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# Founding territorial sciences

## Editors

Pierre Beckouche, Claude Grasland,  
France Guérin-Pace, Jean-Yves Moissoner



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# Founding territorial sciences

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## INTRODUCTION

### **Territorial sciences: Why a book on territories, and why a collection of essays?**

From having been a fashionable trend in various guises, the question of territory has become a major focus of research in recent years. The premise of this book is that it is impossible to address many of the major challenges facing contemporary societies without taking into account their territorial dimensions. These include climate and energy change, population ageing and health care provision, widening social inequalities and increasing access to basic services, urbanization and urban-rural relations, the mobility revolution, decentralization and local development, the obsolescence of the nation-state and European integration, globalization, and new North-South relations.

Yet the question remains: Does the territorial dimension of the changes affecting contemporary societies justify the need to create a Collège international des sciences du territoire (CIST, the International College of Territorial Sciences) and to lay the foundations of a new discipline by holding an international conference? The purpose of the “Founding Territorial Sciences” conference – a conference aimed at bringing together researchers from many different disciplines – was to address the following question: Are the concept of territory and the territorial dimension of contemporary challenges important enough to warrant the development of a new interdisciplinary field, or even a new research field? Or should the aim simply be to harmonize the methods of territorial analysis applied to a wide range of different issues and disciplines (the environment, energy, health, international relations, etc.) based on a view of the territorial sciences as mere “scientific knowledge”?

The broad perspective taken in this book encompasses a wide range of disciplines. The assumption is that disciplines that involve the study of space (e.g. geography and geopolitics, environmental science, spatial planning, urban development and architecture, urban history and urban sociology, urban and regional economics, and the study and practice of development) make a major contribution to our understanding of territories. This new field

will also be of interest to researchers in other social sciences, including demography, the sociology of public policy, institutional economics, environmental law and international law, but also the natural sciences (hydrology and geology), the life sciences (biology, agronomy, health, etc.) and engineering science (geomatics, scientific modeling, complex systems).

The interdisciplinarity of the territorial sciences will depend on how we define the field – i.e. as a form of scientific knowledge or as an emerging discipline. If we define the territorial sciences as scientific knowledge, the assumption will be that the combined resources of a range of disciplines are needed to understand the territoriality, or territorial dimension, of their objects of study. The aim is to focus on the conceptual approach to the term “territory” in order to highlight potential variations or differences between different disciplines, the assumption being that the study of space in different fields needs to be based on similar methods (i.e. criteria for delimiting space, the measurement of interactions, the role of territories in social representations, the degree of consistency between functional and institutional spaces, and the spatial analysis of resource allocation, among other things). In this sense, it may be more accurate to speak of the “science of *territories*”, or even simply to develop a common *methodology*, since the assumption is that territories serve to reveal multidisciplinary issues involving other disciplines.

However, if we take the view that the concept of territory can be the object of an autonomous discipline, i.e. “*the science of territory*”, the key concepts, principles and methods of the field will need to be defined. Here, the assumption is that researchers with an interest in territorial issues will need to focus on the territory itself rather than broader issues such as the relationship between the individual and the collective. To put it another way, researchers will need to view these broader issues as providing an opportunity to improve our understanding of territory as a research object. Based on the hypothetico-deductive method, the resulting laws will serve to highlight general empirical patterns showing how territories function, but will also serve to demonstrate the diversity of territories based on the analysis of deviations from these patterns. The new field will also need to resist the twin temptations of exceptionalism (i.e. all territories are different and no general proposition can be formulated about them) and determinism (i.e. a unique principle governs how territories function, regardless of time and place). In any event, it would be absurd to build a science along these lines solely on the basis of the concept of territory and without seeking to combine it, at the very least, with concepts such as space, network and scale.

The aim of this book is to examine these questions and to engage in debates focusing on both scientific and practical considerations as part of a new series entitled “*Sciences du territoire*” (territorial sciences), in collaboration with Karthala. This first volume includes some of the papers and debates from the founding conference held by the Collège international des sciences du territoire on 27, 28 and 29 November 2011. Included here are the contributions that focused most directly on the research question presented in this introduction and further developed in the *Debate paper*<sup>1</sup>. We have opted to include the *Debate paper* despite feeling

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<sup>1</sup> A first version of this text was made available before the 2011 conference and was used as a call for papers.

that it remains incomplete. The debate is ongoing and the *Debate paper* needs to be seen as a work-in-progress.

Part one examines recent developments at an international level, focusing on both traditional debates, such as the debate between the spatial approach and the territorial approach or the *place versus space* debate, and the relationships between researchers and the actors of territorial development. Recent initiatives in Germany, Quebec, Italy and the United States are examined in order to better understand recent debates in France over the development of a transdisciplinary field centered around the concept of territory.

The collection of territorial data and the processing of local and micro-local data is a major focus of research at the CIST. However, as shown in part two, the combination of rich and varied territorial data collected at different levels raises a number of theoretical, methodological and empirical issues.

The relationship between social demand and professional practice is a major focus of the territorial sciences, given the close ties between territories and the actors of territorial transformation. *The assumption is that territories are an important meeting point with social demand, and therefore with policy-making and action.* Therefore, the task of the territorial sciences is to articulate and address territorial issues and to provide tools to promote public debate and support decision-making, which is precisely the focus of part three.

The discussions generated by the conference are only partly reproduced in this volume. The debate continues on a daily basis in the various events held as part of the GIS CIST<sup>2</sup> and will be further explored in future publications in the series, of which this volume is the first.

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<sup>2</sup> Groupement d'intérêt scientifique (GIS): Scientific interest group.



DEBATE PAPER

## Territory as the legible, tangible product of complex processes and as a resource for action

Pierre BECKOUCHE, Claude GRASLAND,  
France GUÉRIN-PACE, Jean-Yves MOISSERON<sup>1</sup>

### 1. THE “SPATIAL TURN”, OR THE RISE OF THE CONCEPT OF TERRITORY

Since the 1980s, there has been growing interest in the question of territory among social scientists. Let us begin with a brief outline <sup>1</sup>of the various meanings of the concept in different social science disciplines (note, however, that the meaning of “territory” is invariably discipline- and context-specific<sup>2</sup>). A good example of the growing popularity of the concept is the increasing focus on territorial issues in anthropology. Anthropologists have applied the concept of territoriality to both traditional and modern societies, with concepts such as *household*, *urbanization* and *network* playing an important role in recent research. More generally, there has been increasing interest in the symbolic dimension of territories, especially from a community and relational perspective (e.g. the national imagination of diaspora communities, the tension between the sense of origin and the reconfiguration of identity in new local territorialities, and the myth – or myths – of return).

There has also been a shift in the approach to territorial issues among historians. In traditional historiography, the concept of space involved notions such as the state, national borders and lines of demarcation or peripheries. Some studies in the new history (or *nouvelle histoire*) focused on specific territories, though always in traditional territorial contexts and frameworks (i.e. country, nation or village). Space was also at the heart of major historical studies, such as

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<sup>1</sup> This chapter was reviewed and edited by members of the CIST, and in particular by Chloé Didelon, Timothée Giraud and Marta Severo.

<sup>2</sup> This section is based on preliminary research conducted by the CIST prior to the 2011 conference, and in particular on contributions from Martine Hovanessian, Jean-Paul Billaud, Hervé Brédif and Marie-Louise Pelus-Kaplan.

the work of Pierre Chaunu on transatlantic trade or Fernand Braudel on the Mediterranean. However, the resurgence of interest in the question of territory only really began in the 1980s as a result of the development of interdisciplinary research. Recent studies have focused more on spatial processes (broadly corresponding to “territorial” processes) than on ontological or political space. The basic premise of recent research in this area is that space is a construct rather than a given. Hence the interest in landscapes, representations (mental maps), in domestic space, and in the environment – in short, in the question of space constructed by collective actors seizing upon social and cultural problems and inequalities and involved in new systems of governance.

There has also been a spatial turn in economics as a result of research on economic inequality and the unequal distribution of wealth and the underlying geographical concentration of production. One scholar<sup>3</sup> was even awarded a Nobel Prize for his work in geographical economics. Until recently, mainstream research had failed to provide solutions to these problems, largely because the concept of space in neoclassical economics was limited to questions of distance and cost. Trade barriers were seen as “imperfections” impeding the development of an ideal market designed to ensure prosperity for all. In short, the concept of territory was stripped of content, devoid of identity, and reduced to a residue. General equilibrium theory states that spatial inequalities are bound to decrease. However, recent studies have highlighted agglomeration forces that go against the grain of the idea of equilibrium. Returns to scale and positive externalities are now seen as centripetal forces, suggesting a greater emphasis on *cumulative benefits* (as opposed to the *comparative advantages* highlighted by Simon Kuznets and Jeffrey Williamson, the inheritors of Adam Smith, who see general equilibrium as a process resulting in the reduction of territorial disparities). More recent studies have viewed territories as resources or even as factors of production. The result has been the emergence of a new concept: *territorial capital*. In this view, territorial practices (i.e. spatial planning) and policies are placed at the heart of research and policy recommendations.

It is also important to acknowledge the debate over the term “common good” at the crossroads of economics, law and political science, where recent discussions have also often involved a territorial dimension (such as water, air, forests, or pastureland). The political economist and Nobel Prize winner Elinor Ostrom showed that alongside privatization and public management (the state), social collectivities are also capable of managing common goods in an economically viable way through specific institutional arrangements. In the economics of conventions, sociologists, political scientists and other scholars outside economics with an interest in the cultural and institutional characteristics of different countries have highlighted significant differences between national responses to globalization. In other words, global norms produce different effects and serve to highlight the specific features of each territory.

Geography has also experienced what might be termed a “territorial turn”. Over the past twenty years, the growing popularity of the term “territory” has both enriched and complicated research in this area. In geography, *territory* provides a basis for examining the political, institutional and financial mechanisms governing the production of space and for understanding

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<sup>3</sup> Paul Krugman.

local interactions, while also highlighting the importance of the “interplay of actors”. Theoretical geography and spatial analysis have explicitly recognized these conceptual developments by integrating into classical spatial interaction models (based on the continuous effects of distance) barrier parameters, or, in other words, territorial interaction parameters (based on the discreet effect of a frontier that sharply reduces probabilities). While the idea is not new (consider the work of August Lösch), it is only recently that we have begun to consider territorial effects such as these as intrinsic components of the behavior of actors (as opposed to viewing them as mere residue). Therefore, Tobler’s first law of geography (i.e. “everything is related to everything else, but near things are more related than distant things”) can now be supplemented by a second law that takes into account the discontinuities created by borders (“everything is related to everything else, but places belonging to the same territory are more related than places separated by borders”, Grasland, 2009).

There are many other disciplinary and thematic examples of the rise and success of territory as a research topic in recent decades. But how can we explain the success of territory?

## **2. TERRITORY AS THE LEGIBLE, TANGIBLE PRODUCT OF COMPLEX PROCESSES**

Our hypothesis is that the success of the concept of territory can be explained by the “integrative” nature of the concept as a palimpsest recording the traces of past events within the landscape through complex historical processes, as a record available for analysis, and as a tool for informing future policy developments. Let us clarify this point.

### **2.1. The era of complexity**

The notion of “complexity” as a tool for understanding contemporary societies first emerged in the 1970s. Following Edgar Morin (among others), theories of complexity and complex systems theory were developed to explain large-scale systems composed of many interacting, nonlinear and self-organized components<sup>4</sup>. The earliest studies in this area have since proved useful. The basic assumption is that the increasing complexity of human organizations and their interaction with the environment requires appropriate conceptual and technical tools.

What is true of the social sciences is also true of emerging disciplines such as computer science, but also of the self-proclaimed “hard” sciences – with “complexity” appearing to provide the basis for bridging the traditional gap between the “hard” and “soft” sciences. For example, modern biology, based on the discovery of the genetic code in the 1960s, needs the concept of “biocomplexity” to understand the complex network of interactions linking DNA

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4 There are two main approaches to complexity. The first approach, developed by Edgar Morin and Anthony Wilden (among others), is related to the problem of uncertainty in knowledge and to attempts to go beyond the traditional distinction between the subject of knowledge (i.e. the knowing subject or the observer) and the object of knowledge, with all the associated social and ethical implications. The second approach, developed at the Santa Fe Institute in the 1980s, involves using computational tools to model “complex adaptive systems” containing a large number of independent, interrelated and interacting elements and bringing together neighboring disciplines such as physics, chemistry, biology and ecology in a common mathematical framework.

to proteins (not an automatic coding, but involving processes with multiple determinants and trajectories, feedback loops, etc., as shown by the work of Henri Atlan). The immunologist George Klein argued that “from now on biologists will not only have to live with complexity, they will also need to love it”<sup>5</sup>. In other words, biologists will also need to collaborate with other disciplines in order to deal with complexity. Similar developments have taken place in the “new geography”, a field that emerged in the French-speaking world in the 1960s and 1970s. Far from being limited to quantitative methods, the “new geography” has also benefited from the discovery of systemic analysis, which has provided the basis for building new bridges with other disciplines (such as computer science, physics, and ecology), resulting in the increasing contribution of geographers to the goal of information science and complex systems.

