so virtual, a world of "times that are a-changing"!

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Notes

1   The term 'glocal' comes from the contraction of two words: 'global' and 'local'. As we shall demonstrate in the present article, at this level of analysis, we have distinguished four spaces of 'glocalisation': the market, the port, the airport and the web page. Each of these spaces maintains a 'balance of forces' (local and global) that are in conflict within the system of urban networks. Over time, we observe that the conflict between the 'forces' (local and global) diminishes down to a total 'glocalisation', or fusion between these forces, the web page being the perfect example. The spaces that we have enumerated are 'glocal', spatial nodules.

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3   Here, we use the notion of space as a 'balance of forces' (local & global) that are in conflict inside the system of urban networks.

4   Here, we use the notion of time, as historical time, viz., the time of cultures and of societies that spread and which regularly settle firmly into a 'state of morphological stability'.

5   This term is utilised by René Thom in his work *Apologie du Logos* (1990: 196) to describe the dynamics of the cyclical paths of hysteresis around the point of the cuspoïd system (cf. the axes in Fig. l: a = b = 0 – the organising centre). According to the online Larousse dictionary, the notion of hysteresis signifies a system whose properties at a given moment depend on its entire former evolution and not only on its current parameters.

6   At the time I was inspired by unpublished texts by Per Aage Brandt belatedly published as Brandt (2003).

7   These nodules are expressed at different scales of space: global, regional, urban, architectural, …

8   At the time of the Great Discoveries.

9   This passage underlines diversity and heterogeneity in the relation between time and space.

10   For this section, we were inspired by discussions with the philosopher Raphaël Lellouche and by some of his unpublished texts.

11   The Portuguese Empire is a maritime one, in the sense that it depends on a maximum of spatiality and it is commercial, in the sense that it depends on a minimum of territoriality (Barreto 2000: 51).

12   Michel Serres has named these subjects "petits poucettes et poucets"(from the French *pouce*, 'thumb') for their capacity to send SMS with their thumbs.

13   Here, I was inspired by certain aspects of the article by Jean Fisette "Semiotics, ethics and globalisation", University of Quebec, Montreal. Available at: http://www.jeanfisette.net/publications/semiotique2c-ethique-et-mondialisation.pdf (consulted 02/02/2013).

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