Contemporary research is the product of a long historical process marked by *increasing interdisciplinarity*<sup>6</sup>, but also by increasing links between theory, modeling, observation and simulation, between fundamental and applied research, and between research and social practice. While interdisciplinary collaboration has always existed, it is particularly characteristic of the advent of complexity and the generalization of digital tools. As we will see, this explains the highly interdisciplinary nature of the territorial sciences and their organic relationship to social needs and demands.

Let us focus on social issues. Four interrelated developments appear to account for the advent of the idea of a society conceived as an infinitely complex combination of elements. These developments are indicative of four major paradigms.

## **2.2. The new paradigms of complexity**

### *2.2.1 The technical paradigm (accessibility)*

The new technical paradigm is the result of two major developments over recent decades: the mobility revolution (i.e. the mobility of people, goods and information) and the development of digital technology. The digital revolution has had a profound impact on work methods in all sectors of activity. The interoperability of digital information opens up a potentially infinite field of research and action by breaking down traditional barriers and dividing lines, such as the boundaries between different sectors of the economy, between the public and private spheres, between administrators and the administered, between professional and personal life, between production and consumption, between the reception and production of media information, and between art and science.

Interaction has also become a central feature of social production, and accessibility (whether it be access to data, goods, services, territories, well-being, etc.) has emerged as a key characteristic of current practices in a wide range of areas, to such an extent that *accessibility* may

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5 Seminar cited by Henri Atlan (2010).

6 Interdisciplinarity is at the heart of complex systems. For example, Murray Gell-Mann, one of the founders of the Santa Fe Institute, worked at the interface of particle physics and the theory of evolution.

be said to have become a defining feature of modern life. Many recent studies have attempted to demonstrate the changing nature of our space-time. The assumption is that speed has become both the condition of accessibility and one of its limiting factors (along with connectivity). Processes are becoming faster and interactions are multiplying rapidly, resulting in a fragmented succession of “immediacy” – a sign of the triumph of “presentism” (Virilio, 1995). Space is now subject to “generalized mobility” (the *ideology* of generalized mobility, according to Allemand, Ascher and Lévy<sup>7</sup>), a phenomenon that has generated a whole new range of social issues, including the right to mobility, the foundation of a “universal mobility service” (Ascher, 2005). In an effort to regulate “universal mobility”, Thrift (2012) went so far as to ask whether traceability systems (barcodes, SIM cards, RFID technologies, etc.) might lead to a “new world order”. The task of governing the reconfiguration of space-time is left to information processing systems, which have come to play a central role in modern life – a development that Nicholas Negroponte had predicted more than fifteen years ago in his book *Being Digital* (Negroponte, 1995). These systems provide a basis for managing complexity (operational dimension), but also for monitoring (political or policing dimension) and explaining it (cognitive dimension).

### 2.2.2 *The cultural paradigm (innovation)*

The cultural dimension of the new paradigm involves a shift from an architecture of meaning defined by memory and repetition – in other words, a culture defined by the relation to the past – to an architecture defined by creation, i.e. a culture defined by the relation to the future. Jean-Paul Sartre anticipated this shift by positing that “existence precedes essence” (in other words, it is not what or who we are that determines our actions, but rather our projects and actions that define who and what we are). This has been a long and slow process. Marcel Gauchet (1985) traced the roots of the shift to the beginning of the Christian era, and even to a pivotal moment in the history of humanity (the “Axial Age”) – the middle of the first millennium BC. Cornelius Castoriadis (1996) saw the Greek cities of antiquity and Western modernity as the two great historical moments in the self-proclaimed “autonomy” of societies based on the idea that we have the right to be what we make of ourselves, whether individually or collectively. However, it was not until the twentieth century that society defined by its project became the dominant model (at least in the West), despite the resistance of societies based on social status and defined primarily by the past.

Another way of putting this is to say, following Louis Dumont (1983), that the relationships between groups and individuals have shifted toward a greater emphasis on autonomy. The contemporary emphasis on “individualism” places a high value on self-creation (the imperative of autonomy), whereas holism is based on compliance with norms and an emphasis on social order. The transgression of traditional boundaries associated with the emancipation from traditional status positions has emerged as the dominant cultural paradigm of the modern era, a concomitant of the paradigm of accessibility. Transcendental categories (the State, God, the King, the People, Socialism, etc.) have also come under increasing scrutiny in recent times. Whether accepted or rejected, meaning in contemporary society is not a given but a product

<sup>7</sup> See Allemand, Ascher and Lévy (eds.), 2005.

of the transgression of traditional boundaries, social innovation and the rejection of arguments from authority. Today, meaning is a matter of creation rather than transmission<sup>8</sup>.

### 2.2.3 *The economic paradigm (market)*

In the economic sphere, the new paradigm is rooted in the (supposed) triumph of global capitalism and the rule of the market – a system in which goods and services are produced and traded freely to quench the thirst for accumulation and in which growth is seen as the only solution to contemporary problems. We will briefly outline the chief characteristics of this paradigm:

- A product of the rise of neoliberalism following the collapse of socialism after 1989-1991, the “Washington consensus” is based on the premise that the system is optimal and that growth is strongest when “pure and perfect” competition (i.e. diversity of actors and absence of monopoly, product homogeneity, market transparency, free entry and exit, free movement of factors of production) is the dominant and, if possible, globalized paradigm. In this view, competing territories are seen as goods among others.
- The market economy paradigm has become so powerful that it now extends to all aspects of society, with the reification and commodification of human relationships giving birth to the idea of a market *society*.

Many criticisms have been leveled at the new economic paradigm in recent years, particularly since the political shock of 9/11 and the 2008 economic crisis. An alternative vision has yet to emerge, although the rise of emerging economies and regional economic communities may be an indication that a more polycentric and “regional” vision of the world-system is starting to take shape.

### 2.2.4 *The political paradigm (deregulation)*

The current political paradigm sees globalization as a sign of the end of the nation-state, as the contestation of a unique and transcendental normative framework, or even as the contestation of all normative frameworks (or what some see as the revenge of society and the economy on politics, a movement that led to a wave of deregulation in the 1980s and 1990s). The new paradigm represents the revenge of informality on formality, of actors on the system, of civil society on the state, of creativity on control, of horizontality on verticality, and of the individual on structures – a movement indicative of the emergence of “a world order in which solidarity is free from state interference” (Badie, 1995). The idea of a unique nation-state has been superseded by pluralism and, in particular, by the emergence of a plurality of normative frameworks. Today, the assumption is that norms are produced rather than inherited. New rules have emerged, and the constraints they impose are no longer necessarily grounded in or justified by their constitutional origin or basis. Norms

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<sup>8</sup> Following Bruno Latour (1991, 2012), we may question the validity of these claims. The assumption is that the supposed shift is more a matter of discourse. The question that arises is: Have we ever been modern? The paradigm of transgression and self-creation is increasingly contested, and there has been a resurgence of interest in the idea of impossibility and the importance of limits and constraints, whether religious, symbolic or environmental, though not to such an extent as to become the new intellectual paradigm.

and rules are now produced by many bodies, some of which are not always clearly identified (UN institutions, Bretton Woods institutions, European Union, NGOs, unions, firms, etc.). There is also an assumption that norms extend beyond the technical and economic sphere, encompassing ethics, the environment, and society. In some contexts, they may even be said to extend beyond the sphere of regulation (consider, for example, the concept of corporate social responsibility). Though initially defined as incentives, some norms end up having force of law. For example, the OECD makes “Recommendations” that states are urged to incorporate into their legal systems, while the ILO makes “Declarations”, the World Bank issues “Guidelines” and NGOs threaten to “name and shame” companies that fail to comply with codes of conduct and fundamental rights.

### 2.3 The impact of the new paradigms on the importance of territory

The new paradigms have a number of implications for the development of a science of territory.

The first is the *need for unified representations of the social narrative*. The increasing diversity of available reference points (whether symbolic, cultural, identity-related, technical, local, or international) complicates the task of developing a widely applicable frame of reference – i.e. applicable from one individual or group to another. Mobilizing people or a society requires a sufficiently unified representation to serve as a basis for action. Although traditional authorities such as the state or the Church have continued in their efforts to play this unifying role, the onus is now on individuals and social groups to develop their own representation of the world. We suggest that territories may help to give substance and consistency to unified collective representations.

The second implication is the *new relationship between substantive content (truth, justice, etc.) and the tools and methods used to construct such content*. Since every society needs to develop its own narrative, there is an assumption that the way in which the basic materials of its values are arranged and organized matters just as much as their content. What this involves is a shift from teleology to methodology, a shift illustrated by the prevalence of the Rawlsian conception of justice in which the *procedural* transparency and fairness of the conditions of justice count just as much as the substantive content of the Good. This is reflected in the broader changes affecting contemporary societies, which are increasingly defined less by the end than by the means, less by laws than by contracts, less by external foundations than by results and outcomes, less by ideology than by practical realities, and less by rules or principles based on a limited number of axioms than by the processing of large amounts of data<sup>9</sup>.

The third implication is the *changing relationship between knowledge and society*. The society of accessibility and the idea of a project-driven society in which meaning is constructed rather than natural imply the active involvement and participation of all actors. Today, the world of

<sup>9</sup> The generalization of a form of evaluation that replaces a principled-based approach with a consequentialist approach is indicative of the decline of principles in favor of a process of meaning construction through resources and results.

knowledge, science and research involves an increasing number of social actors, and it is becoming increasingly less acceptable to define knowledge as the preserve of experts and technocrats. The paradox is clear for all to see: increasing complexity means that knowledge is increasingly becoming a matter for experts, a trend at odds with “individualism” (i.e. democracy or, following Castoriadis, autonomy) and the emphasis on universal access to knowledge and shared decision-making and target-setting. Hence the emphasis on communicating issues and challenges to the widest possible audience. Hence also the emphasis on the tools used to represent knowledge and to visualize data, information and debates. Alongside political democracy, the emphasis on “technical democracy” or “participatory democracy” implies promoting transparency over opacity in a world subject to constant change and innovation. Transparent *procedures* must involve new actors to define common policies. The point is not only to promote “participatory democracy” but to encourage the co-construction of frames of reference by diverse actors in order to combat the process of “dual delegation” separating experts from laymen and citizens from their institutional representatives.

#### **2.4. The debate over the disappearance of territories**

At first sight, none of these developments appear to be favorable to territories. Indeed, the mobility revolution, ubiquity and digital interoperability are often thought to be indicative of the end of geography, particularly for those who have come to be known as “digital natives”. Here, the assumption is that a society based on individualism reduces territorialized society to a historical relic that will only last as long as the nation-state or the city are able to resist a form of spatial organization defined by “inter” and “trans” paradigms (interurban, transnational, network-based, etc.). The territory of the nation is assumed to be a declining framework, a trend associated with the emergence of a new generation of citizens intent on inventing the present on a global scene. There is also an assumption that the market economy is based on (and indeed requires) the free circulation of production factors. In other words, any producer or consumer, wherever they may be in the world, should ideally have access to these factors since the global circulation of production factors ensures their optimal use.

Finally, the new means of communication are assumed to provide a basis for the emergence of groups of actors organized not on a territorial basis (in the sense of being delimited) but on the basis of variable geometry. Here, the territory is viewed simply as a contingent support tool, with actors requiring it to have *generic* qualities to ensure accessibility (consider the generalization of the equipment and resources of territories as communication networks, the convergence of architectural and town-planning models throughout the world, the growing success of the globalized circulation of brands not tied to particular areas or terroirs in agribusiness, etc.). Broadly speaking, the effect of the dematerialization of social activities (consider the rise of the intellectual functions of conception, design and organization at the expense of production functions, but also the role of ICT and remote control systems) is to “deteritorialize” human activities. There is an assumption that networks have become the dominant organizational model, while space has come to be viewed as a mere support tool or as an obsolete framework. Notwithstanding their naivety, and despite all the evidence to

the contrary, these prophecies raise interesting questions and provide a basis for enriching our conceptual frameworks by combining the concepts of network, space and territory more productively (Jessop et al., 2008).

The long-standing “network versus territory” debate has challenged the assumed superiority of the former over the latter. The first argument against this view is descriptive and posits that, while networks may undermine or destroy territories built on the principle of spatial contiguity (e.g. countries), they have not replaced them. The assumption here is that networks have always existed and it will take a lot to kill off a form of national organization that the economy of the twentieth century has done so much to promote and consolidate. Second, the critique of the violence and oppression associated with nation-state governance and territorial borders no longer holds true. The idea of power as land-based only applied in an era in which wealth was property. Since then, the theory and reality of property and ownership have changed radically. Today, property is inherently mobile and movable and financial flows have emerged as the new instrument of domination. There are also growing calls for greater protection against their power. Lastly, as Pierre Hassner (1996) argued in response to Bertrand Badie: “we can imagine a world dominated by networks. However, it is difficult to see how they might produce a balance between affective identification and functional efficiency in which the conflicting needs of the soul and human society are met”. Badie cites the example of the vitality of the Chinese diaspora in Eastern Asia, a diaspora that supposedly transcends traditional boundaries and frontiers<sup>10</sup>. However, it is important not to forget that the Chinese diaspora has built its system of mutual trust on, and in their name of, their national community of origin.

Recent studies have shown that networks and territories are complementary systems, focusing in particular on how networks generate (i.e. delineate) new territories (see the recent work of the LATTs and Géographie-cités research centers on the links between networks and territories). This applies at local, national and international levels. For example, the Euro-Mediterranean region, if it were ever to become a reality, will probably be largely based on energy networks (specifically, gas and electricity). Fundamentally, the interaction between networks and territories serves to redefine the concept of scale. It may even serve as the matrix of an overarching “vision”, just as the railway was for the Saint-Simonians in the “Mediterranean system” (Le Chevallier, 1832).

## 2.5. A territorial interpretive framework

In 2001, Rogério Haesbaert attacked “the myth of deterritorialization”, warning against the tendency to rely on convenient slogans and formulas (such as “the annihilation of space by time”) that construe territories as obstacles to progress and mobility. Rather than deterritorialization, Haesbaert argues that we should speak of “multi-territorialization”, suggesting the

<sup>10</sup> “The sinicized world is increasingly characterized by all kinds of cross-border mobility in which financial flows, migration flows and cultural flows describe circles of exchange that transcend national spaces” (Badie, op. cit.).

possibility of constantly reconstructing our territory by experimenting with different territories at the same time. This possibility has always existed, though never in the contemporary era.

Karl Polanyi (1983) was the first to challenge the idea of an economy that can be modeled and viewed in “isolation” from society. The assumption is that it is impossible to isolate the flow of production factors from the concrete conditions of their production and, in particular, from the specific institutional arrangements of particular societies. The concept of territory provides a good approximation of the specific historical, cultural, political, legal and biophysical interaction process through which a society or an individual are integrated into the market. International relations specialists say much the same thing in arguing that the realist paradigm (based on pure power relations between states) remains a fundamental framework of interpretation, though it may also need to consider other actors of international relations operating at a national level (for example, global cities) or supranational level (for example, diasporas, NGOs, and multinational firms).

There are a number of arguments against the supposed disappearance of territories. The implications of the new paradigms – i.e. the need for unified representations of social narratives, the new relationships between substantive content and the tools needed to develop such content, and the changing relationship between knowledge and society – have created a need for rootedness (both theoretical and practical) that territories are capable of fulfilling. Far from being mere support structures, territories need to be seen as operational tools for developing common references and shared content, as common frameworks for action, and as forms of inter-intelligibility enabling communication between (and the translation of) diverse academic and social languages. The equivalent of the concept of territory in IT is the operating system enabling the integration of several software programs.

## 2.6. The ambitions of the CIST

The purpose of the founding conference of the CIST was to challenge the idea that territories have been rendered obsolete by the paradigms of accessibility, the free circulation of production factors and the transgression of boundaries, but also to argue that territories provide a useful framework for interpreting and understanding the changes implied by these new paradigms. In the new framework, territories are assumed to have the following properties:

- *Delimitation* (a concept defined as a gradual process and that raises the questions of thresholds, border effects and internal-external relations) is the expression of the obstacle to hypermobility and accessibility; this obstacle may be specific to particular phenomena (effect of distance on diffusion – for example, the spread of seeds or the dispersion of radioactive material); it may also take different forms in different social groups (easy accessibility for some, limited accessibility for others).
- Whether local or involving different levels or scales, *interactions* come from the forms of access made possible by territories; modern territories can be a real factor of production (see

the concept of organizational performance applied by Pierre Veltz<sup>11</sup> to territories). We noted above that the capacity of territories to articulate and combine different levels and scales was at the heart of the relationship between “area” and “network”.

– The *materiality* or *specificity of place* refers to the absolute (biological, physical or social) properties of a territory that will reduce the need to describe or model it based on common quantitative criteria (Sassen, 2006). Territories with exceptional physical properties are a good example; hence the difficulty of explaining concrete space in mathematical economics. This concretion has an important *temporal* dimension. To paraphrase Marcel Roncayolo (Chesneau and Roncayolo, 2011), territories are a form of “consolidated time”, meaning that they resist a definition of society as the sum of all possible combinations (i.e. society defined by its vision or project) and remind us of the importance of memory and heritage (see the cultural tradition and its degree of resistance to external influence; see also the questionable notion of “civilizational area”). According to Veltz (op. cit.), territories are the “complex sugars” of growth and development, a way of resisting the tyranny of short-termism and of promoting a long-term view of development. It is not that territories are forever beyond acculturation or that they cannot behave like any other territory. Rather, the point is that interaction is necessarily relative to its constituent physical and social elements<sup>12</sup>.

The three properties (delimitation, interactions, specificity) are not specific to territories. The peculiarity of territories is that they are characterized by these properties and by those that result from the interactions between them, as shown by the notions of “environment” (generated by the materiality and interactions of places) and “localization” (delimitations and the materiality of places). The resulting whole can be described as “territoriality”.

“Territorialization” involves another set of qualities or properties:

– *Representation* refers to the capacity of a territory to form a social narrative. The specificity of territories and the effect of their interactions (expressed in the landscape or in the local culture) make them particularly well-suited to this role. This may be at a local, regional or national level – recall, for example, that the universal political figure of modernity, the nation-state, was formed on a territorial basis; it may also be at the level of large regions (“Europe”, etc.). Whether individual or collective, unique or shared, agreed-upon or not, the representation of territory generates expressions ranging from a mobilization of the territory as an identity referent to sometimes violent demands at the root of conflicts.

– The *allocation* of resources, activities and responsibilities largely involves a territorial approach and perspective. Most major bodies and authorities (firms, the state, churches, international organizations, etc.) rely on a territorial strategy. The allocation of their resources contributes to constructing or characterizing territories.

– Finally, there is the question of *mobilization*. Mobilization implies a unified representation of the social narrative and a sufficiently coherent material basis for action. The greater

<sup>11</sup> See Veltz (2005).

<sup>12</sup> Are we seeing the return of Vidal de la Blache, the founder of the *Annales de géographie* in the late nineteenth century? Vidal de la Blache studied the physical-social interactions characterizing the different regions of France based on what might be termed the “natural science of lifestyles”.

the complexity of processes and the greater the diversity of actions, the greater the utility of relying on territories. Consider the following example: in order to cope with the inherent uncertainty of globalization, firms need to be locally, nationally or regionally embedded to allow for some degree of predictability and to ensure actual or potential access to scarce resources (training systems, technological competencies, relations of trust in the area of credit, etc., hence the constant dialectic of the deterritorialization and reterritorialization of firms).

Navigating between representation and mobilization, territories remain the main source or basis of legitimacy. The assumption is that territories enable contact with populations and provide a basis for understanding, decision making and action. Pierre Hassner (op. cit.) is right to say that Facebook networks have limitations. Every social activity can have its own regulatory framework and scale. But *policy-making – the domain of arbitration – requires a common denominator – a role that territories can potentially perform*. Territories are local and, above all, national. The assumption is that the national is not the sum of local territories since some matters are only relevant or applicable at a national level (see the work of Laurent Davezies<sup>13</sup> on the geography of public finance, the broadest level for addressing the needs of the population and as yet the only real form of political legitimacy<sup>14</sup>). At a higher level (e.g. Europe), and even more so at a global level, the question that arises is the nature and basis of legitimacy (see the criticisms leveled by Pierre Rosanvallon at the limits of the technocratic management of globalization and the lack of legitimacy of EU bodies). The debates surrounding global governance reform have focused on the shift from the G8 to the G20 and, according to the Stiglitz report on global financial governance, on the need for a “G192” (i.e. the UN), but also on the shift from nations to regions (European Union, Mercosur, etc.) in the domain of representation in international organizations (e.g. Bretton Woods). In any case, it is clear that the discussion of legitimacy is largely grounded in territorial units and levels.

Because of these qualities and properties, territories may be said to provide a useful interpretive framework for the study of complexity. We suggest that territories form a *tangible sign* that can inform both research and practice.

### **3. THE TERRITORIAL SCIENCES: A DISCIPLINE, AN INTERDISCIPLINARY FIELD, A FORM OF KNOWLEDGE OR A MULTIDISCIPLINARY SUBJECT?**

#### **3.1. At the crossroads of ‘territoriality’ and ‘territorialization’**

Two observations need to be made to understand the difference between “territoriality” and “territorialization”. First, territoriality refers to a cross-sectional situation at time  $t$ , while territorialization implies a longitudinal perspective. The point is not to distinguish between “objective” and “subjective” (or “instinctive” and “strategic”) dimensions. Brighenti (2010) reminds us

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<sup>13</sup> Davezies, 2008.

<sup>14</sup> Rereading Foucault, Brighenti (2010) argued that the sovereignty-governance pair is territorial *par excellence*.

that a science of territory cannot be based on the juxtaposition of a “deterministic” biological or ethological approach and a sociological “constructivist” approach<sup>15</sup>. In other words, territories have both a functional dimension and a symbolic dimension involving perceptions and representations, and the two dimensions interact. Consider, for example, the “delimitation” property, which lends itself to an analysis of territorialization (representation, strategy, mobilization, etc.). The issue is to know who determines the delimitation of a territory, but also why and how they do it.

### 3.2. Material and immaterial territories

Second, the qualities and properties described above (accessibility and delimitation, interactions and the perception of interactions, representation, legitimacy and mobilization of actors) are also characteristic of virtual spaces, thus opening new perspectives for the combined analysis of “material” and “immaterial” territories based on their interactions rather than their juxtaposition. The notion of “augmented reality”, based on the approach developed by McLuhan (1964), is a good metaphor for the links between the two types of territories. However, in order to understand cyberspace, and in particular the relationship between cyberspace and material territories, we will need to consider the claim that “since the ocean of information is constantly reinventing itself and was neither planned nor intended by anyone, it would be pointless to look for a beautiful Cartesian structure or even to attempt to map it” (Godefredi, 2011).

### 3.3. Objects and interdisciplinarity

The broad perspective taken in this book encompasses a wide range of disciplines. The assumption is that the disciplines that involve the study of space (e.g. geography and geopolitics, environmental science, spatial planning, urban development and architecture, urban history and urban sociology, urban and regional economics, and the study and practice of development) make a major contribution to our understanding of territories. This new field will also be of interest to researchers in other social sciences, including demography, the sociology of public policy, institutional economics, environmental law and international law, but also the natural sciences (hydrology and geology), the life sciences (biology, agronomy, health, etc.) and engineering science (geomatics, statistical modeling, complex systems).

The territorial perspective has the potential to provide insights into a wide range of multidisciplinary subjects. To date, the Scientific Council of the CIST has identified the following areas:

- The relationship between the individual and the collective (identity questions; individualization of practices and social fragmentation; policies against social inequality among populations and/or territories, etc.);

<sup>15</sup> To use the term employed by many authors, notably historians, who have tended to interpret identity questions as politically and socially constructed processes; see, for example, Anderson (1983), Hobsbawm and Ranger (1983), Le Bras (1997), and Thiesse (1999).

- The new norms and regulations generated by globalization (the new role of the state and the proliferation of producers of norms and standards; the increasing obsolescence of national regulations as a result of the emergence of local and transnational frameworks; common goods and multi-actor governance, etc.);
- Trends and discontinuities in social, physical or biological events (risks and vulnerabilities; security, sustainability and resilience; policies for crisis prevention and management policies; need for long-term planning with the increasing pace of social practices, etc.).

### 3.4. Mere knowledge...

The object and interdisciplinarity of the territorial sciences will depend on how we define the field – i.e. as a form of scientific (or academic) knowledge or as an emerging discipline. If we define the territorial sciences as scientific knowledge, the assumption will be that the combined resources of a range of disciplines are needed to understand the territoriality, or territorial dimension, of their objects of study. The aim is to focus on the conceptual approach to the term “territory” in order to highlight potential variations or differences between different disciplines, the assumption being that the study of space in different fields needs to be based on similar methods (i.e. criteria for delimiting space, the measurement of interactions, the role of territories in social representations, the degree of consistency between functional and institutional spaces, and the spatial analysis of resource allocation, among other things). In this sense, it may be more accurate to speak of the “science of *territories*”, or even simply a *methodology*, since the assumption is that territories serve to reveal multidisciplinary issues involving other disciplines beyond the field.

More modestly, we might even argue that the spatial turn is primarily a sign of advances in fields (such as history, economics, political science, biology, agronomy or climatology) that examine the question of territory viewed *simply as a multidisciplinary subject*. If the notion of territory is so “fashionable”, it is perhaps because the mobility revolution, the increasing pressure of human production on the biosphere and the challenges to the traditional geographical frameworks of the nation-state pose unprecedented challenges. In other words, is it simply that the “territorial sciences” refer to a *diverse set of territorial problems* facing societies and established disciplines? In this view, the spatial turn might be seen as evidence of the capacity of different disciplines to address territorial questions rather than as a demonstration of the relevance of an autonomous field of “territorial science”. To put it another way: “Territoriology should be developed in an open field, through problems rather than through a discipline” (Brighenti, op. cit.).

### 3.5. ... or an autonomous academic discipline?

If we take the view that the concept of territory can be the object of an autonomous discipline, the key concepts, principles and methods of the field will need to be defined. Here, the assumption is that researchers with an interest in territorial issues will need to focus on

the territory itself rather than broader issues such as the relationship between the individual and the collective. To put it another way, researchers will need to view these broader issues as providing an opportunity to improve our understanding of territory as a research object. Based on the hypothetico-deductive method, the resulting laws will serve to highlight general empirical patterns showing how territories function, but also to demonstrate the diversity of territories based on the analysis of deviations from these patterns. The new field will also need to resist the twin temptations of exceptionalism (i.e. all territories are different and no general proposition can be formulated about them) and determinism (i.e. a unique principle governs how territories function, regardless of time and place). In any event, it would be absurd to build a science along these lines solely on the basis of the concept of territory and without seeking to combine it, at the very least, with concepts such as space, network and scale – even at the risk of finding out that the science of territory is nothing more than a new name for a rebuilt geography.

As we know, the history of disciplines is marked by the disappearance or relegation of some fields (e.g. philology or classical studies) and by the emergence of new disciplines (IT, communication, etc.). There is a case for arguing that the importance of territorial issues justify the development of a new discipline specifically devoted to the study of territories.

A less ambitious option would be to approach the “science of territories” as an interdisciplinary field. Many new fields are emerging at the margins of several disciplines, a process that has produced new reference disciplines (biochemistry, astrophysics, etc.) and new research areas covering several disciplines (e.g. cognitive science) based, for example, on powerful new methods of investigation replacing traditional frameworks and approaches<sup>16</sup>. The challenge is to ensure the coherence and consistency of the new field and to develop strong links between disciplines beyond simple analogies or metaphors<sup>17</sup>.

Planning is a good case as a simultaneously interdisciplinary and professional field. Rather than emerging from new research questions, the field of planning emerged as a result of the interest of *professional* practitioners (i.e. property developers, land developers, hauliers and transport specialists, and local authorities, among others) in research conducted in a range of disciplines. The internalization of their practices as part of a new hybrid field with academic and professional aspirations provides a basis for explaining the transformation of territories by these professionals and facilitates the interaction between research and social demand. The fact that, faced with the paradigm of hyper accessibility, distance is a hindrance, a constraint and sometimes an opportunity (attractiveness of territories, pioneer frontiers, etc.) makes territories a fundamental *practical* issue, thus justifying the existence of a hybrid

<sup>16</sup> “A new field of investigation, hitherto separated by the division of academic labor and its disciplinary institutionalization, gradually emerges from the development and study of unsolved problems or unexpected findings made possible by advances in theory, methodology and technical procedures for experimentation and verification.” (Turmel, 1985).

<sup>17</sup> The experience of other interdisciplinary fields or countries in the area of the territorial sciences (for example, the Center for spatially integrated social science at the University of California, Santa Barbara) was a key focus of the conference.

field such as planning. Is it not true to say that such hybridization is characteristic of all the territorial sciences?

### 3.6. The importance of social demand and the role of territorial information

Whatever the case (scientific knowledge or field, even scientific discipline), the connection with social demand and professional practice is a major characteristic of territorial sciences<sup>18</sup>, given the issues that connect territories to those involved in their transformation. *The assumption is that territories are an important meeting point with social demand, and therefore with policy-making and action.* Therefore, the task of the territorial sciences is to articulate and address territorial issues and to provide tools to promote public debate and support decision-making.

This is one of the reasons why *territorial information* – a necessity for the production of such tools – *is also a central focus of the territorial sciences*. Rather than territorial “data”, it is more accurate to speak of information produced and organized on a territorial basis or, to use a more fashionable term, territorial ontologies. The conceptualization of territorial information is a central aspect of the formulation of theories and implies a clear distinction between hypotheses and their validation. Not unlike social categories, political and administrative divisions are both a condition for the study of reality and a dimension of this reality requiring analysis. More generally, the new geolocalized information systems (such as GPS) need to be theorized before any practical use can be made of them. Digitization allows for data interoperability, just as integrated data analysis serves to highlight contemporary forms of spatial organization (network architecture, new roles of metropolitan hubs, spatialization of social practices, etc.). However, territorial information will only promote the “integrating” function of territories if it is viewed as an object of critical inquiry and reflection.

## CONCLUSION

It seems reasonable to suggest that the answer to the question as to whether territorial sciences form a science, an interdisciplinary field or mere knowledge will emerge from empirical, methodological and theoretical research on territorial information. If it transpires that research on the concepts, sources, methods, uses and promotion of territorial information define the heart of the new science and determine its relationship with other disciplines, we may arrive at some form of disciplinary autonomy (i.e. “the science of territory” or “the territorial sciences”). However, if the results of research were to be limited to the development of protocols for processing territorial data applicable across several disciplines, territorial sciences would be nothing more than a form of knowledge.

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<sup>18</sup> Until the results of the conference become available, we will continue to use this term (i.e. sciences in the plural) to refer to the object of CIST research.

Table 1. Foreseen answers of the conference over the scientific status of territorial sciences

Academic status	Name or label	Content	Territorial information	Social demand
Multidisciplinary subject	"Territory"	Territory as a research topic in an increasing number of disciplines	Wide diversity (even disorder) of sources and methods of analysis	Contingent
Knowledge	"Territorial sciences"	Methodology of territorial analysis applicable to several disciplines	Research aimed at ensuring comparability of sources, concepts and methods	Incorporated into the formulation of research questions
Interdisciplinary field	"The science of territories"	New field of research at the crossroads of several disciplines	Compatibility of sources, concepts and methods; significant emphasis on visualization tools	Integral component of research
Academic discipline	"The science of territory"	New autonomous discipline positing the scientificity of the object "territory"	IT is at the heart of the discipline and provides a basis for building links with other disciplines and for meeting social needs	Integral component of research

Our conclusions on the above considerations leave us somewhat perplexed. This text ultimately triggers a thinking process that is currently under way and is set to open up perspectives and respond to the contemporary challenges that new scientific paradigms attempt to tackle and resolve. We have observed how all scientific disciplines have been affected by the spatial turn. But this is only the start of the story. Theoretical paradigms and the reality of "social cohesion" have collided to form a new configuration made up of science and democracy in a bifurcating world characterized by increasingly vague contours. As researchers, teachers and citizens, we are shaped and surrounded by these changes. The dough kneaded here is only a vague indication of the definitive form of the bread that will eventually emerge from the oven. The secret alchemy of the fermentation process has only produced soft shapes whose richness comes from their future. To extend the metaphor, we might say that the ambition of the CIST is to be the leavening agent that will allow for the emergence of a science of territories.

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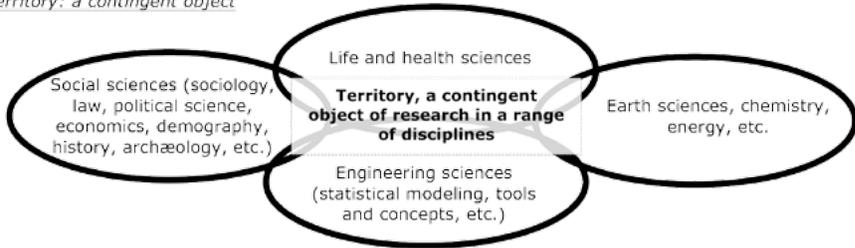
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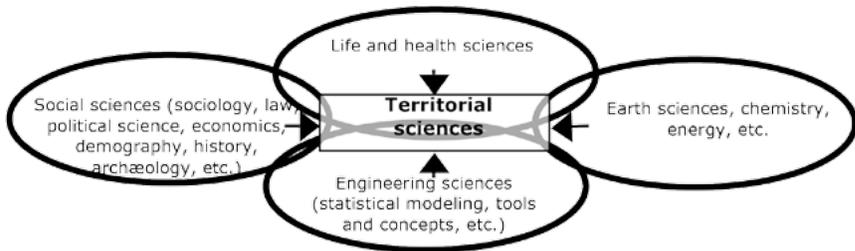
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**APPENDIX:  
POSSIBLE SCIENTIFIC POSITIONING OF THE TERRITORIAL SCIENCES**

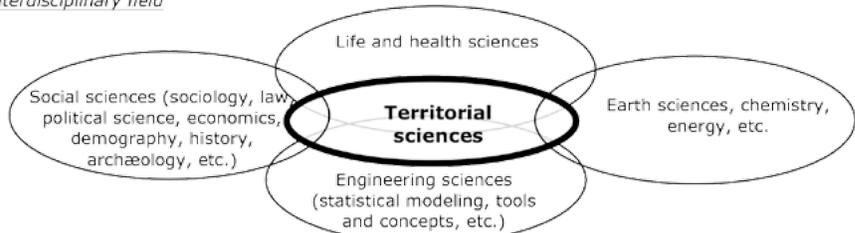
*Territory: a contingent object*



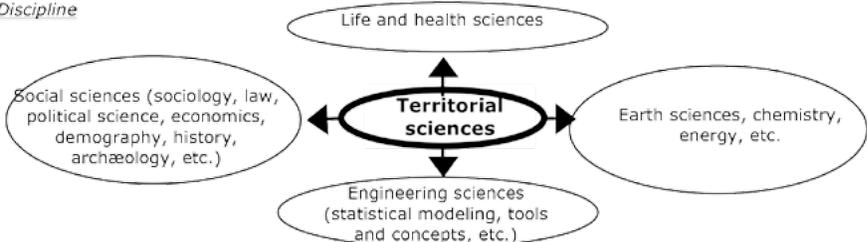
*Scientific knowledge*



*Interdisciplinary field*



*Discipline*





PART 1  
**The international scientific  
debate on territory**



**1.1**

**Space vs. place**

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CHAPTER 1  
**Territoriality: a tension at the heart of  
territorial contradictions**

Guy DI MÉO

As a result of developments over the past three decades, the term “territory” has become a part of our everyday language. The concept owes its popularity to the fact that it has come to mean something more than the legitimate boundaries of nation-states and their administrative divisions. The concept first gained legitimacy in public life as a result of the increasing emphasis on territory and territorial structures in politics. It is in this sense that the term has enjoyed a new lease of life. The result has been the emergence of new objects, particularly in France, where the increased emphasis on decentralization and spatial reconfigurations (i.e. communities of communes and cities, regional natural parks and areas, departments and regions endowed with new powers, etc.) has had a significant impact in recent years. However, while political and administrative power has become increasingly territorialized under new spatial conditions, the popularity of the term has also spread beyond the political sphere. The economy, associations, the media, marketing, planning and development – in short, many areas of social and public life, communication, and activism – have become increasingly territorialized, but also increasingly keen to promote their territoriality. These developments raise a number of questions: Was the aim, as has often been said, to build more effective structures and organizations that take account of spatial data and the potential resources of territories, including both material resources (goods, heritage, know-how and skills) and conceptual resources (identities and memories, environmental amenities, etc.)? Or was the aim of these institutions to strengthen their identification for internal purposes (i.e. increased use and involvement of staff and other resources) or to assert their presence in the markets in order to attract a new generation of customers increasingly aware of *terroirs* and of the importance of the origin of products and associated distribution circuits? It seems likely that both factors played a part. Some have interpreted these developments as a response to the homogenizing effects of globalization, while others have seen them as a sign

of the end of Fordism, signaling the emergence of forms of production that are simultaneously international (markets and production systems) and present in local/regional networks. Here, the assumption is that united societies provide a competent, flexible and productive workforce capable of adapting to volatile markets and their products, but also to the constant need for innovation in these markets.

While the notion of territory has become increasingly common in political discourse, social science researchers, particularly in geography, remain skeptical in the face of what they see as a politically dangerous idea – dangerous insofar as it generates conflicts by stigmatizing difference. Because of the image of rootedness it implies, the traditional conception of territory is also ill-adapted to the increase in population mobility. In the 1990s, a number of studies predicted the “end of territories” (see *La fin des territoires* by Badie, 1995) or examined the “aporias” of the concept of territory (or “ses apories”, as noted by Lévy, 1993). The concept has also come under fire in more recent research. For example, a volume entitled *Territoires, territorialités, territorialisation. Controverses et perspectives*, edited by Martin Vanier and published in 2009, opposes two groups: on the one hand, the advocates of the “*paradigme augmenté*” who “continue to see [territory] as a major explanatory factor” in political and social action, even at the risk of exaggerating its importance, and, on the other, the defenders of the “*paradigme débordé*”, who seem intent on undermining the TTT trilogy (territory, territoriality, territorialization) once and for all. The latter see territory as the root of all evil – as signifying an infringement of freedom and the free movement of persons, as an instrument of capitalism, neo-colonialism and tyranny, as an economic non-sequitur, as a cause of unnecessary spending, as a social and cultural aberration, and as a major obstacle to humanism and the brotherhood of peoples.

However, it is important to note that one of the main objections to the notion of “territory” involves a narrow and exclusive focus on the political dimension of the concept, as if a territory were attached to the land and confined to a finite and closed space, while also implying that the political territory governs and even entirely determines people’s lives, their spatialities and their representations. There are several problems here. The first is that other types of territories also govern and structure our daily lives. Some territories, like political territories, are based on a perfect grid or mesh-like structure governed by the proximity, continuity and contiguity of the places that compose it, a structure illustrated by the *appellations d’origine* of agricultural products or by technological centers (or poles) and centers of excellence located around urban areas. By contrast, other territories, such as centers of industry or service activities, may be said to form networks or even rhizomes. From a linguistic or religious point of view, the distribution of speakers or believers will be based on one or the other of these models.

We may note that territories that specialize in a particular sector of activity or that are defined by a particular cultural characteristic rarely overlap with the territorial entities formed by administrative and political divisions. While the spatial frameworks in which individuals operate are shaped around the territorial environments and political and ideological contexts governing

our lives, they are also produced by, from and with these life spaces. In this sense, there also needs to be an emphasis on economic, cultural and existential territories (among many other types of territories). The assumption is that spatial forms, structures and regimes also reflect imaginary spaces that are beyond objective control and analysis. Some of these forms and regimes involve virtual spaces and “hyperspaces” (e.g. the Internet, video games, news channels and the media generally). These territories involve specific spatial arrangements (i.e. networks of places and territories) in the form of archipelagos of connected islands linking, say, work time (12% of the average time of every French person) and leisure time (88% of their time). The sociologist Jean Viard emphasized the “figure” of the home in this dialogue, noting <sup>1</sup> that “our homes are at the heart of our real and virtual social networks”, to the point that they “must provide access to nature, in particular air, sun, and the outdoors”. Along with other factors, homes may be said to articulate (i.e. to shape and govern) the various forms of our spatial and territorial relations.

The various combinations and configurations of territorial relations are the result of these inevitable, permanent and constantly renewed interactions. It is in this way that individuals are able to shape and mould their relationship to space (through their homes, but also through more complex forms of cognitive synthesis), in line with their practices, experiences and representations.

The purpose of the following pages is to examine this question in more detail. After a brief overview of the political origins of collectively and individually identified territories, I will show that territories are, more generally, the product and crucible of social action. A distinction will be made between objective and objectified territories on the one hand and the life spaces and experiences of social agents and actors on the other. I will then examine the subject-object tension linking the practices and representations of our experience and imagination to the normalized universes of the territories of power and action. This tension will be referred to as “territoriality”.

## **1. TERRITORY: A SPACE OF POWER AND A POLITICAL SPACE**

In one sense, a territory inscribes the organization of power (primarily political power) governing society on the geographical space carved out by actors. In the same way as the population of a nation, but with even greater force, a territory confers upon a state and a country the materiality of a body through symbolic cartographic representations of the spaces that form it. For example, at a national level, a territory is the sign of the power of the state over the land – a land confined within national borders defined and managed by the state. At the level of communes, departments and regions (in the case of France), a territory may be said to embody and represent the local and regional subvarieties of the national territorial architecture. At local (communal, departmental and regional) levels, every territorial network has a name, whether ancient or more recent (consider the case of the districts created in the last decades based on the concept of *pays* defined by the Loi Voynet or the communities of communes and communities of cities)

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1 Working document by Jean Viard dated April 2012, designed as a contribution to the project “*La communauté urbaine de Bordeaux : 55 000 hectares de nature*”.

and reflecting past names to a greater or lesser extent, such as the provinces and countries of the *Ancien Régime*. Whether historical or contemporary, past or present, the names of territories create difference, distinction and identity, producing symbolic distance and separation and shaping the socio-political fragmentation of space.

In another sense, the concept of territory involves a more naturalistic or even ethological interpretation of the division of geographical space. Ethology is the study of animal behavior, including spatial behavior. In this view, the concept of territory is defined as “a vital space that an animal or group of animals defends as its exclusive property” (Ardrey, 1967). The ethological definition of territory provides a basis for exploring the origins of a territory viewed as a space shaping power relations in society. The assumption is that a territory is the result of an act of violence. In other words, a territory is seen as a mapped (i.e. charted and demarcated) and appropriated space that is subject to social control, i.e. political and economic power, but also ideological power (consider, for example, the foundations of the right to occupy and cultivate the land, for and by a given social aggregate) over the various resources contained within it. Based on functionalist grounds, the standard justification for the practice of coercive territorialization is the survival and reproduction of the dominant group. However, beneath the expression of this vital force (see, for example, the ancient Germanic conception of territory and borders, both regionalized and mobile), there are also more sinister forces at work involving belligerent tendencies and the idea of the exclusion of the other also implied by the notion of territory. The risk of exclusion was highlighted by Brunet (1990), who argued that “to claim an identity on a territorial basis eventually amounts to excluding the other”.

A political territory may thus serve as an instrument of exclusion, but it can also be an instrument of domination and segregation. In this sense, a territory has the potential to generate social tensions. However, it is important not to overstate the predatory dimension of territories. The law is not necessarily an instrument of domination, hegemony and exclusion. Neither is it simply an expression of a will to power. Conceived, designed and governed by a democracy, a territory can also have generous and altruistic ambitions, such as the promotion of integration and social diversity, citizenship, justice, solidarity, collaboration and cooperation. In this sense, a territory may also be seen as the generating mechanism of the social contract.

At any rate, whether conceived as an expression of tyranny or democracy, the political dimension shapes and informs the actions of any territory.

## **2. TERRITORY: A SPACE ARTICULATING SYSTEMS OF ACTION**

In any space conceived as a system, whether territorialized or not, actors and agents produce organizations (with economic, cultural or social goals) that generate collective action associated with private interests. These interests may serve to promote a given system of action and to provide positive feedback on it. However, they may also serve to impede its functioning, thus generating negative feedback.

Many systems of action formed by aggregates of actors (i.e. agents endowed with powers over others) and agents (i.e. mere executants) become spatialized and territorialized. In other words, they turn the geographical space they appropriate (juridically, economically, affectively) into a resource – i.e. the reality and the representation, or, in other words, the very substance, of their action. These are the conditions under which systems of action find a real substance or meaning, that they become more readable, and that pull factors, mobilization and a sense of social and cultural solidarity are able to fully develop. In many cases, it is through their territorialization that systems of action define their mode of governance and perform their systemic function (Auriac, 1983). In addition to their territorialization, systems of action draw on different levels of observation that serve to organize and confront the interventions of endogenous actors (operating from within), exogenous actors (operating from outside) and transitional or interterritorial actors (Di Méo, 1991).

As concrete systems of action, these processes serve to generate social and spatial discontinuities, bifurcations and ruptures which in turn generate territorial fragmentation. This may involve differences and divisions between groups of actors who, within the systems they form, are made to enter into competition or conflict, causing them to divide. Any system of territorialized actors selects and divides its space around key pull factors that serve to define its central objectives. For example, until the early 1980s, the Graves area in the Bordeaux region of France benefited from territorial recognition (as an AOC) and a communal system of professional management (in the form of a federation of wine producers). However, in 1984, following the intervention of a dissident group of more elitist winemakers, the area was divided into two *appellations*, resulting in the creation of a new area of greater fame to the east and south-east of Bordeaux: the prestigious Appellation Pessac-Léognan.

Operating as foci of local action, pull factors are both real and symbolic, both material and ideal. They may take the form of local territorial bodies governed by implicit conventions or by contract-based arrangements. Examples include *terroirs* or agricultural areas endowed with a prestigious *appellation* or areas of major economic importance (e.g. the wine-producing area of the Midi or cereal production in the Beauce region), but also residential areas where local residents seek to control access, landscapes, natural or man-made sites or regional parks (e.g. natural parks) needing protection, centers of excellence in industry and services, or manufacturing areas.

There are also pull factors, spaces or territories that are organized as networks. These tend to operate on a contract basis or through less formal arrangements based on a logic that takes little account of spatial proximity. Examples include the German planning regions and the various urban networks created in recent years in many countries throughout the world. Consider also the case of firms attached to the territorialization of their activities, however fragmented or splintered their territorialization may be in geographical terms (which does not in any way preclude forms of territorialization). This last form of spatial organization is governed by constraints related to the management of skilled labor pools, the exploitation

of material, intellectual and environmental resources, local cooperation established between firms of all sizes, image and reputation (particularly prestige), and market localization (among other factors).

In short, the territory both shapes and is shaped by flexible spatial forms and regimes. Territorial identifications are constantly having to negotiate with a wide range of geographical gaps and discrepancies – not least those separating the economic spatial order from its political counterpart. Consider the case of the aeronautical industry in southwestern France, a major center of economic activity located in an area covering several departments and regions around the Garonne and the Adour. The discrepancy between political and economic territories has not undermined the sense of territorial identity centered around the cities of Bordeaux and Toulouse, the Grand Sud-Ouest, administrative regions with emerging identities (such as Aquitaine and Midi-Pyrénées), particular *départements*, local areas rooted in social representations (the Béarn, the Basque Country, the Chalosse, etc.), and small and medium-sized towns. What we are faced with is the mystery of representational unity in diversity: how can we introduce order into this chaos?

A territory is not in any sense a strictly political reality, at least not in the public and institutional sense of the term. In order for it to be collectively perceived, appropriated and shared, and in order for it to be incorporated by the agents and actors who define it as an issue or focus of debate, other factors besides the political dimension need to come between humans and geographical space. A territory is as much a political reality as it is a social and cultural reality. In other words, a territory is a shared experience, an experienced reality, a representation and a collective identity.

### 3. THE EXPERIENCE OF TERRITORY

The territories of our experience are to a large extent the territories of our daily lives. Often more virtual than real, they are formed by the places of our experience and steeped in our routines and affects. The territories of our experience are linked by a greater or lesser degree of geographical continuity, depending on the intensity of the practices we develop and our movements between the different places within them. Depending on the level of mobility and our means of transport, the territories that shape and govern our life spaces can become stretched and frayed. In such cases, there is a possibility that the contiguity of the sites and places that form them may collapse, creating a discontinuous territorial network, a familiar network with elements separated by known or unknown interstices and detected or undetected flows.

We often identify with these spaces, though identification will be more difficult if their unity is not self-evident. The practices and representations that shape our engagement with everyday spaces (our work environment, our home, etc.) generate autonomous entities centered around the main areas and places of life, memory and projection. The result is, at best, a sense of plural territorial identity, a common experience for many people today. We

often seek to relate the territories objectified by institutions or by political or economic organizations to our experience. I once conducted a study on territorial representations among a sample of local residents in Gironde, between the Garonne and the Dordogne, in the area known as the Entre-Deux-Mers. While most of the participants identified themselves as residents of the Entre-Deux-Mers, they also had a tendency to appropriate the name of their territory to the point of construing it in terms of the familiar sphere of their common and ordinary (i.e. everyday) movements. Similarly, at the “Founding Territorial Sciences” conference held by the CIST in November 2011, I was particularly intrigued by a paper given by Arnaud Brennetot and Sophie de Ruffray entitled “*La Normandie, laboratoire de l’ambiguïté régionale*” in which the authors presented the results of a study conducted on a sample of 82 elected representatives in Normandy. The aim was to examine the participants’ perceptions of the territory in which their regional activities were rooted. The findings showed that the idea of “region” associated by the participants with their actions and activities was related to a greater extent to provincial Normandy (i.e. a broad conception) than to the smaller (i.e. narrower) regional authorities of Upper and Lower Normandy. In addition, while elected representatives in Lower Normandy were found to have a greater tendency to extend their region toward the *Grand Ouest* (Brittany, Pays de la Loire, and Manche) near their area of residence, those in Upper Normandy were more likely to associate their region with neighboring departments bordering their constituencies in the Paris Basin (Picardie and Île-de-France). In terms of representations, the results of this study provide further evidence of the tendency to focus objective territories of reference and belonging (or rootedness) on personal life spaces and sites of action, as in the previous example of the Entre-Deux-Mers Girondin.

This feeling is made more complex by the fact that more abstract territories and places endowed with sometimes mythical significance also play a part in shaping and disrupting our relationship to territories, particularly since the representations we have of them are rooted in our imagination and formed by a blend of dreams and information, of reality and virtuality, informed by the Internet and the media.

The territories of our experience suggest a close relationship between two key terms. On the one hand, there is the personal life of a network, the movements and mobilities that shape and inform it from place to place and from places to territories. But there are also the collective referents of social representations (sometimes community representations), which tend to be more stable and established and which are formed by political territories, such as those examined in the first part of this chapter.

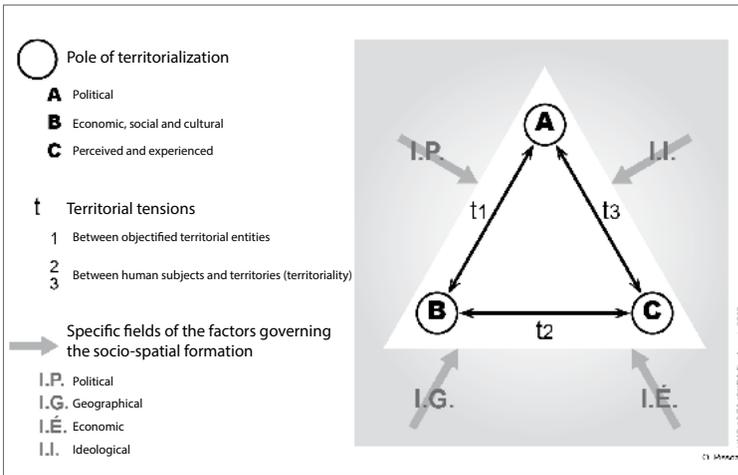
In short, the territory experienced by an individual is the result of an alchemy. It is constructed on the basis of actual (i.e. concrete) experiences that are fed and informed by the practices of life spaces and ordinary, everyday movements. An experienced territory (in the sense of a territory experienced by a subject) acquires further substance through the representations of spaces produced by dreams, the imagination, hyperspace, the Internet and the media. At the risk of deforming or misrepresenting them, it also draws

to it the institutional territories established and imposed by ideological state apparatuses and economic spatial organizations. The experienced territory thus paves the way for territoriality.

#### 4. TERRITORIAL TENSION AND TERRITORIALITY

We need to be more specific about the nature of territoriality. I propose three dimensions of territory.

Figure 1.



The first dimension (A) amounts to assimilating a territory to a political space, or at the very least to a site for the legitimation of political, ideological or economic power. This use of the concept is based on quasi-ethological foundations. In this view, a territory is construed as an exclusive site or locus for the mobilization of material and symbolic resources for a given group or social formation. As a space of control and of the potential exercise of legal violence, the territory serves as an instrument for regulating power relations in a specific (i.e. localized) society. Here, the territory is a key mediator, providing a context for the exercise of governance. However, it is also subject to representations or to distortions, misrepresentations and reappropriations. As shown in Figure 1, there are tensions ( $t_1$  and  $t_3$ ) between, on the one hand, the objectified, decreed and established (i.e. official) form of the territory (A) (or “conceived space”, to use the phrase coined by Lefebvre, 1974) and, on the other, the spaces of systems of action (B) (Lefebvre’s “perceived space”) and experienced spaces (C) (or “represented space”, according to the author of *La production de l'espace*, i.e. spaces endowed with more autonomy and involving less dependence on the subject, actor or agent), which bear little or no resemblance to the objectified territory. In this sense, a territory is also a unique combination of systems of action (B), though it may not necessarily overlap with the forms implied and generated by its political form. Systems of action often pertain to a political order, in the strict sense, but may also deviate from it to

come under the influence of economic or cultural logics. In such cases, systems of action are subject to tension  $t1$ . In the same way as political territories (A), territorialized systems of action (B) also enter into conflict with experienced spaces or territories (C), a process corresponding to tension  $t2$  (see Figure 1).

It remains that the territory is, first and foremost, an experienced relationship (C) with geographical space. The territory of individuals emerges from, and is shaped by, their social life and the social networks in which they participate, but also the representations and perceptions associated with their practices. In this sense, a territory is a kind of mental synthesis, a product of cognition.

Between (A), (B) and (C), there are, in short, various tensions ( $t1$ ,  $t2$ ,  $t3$ ), as shown in Figure 1. Their intensity varies in different individuals ( $t2$  and  $t3$ ) and territories ( $t1$ ,  $t2$  and  $t3$ ). They reveal two levels of socio-spatial reality: on the one hand, the context, involving the realm of collective challenges and determinations (A, B and  $t1$ ), i.e. the pole of contingencies faced by situated individual and collective action, and on the other hand the Web or network of individual motivations and strategies (C,  $t2$  and  $t3$ ). The latter, although they are also a social product, an effect of place or territory, give a central role to the autonomy and competence of actors, if not agents. Finally, individuals' behavior in society and space is governed by both spheres of influence, both energies or forces.

## CONCLUSION

It is this cluster of tensions ( $t2$  and  $t3$ ) that I want to call "territoriality". My contention is that territoriality organizes and structures territories, which operate as networks occupied and appropriated by or simply imagined and referred to by every individual. Territoriality reveals how individuals build their relationship with the spaces they inhabit, perceive and identify with. Figure 1 shows that while individual territoriality involves the interplay of tensions  $t2$  and  $t3$ , a complex territory associates the three poles (A), (B) and (C). The three poles are shaped by the tensions ( $t$ ) of territorialities (the mobilities of which are one of the main component elements), exposing them to the risk of disaggregation. Distinguished by name and by their identity references, territories are organized around an efficient quadripartite structure. In previous research, I discussed the concept of socio-spatial formation (Di Méo, 1991 and 1998; Di Méo and Buléon, 2005). If viewed as a method of territorial analysis based on the tools and techniques of spatial analysis and ethnomethodology, the concept of socio-spatial formation will be seen to be articulated around four basic logics. The geographical logic is a reminder of the need to form a territory with the appropriated geographical space, a space invested with meaning by one or several spatially situated social groups. The economic logic emphasizes the idea of the territory as a system of action. Here, and as part of the territorial contract or convention, the aim is to produce goods and services, to create value, and to tackle the issue of resource scarcity, either by protecting resources or by producing them in a controlled space. As noted above, the political logic is central since it governs the production of territorial rules. Finally, there is the ideological logic, which

involves affects. The ideological logic involves the capacity for collective appropriation, but also the network of values governing the social and collective production of the territory as a real or perceived common good. I suggest that the interplay and coherence/cohesion of the elements of the quadripartite structure or socio-spatial formation determine the solidity of a territory, its capacity to resist the threat of latent dissolution posed by more erratic territorialities governed by the vagaries of movement, by human diversity, and by globalization – in short, by change.

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## CHAPTER 2

# Space and territory: toward integrated concepts

Denise PUMAIN

The “Founding Territorial Sciences” conference organized by the International College of Territorial Sciences provided an ideal opportunity to reflect on the foundations of the emerging science(s) of territory (or territories), a field aimed at bringing together a range of disciplines to build a new interdisciplinary research project. As part of this project, I was invited to speak about the contribution of geography to the conceptualization of space and territory. This chapter presents the results of my recent work in this area. Since a multilingual dictionary or encyclopedia has yet to be published, and since the distinctions between *espace*, *espacio*, *space* and *raum* or *territoire*, *territorio*, place and *gebiet*<sup>1</sup> have yet to be clarified, I will draw on recent French definitions taken from the literature (note, however, that the chapters by Goodchild, Couclelis and Cox in this volume provide useful insights into the meaning and use of space and territory in English). The dictionary of geography by Brunet et al. (1992) draws on geographical practice to define the key concepts of geography and provides an overview of the various meanings and connotations of space and territory. According to Brunet et al., the term “geographical space” has two meanings: “1) an area of land used and developed by societies to ensure their survival (i.e. geographical space in the broad sense); 2) a set or network of places and the relations between them (this definition can be modeled)”. The term “territory” has two closely related meanings: “1) a structure or framework of administrative subdivisions and 2) an appropriated space associated with feelings or an awareness of its appropriation (whether legal, social, affective, or other)”.

A review of recent research suggests that the concepts of space and territory are not always clearly distinguished. As often happens in the social sciences, the use of everyday language to define complex concepts can have the effect of blurring the intent (or “message”) of research. In some cases, terms come to acquire a specific meaning associated with a particular theoretical framework, thereby allowing for the emergence of cumulative theoretical

<sup>1</sup> See *Hypergeo* (multilingual encyclopedia of geography), available at [www.hypergeo.eu](http://www.hypergeo.eu)

research based on periodically revised concepts. However, geographers have tended to use the term “space” to refer to a geographical area or a continuous stretch of land (which may not be clearly defined or delimited as a region, territory or spatial system), thus depriving the concept of its relational dimension. Geographers and researchers in other disciplines are increasingly using the term “territory” in the same conceptually vague sense, likening it to the concept of space in the broad sense defined by Brunet – a concept related to, but not synonymous with, the English term “place” (a term examined by Goodchild in this volume).

Despite these advances, a rigorous scientific approach has yet to be developed. Another factor limiting the construction of shared knowledge is the effect of artificial dichotomies underlying attempts to advocate the use of one or the other term to define the object of geography, variously defined (in French) as “the science of space” (or “spatial science”), “the organization of space”, “spatial analysis” or “territorial science” (Antheaume and Giraut, 2005). This chapter examines recent developments in geographical research, showing how simple models supported by research in a range of disciplines have led to significant advances in our understanding of the concepts of space and territory. The main assumption is that the two concepts are not mutually exclusive, but complementary. In particular, I argue that both concepts need to be further developed to ensure that geography continues to build cumulative knowledge – specifically, theoretical and practical knowledge (*Hypergeo*, s.d.; Pumain, 2009).

In order to ensure that they can be fruitfully used to promote further developments, the concepts of space and territory must be defined using a range of sources and frameworks involving different levels of observation (from the individual to the group, from the local to the global, and so forth) and by drawing on different disciplinary fields and perspectives (from cognitive science to political science, but also environmental science). The challenge is to define the relationships between the concepts and perspectives involved in a geographical theory designed to explain the construction of space and territory at different geographical levels and from a historical perspective. As noted by Couclelis, who integrates “territorial metascience” in the modeling of complex systems, conceptual definitions must incorporate the dynamics of geographical entities, which may involve nonlinear causal relationships (for example, feedback loops). Applied to territoires conceived as objects of “historical science” (Passeron, 1992), conceptual definitions must also be contextualized, i.e. located in time and space (or history) – in short, in a “geohistory” (Grataloup, 2007) – or even in certain classes of processes (if the aim is to apply the concepts to specific issues and cases – for example, to define an economic space or to describe and characterize a network-based territory). It is beyond the scope of this chapter to examine the field as a whole. Instead, we will focus on various milestones in the history of the field.

## 1. TOWARD A RELATIONAL CONCEPT OF SPACE

In the “realist” conception that long dominated geography (Orain, 2004) – a conception that many geographers still subscribe to today – geographical space was (is) simply a “given”, a mere container or framework of human activity. Among laymen, there is an assumption that the history of geography ended when geographers filled in the last remaining “blank space”

on the world map. The term “geolocalization” (a tautological concept related to the increased emphasis on the digital dissemination of basic “geographic” information) is indicative of the “end of geography”, with geographers seeing the data of “outline maps” merely as a prerequisite for analysis (Janelle and Goodchild, 2011). I will use the term “topographical space” to refer to a geometric construction (refined to ensure that a three-dimensional object – i.e. the Earth viewed as an oblate spheroid – can be converted into, or represented as, a two-dimensional map) in current digital representations provided by organizations such as the French National Geographic Institute (IGN) or in positioning systems such as GPS. At a theoretical level, Béguin and Thisse (1979) defined geographical space as a set or network of places in which each place has two coordinates (allowing for distance calculations) and attributes (including possibly a surface area). The problem with Béguin and Thisse’s “axiomatic approach to geographical space” (to quote the title of their paper) is that it fails to go beyond a geometrical representation of geographical space. As a construct, the geometrical representation of geographical space differs from the “realist” conception of space in the sense of an area or stretch of land. However, it is important to note that it does not take into account existing relativistic (Harvey, 1969) and dynamic conceptions (Reymond, 1981) of geographical space.

## 2. GEOGRAPHICAL SPACE: A SOCIAL SCIENCE CONSTRUCT

The “anti-spatialists” of the 1970s and 1980s denounced the “fetishization of space” – in other words, the tendency to view space as an object of research in isolation from social processes (Grataloup, 1996). However, a different picture emerges if we consider the case of spatial analysis (see, for example, Haggett (1973), who posited that geographical entities or configurations are created by the repetition of movements in space), or the work of a theorist such as Bunge (1962) using his methods to highlight social inequalities in the suburbs of Chicago, or even the history of French geography, where the ideological conflict was not between “spatialists” and Marxists so much as between “progressives” and “conservatives” (which explains why “radical geography” never caught on in France; see Orain, 2004; Robic et al., 2006). What these examples show is that the attempt to develop a concept of space rooted in geography was not based on the deliberate exclusion of the social and the political. Rather, the controversy was between those who, like Lévy (1994), argued that there can be no such thing as a specific theory in geography (since geographical space is nothing more than “the spatial projection of societies”) and those who, following Ullmann (1954), defined geography as the science of spatial interaction and who believed that geographical space could be a major object of geographical research.

Based on examples from all areas of social life, traditional spatial analysis has contributed significantly to the idea of geographical space as an entity defined by the attributes of places and their distribution, which relate not only to the specific characteristics of places but also to patterns and similarities in geographical situations (Bunge, *op. cit.*; Dumolard, 1981). Here, recurring spatial patterns, represented by models and operating as poles of attraction or wealth accumulation, hyperbolic cones formed by center-periphery gradients, diffusion fringes, and discontinuous lines between higher and lower surfaces (of unequal statistical value) in “statistical landscapes” are identified to characterize a space viewed no longer as

a neutral container but as a social construct, a “produced space” (Lefebvre, 1974). It is on this premise that the journal *L'Espace géographique* was founded in 1972. However, given the limited technical resources of the time, the models used to identify these structures were often based on “static” relationships (in other words, mathematical or computer modeling was not used to understand their temporal evolution), as in the multivariate analyses of “urban ecology” (Berry and Kasarda, 1977) or in spatial interaction models in which the relationships between places were established on the basis of aggregated flows in administrative subdivisions over a given period (Wilson, 1970), or in the concept of a “field” of potential relationships used to simulate diffusion processes (Hägerstrand, 1967).

### 3. ABSOLUTE AND RELATIVE SPACE

A major advance was made when researchers began to define spaces in relation to (i.e. “relative” to) the relationship between places. According to Harvey (1969), space is always relative to the studied phenomenon. Other proponents of the “new geography” demonstrated the variety of forms taken by spatial interactions – for example, interactions governed by interindividual differences in the perception of distance and the perceived value of places, highlighted by “mental maps” (Gould and White, 1974). Developments in this area were also the result of research by cartographers faced with the problem of representing flows (Tobler, 1978) and with the variable effects of distance on these processes, but also with the problem of understanding functional spaces (Muller, 1983; L'Hostis, 1996) and cognitive spaces (Cauvin, 1984 and 1997). It was only when more complex dynamic models were developed that researchers were able to bridge the gap between the conceptual representation of space as a “process” formed by the interactions between places and the unequal or different flows emitted by differentiated places, which in turn reinforce or change differences and inequalities between interacting places and give rise to new geographical patterns and configurations (Grasland, 2009; Sanders et al., 1997).

The view of geographical space as the product of a “dynamic process” still often implies a view of time as mere duration, the temporal equivalent of the role of neutral container given to topographical space. However, recent geographical research provides representations of different “regimes of spatiality” (or “spatial regimes”) that vary at different points in history (here, I am simply transposing the concept of “regime of historicity” developed by Hartog, 2002). The implication is a conception of space as something constructed over time and governed by historical changes in social interactions (Janelle, 1969; Abler et al., 1987; Bretagnolle and Robic, 2006) and the emergence of spatial and territorial interactions. I describe this conception of geographical space as “evolutionary”, the reconstruction and analysis of which involve complex systems methods (Pumain, 1997 and 2003). Here, fractal patterns (or fractals) may be useful (Frankhauser, 1994; Batty and Longley, 1994; Dauphiné, 2011) as a tool for modeling non-uniform, discontinuous spatial distributions with similar patterns (or regularities) at different levels – a far more useful tool for characterizing disparities caused by social processes compared to densities (which imply uniformity). However, to date, fractals have mainly been used descriptively and a geographical theory of the social construction of these distributions has yet to be developed (Pumain and Tannier, 2005; Forriez et al., 2010).

To make further progress in the representation of geographical space viewed not as a container but as the product of interactions and relations, whether as part of a purely conceptual framework or based on a formal model (i.e. mathematics, computer science, etc.), the following must be defined:

- places (or people or objects and their geographical location);
- the attributes of places or individuals;
- the relationships between individuals or places determined by these spatial attributes;
- one or several measures of deviation (distance, topology, similarities) defined a priori or deduced from these relations;
- the laws governing the emergence of entities based on discontinuities in continuous relational processes (dynamic constitution of differentiated places);
- one or several types of relations between entities at different levels (scales).

The categories of space illustrated in Table 1 are identified based on the configurations of the relationships between people and/or places.

Table 1. Types of space and examples

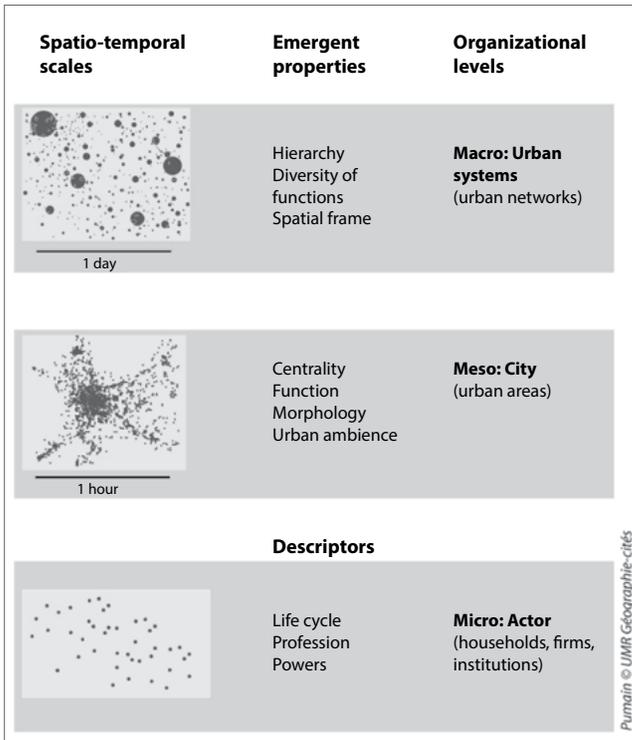
<b>Homogeneous</b> (at a certain level of resolution: regions, areas or countries, landscapes, green spaces)
<b>Polarized</b> (individual territory, region, world)
<b>Reticulated</b> (tunnel effects, small worlds, large networks)
<b>Hierarchized</b> (urban systems, firm networks, political authorities)
<b>Fractal</b> (self-similar, hierarchical, fragmented)
<b>Discontinuous, fractured</b> (barriers to interaction)
<b>Amorphous</b> (no identified relational process)

NB: these categories are defined for all spatio-temporal relations at different levels, from the individual to the global

#### 4. AN EXAMPLE OF THE DYNAMIC MODELING OF URBAN SPACE

Figures 1 and 2 (also included in Pumain, 2006) illustrate the view of cities as adaptors in the “activity-space-time” of societies (at two geographical levels). Urban space can be defined based on daily interactions, implying a critical time (length of journey) of approximately one hour, low-speed networks (with a range that has only increased by a factor of 5 since 1800) and strong interactions (between 3 and 4 people per day) generating recurrent structures: center-periphery price and density gradients and functional and socio-spatial segregation. At a higher level, the urban system includes cities that have become interdependent as a result of their interactions as part of the long-distance governance and control of territories and networks. The boundaries of these systems are relatively vague since the network of relationships in which large cities are embedded is generally larger and more complex than those of small cities, but may nonetheless be measured based on a critical travel time of approximately one day using high-speed networks (multiplied by a factor of 40 since 1800) and implying weak (i.e. limited) interactions (less frequent than in a city), generating universal structures of urban hierarchy and functional and social diversity.

Figure 1. The emergence of urban entities: cities and urban systems



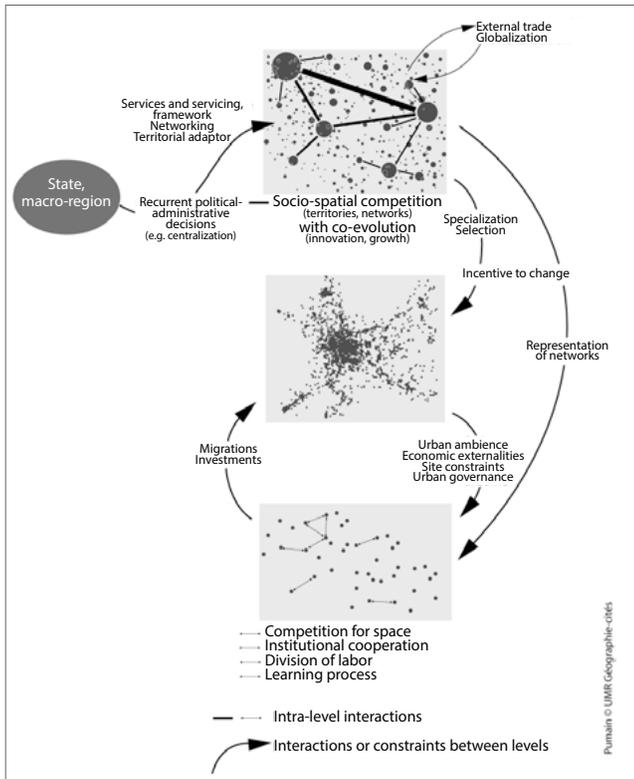
Source: Pumain, 2006, p.172

## 5. TERRITORIES

It is important to note that the typical relationships that exist between the places and individuals forming geographical space are not evenly and continuously distributed at the surface of the earth. Geographical areas often correspond to particular territories, i.e. regions of varying size regulated by territorial (or territorially-based) laws, rules and norms governing social interaction systems and movements in topographical space. Territories, whether continuous or network-based, are shaped and governed by relationships to places and the land, including its resources, its landscapes and its inhabitants. This may involve relationships based on a sense of belonging or on economic or political domination, or even affective or symbolic domination – relationships that form (i.e. define) the territoriality of a given individual or group. In short, spatial relationships determine (i.e. construct) territories, but their form (determined by modes of social relations) is determined by the configuration of the specific territories of each society.

Generally speaking, and almost invariably in its administrative sense, a territory is an area of land delimited by boundaries or borders and associated with political and/or legal and symbolic powers and responsibilities devolved to the institutions that govern it, embodied by entities operating at different levels and serving to legitimize territories and which the individuals who live there endure, accept and/or demand (identity characteristics, feedback effect).

Figure 2. Interactions construct cities and urban systems



Source: Pumain, 2006, p.173

National territories are the archetypal example of the close relationship between societies and their environment (ecosystems, interfaces). However, as a result of advances in political geography (Harvey, 1973; Lévy, 1994; Bussi and Badariotti, 2004), social geography and the geography of representations, culture and minorities, the concept of territory has become a more complex and sophisticated notion in recent research. A broader concept has emerged that covers both the relationships between individuals and between groups and many forms of delimitation (or boundary-making) ranging from inclusion within national boundaries (a recent development) to fragmented units (for example, diasporas) and networks (multinationals, individual territories, etc.).

### 5.1. Territory as a scientific construct

The sheer diversity of territorial forms should not be interpreted as implying that the concept of territory has multiple meanings, but should be seen as an extension of the concept as part of a formal definition. To accurately define the concept of territory, whether as part of a purely conceptual framework or based on a formal model (using mathematics, computer science, etc.), the following must be defined:

- a reference “population” (this may be a single individual, but will generally be a group);

- a continuous geographical area delimited (i.e. marked out) by boundaries (or a set of closely connected places – i.e. a “network-based territory”);
- individual and collective relationships to the places located within the area and between the individuals who live there and who have appropriated it as their own space (cognitive and affective relationships, sense of identity, relationships based on legal and/or economic property, relationships based on sovereignty, common rules of exchange and interaction – i.e. language, currency, “social ties” – power relations, relationships based on symbolic identification, etc.).

Table 2 shows some examples of territories that meet this definition.

Table 2. Types of territories and examples

<b>Defined by size (scale, level):</b> home, neighborhood, region, nation, “large open spaces”, cultural regions or areas, world, etc.
<b>Sometimes defined by spatio-temporal scale:</b> the territories of everyday life, world-economy (F. Braudel)
<b>And/or defined by the nature and spatial form of the relationships used to define inclusion within a territory:</b> administrative and political divisions (or subdivisions) are continuous; there are also territories defined on a network basis (individual, firm, diaspora, etc.), discontinuous territories (territorial enclaves), and virtual territories (Internet, etc.)

## 5.2. Territory and spatial organization

The concept of territory is implicit in the earliest uses of the phrase “spatial organization” examined by Robic (1996 and 2006). Two very different conceptions of the meaning of “spatial organization” emerged at roughly the same time. According to Robic, the point was to define the geographical approach to space by distinguishing it from the concept of economic space developed by Perroux (1950). Two quotations will serve to illustrate the differences between these views. I will quote from Gottmann (1947), who focused on spatial analysis, and Dardel (1952), who examined the phenomenology of space and the concept of experienced space. Gottman (1947) argued that “geographical space – i.e. the space accessible to humans – is a differentiated space. It is not the clear, unified space posited by geometers, but a qualitative space – a differentiated and organized space, concrete but complex, continuous but divided, limited but expanding, accessible but organized”. By contrast, Dardel (1952) posited that “geographical space has a horizon, a shape or mould, a color, and a density. It can be solid, liquid or gas, large or small; geographical space restricts and resists... Geographical reality is not first an object... Geographical science presupposes that the world must be understood geographically, that man feels and knows that he is attached to the world as a being called upon to realize himself in his earthly condition”.

## 5.3. Experienced space: toward the concept of territory

When examining the relationships between places that shape and are shaped by individual and collective perceptions and representations, the tendency is to use a concept of space (see, for example, the concept of experienced space defined by Frémont, 1976) that is synonymous with the concept of territory. Social geography, political geography and cultural geography have

contributed significantly to the understanding and terminology of what might be termed “territorializing spatial relations”. Here, the aim is to describe and characterize territorial relations (or relationships), i.e. the *sense of place* or *topophilia*, to use the term coined by Tuan (1974), which can be approached from many different angles – i.e. from the perspective of cognitive representations of space (based on the perceived, conceived or imagined forms of space), from the perspective of power relations (whether economic, symbolic or semantic; see Raffestin, 1980), or from the perspective of real or imagined representations (i.e. the images of places) targeted by geomarketing and tourism (Debarbieux, 2004). Today, there are many tools for understanding the diversity of spaces and territories that “deform”, misrepresent or magnify topographical space based on real (i.e. physical) or imaginary relationships between places, whether we use a cartographic approach (anamorphosis, projections, misrepresentations and inconsistencies, etc.) or a method using composite indicators for defining urban “ambience” (combining objectified space and perceived space, affects, emotions, etc.), or whether we resort to spatio-temporal models (diurnal and nocturnal space, animated maps, dynamic models) or choose to explore virtual spaces (online social networks, 3D, computer graphics).

## **6. FROM SPACE TO TERRITORY, OR HOW SPACE CREATES TERRITORIES AND VICE VERSA**

As argued by Guy Di Méo in this volume, spatial and territorial analysis must take into account the practices and spatial representations of local residents, users and actors. It would be absurd to isolate spatial structures from the social processes that underlie and produce them or to see them as autonomous by defining space as “actors”. From the concept of lifestyle to the idea of socio-spatial formation posited by contemporary social geography (Di Méo and Buleon, 2005), models and categories have become increasingly complex in recent years and often involve focusing on territories in terms of spatial relations – whether it be the emotional and cognitive relationship between a person and the world, a process involving an operation of “*trajection*” or “*médiance*” between societies and the planet (Berque, 1990), or more prosaic relations in spaces of appropriation (whether joint or collective, individual or fragmented, or involving firm or state control), spaces of regulation (connoting signs, order, and codes, as an expression of social relations, class conflicts, group conflicts, or territorial sovereignty) or spaces of alienation involving restrictions, limits, borders and frontiers, or even gender and minorities.

### **6.1. The challenge of modeling**

In seeking to develop a concept of homo geographicus or “geographical society” (or perhaps “geographizing society”), the remaining challenges are to develop more formal relationships (i.e. repeatedly observed, or that can be translated into computer language to test hypotheses or simulate or inform decision-making) between individual spatial cognition, the individual and collective representations underlying practices and the regulations governing the production of social space and the genesis and evolution of territorial entities. The scale of the challenge can be gauged (following Berthoz, 1997) by the fact that the human brain uses

five different 'geometries' to construct the cognitive configuration of space and by considering all the experiments that would need to be performed to understand the shift from cognition to representation (through learning, socialization, culture, beliefs or the imagination). For this, we would need to model the relationships between several levels of information, between agents, actors, their different strategies and practices, and their interactions (whether based on coordination, cooperation or conflict), and the many social processes that interfere with the construction of space and territory.

## 6.2. Articulating space and territory

Spatial analysis and the phenomenology of spatial and territorial representations are not mutually exclusive but must be integrated into a general anthropological and social model of geographical space and territories. In other words, we need to view space and territory as complementary concepts in the observation, analysis and explanation of places, environments and regions.

The assumption is that the spatiality of human societies generated by territoriality creates (i.e. produces and generates) territories. Space is defined by the form (i.e. the type and structure of "distances", the organization of space, the value of links) of relationships between places from an individual or collective perspective and at different levels. The repetition of certain forms of relationship over the long term produces specializations in regions and "territories", which in turn shape individual and collective actions and representations.

In this respect, it may be useful to define five universal functionalities of human spatiality in different territories, which serve to divide geographical space into differentiated spatial systems in different societies and periods. These functionalities have been identified in previous studies (see Pinchemel and Pinchemel, 1988, and Brunet, 1990).

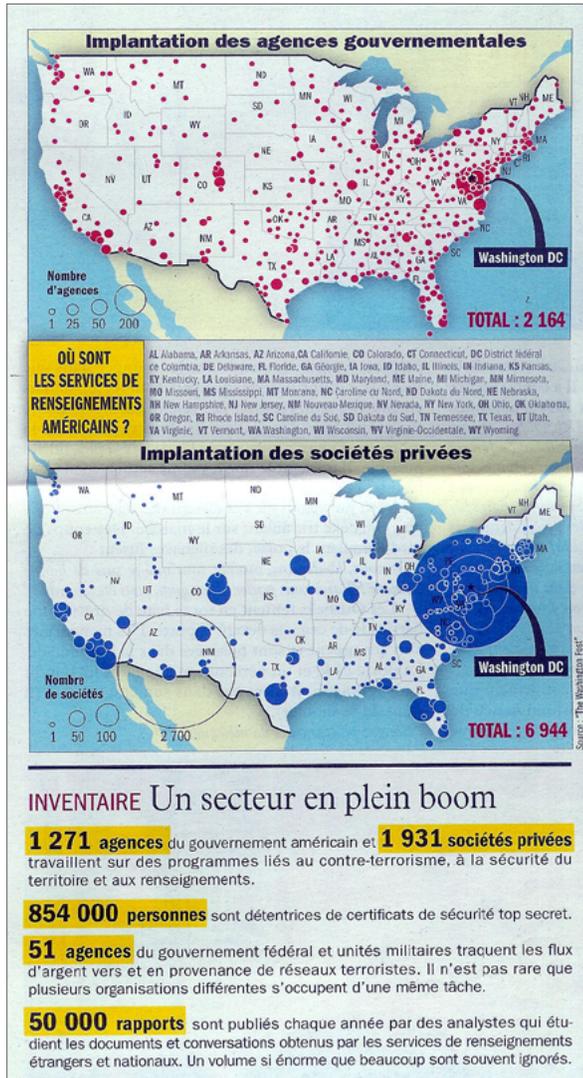
- Appropriation (land registry or customary rights),
- Use of land or exploitation (production),
- Habitat (buildings for residential and commercial purposes),
- Communication (exchanges, trade and commerce, networks),
- Administration and management (divisions and subdivisions, political and administrative territories).

We may need to add a sixth functionality identified by, among others, Raffestin (1980 and 2012) to further define territories and borders and which may be termed *denomination* (Pinchemel, op. cit.) or *semantization* (or semanticization; see Raffestin, 1980). Denomination refers to the semiotic and symbolic meanings given to the places that make up a territory by those who control it. This brings us back to the broad definition of territoriality as "the network of relationships that a society has with itself and with the outside and with others (through mediators), which it requires in order to meet its needs and thus secure the greatest possible degree of autonomy given the resources of the system" (Raffestin, 2012).

### 6.3. The social utility of the concepts of space and territory

We need to be wary of received views such as “globalization erases borders and boundaries”, “communication technologies erase distance by increasing connectivity”, or “externalization and ‘delocalization’ lead to standardized production processes”, or even of the notion that the ubiquity of information associated with high-speed access will kill mobility (Virilio, 1984). It is important to reiterate that the earth is not flat and that the end of territories or the end of geography are not yet a reality. A simple example taken from a weekly news magazine will serve to illustrate this point (see Figure 3).

Figure 3. The secret services in the United States in 2010: two spatial strategies



Source: *Courrier international*, no. 1030, July-August 2010

If we examine the ever increasing number of information services in the United States, we can see that different spatial strategies lead to different location patterns: a sovereign state ensures its presence throughout the national territory by spreading its authority wide, while private operators seek to be as close as possible to the agents with whom they interact (in this case, politicians and lobbyists in Washington), resulting in a high concentration of services.

## CONCLUSION: THEORETICAL PROPOSALS FOR CHANGE

This brief overview of the concepts of space and territory showed that both notions have changed and developed significantly as a result of recent efforts to integrate knowledge and concepts from a range of disciplines in the humanities and social sciences (although the focus was primarily on geography). It is the job of researchers working on geographical space and in the territorial sciences to develop theoretical proposals for the retrospective and prospective analysis of how human societies inhabit the earth. Future research will need to integrate time and duration, and therefore historical and archaeological research, since the assumption is that “geographical space is time inscribed in space” (Pinchemel, op. cit.). Further research is also needed to verify Raymond’s (1971) claim that “throughout history, societies have converted areas (of land) into space”, a view that takes into account the subjection of natural environments to human activity. However, researchers should heed the advice of Tobler (1999), who remarked that “*le monde se froisse en se rétrécissant*” (the world is shriveling as it shrinks), thereby highlighting the increasing inequalities of access generated by the homogenization of human relationships (we might also include the increasing socio-spatial inequalities of wealth). I would add a pessimistic prediction that the increase in territorial inequalities will continue in the twenty-first century despite the stabilization of the world’s population.

However, I would like to argue against the notion of “spatial inertia” posited by Cox. The persistence of forms in human geography is not a matter or product of inert social or territorial structures resistant to social change. Rather, human geography is produced actively, though often not intentionally (in terms of its form at higher levels, e.g. regions, countries, large networks, etc., by multiple actors who seek to highlight existing geographical situations and who seek to establish all kinds of asymmetrical power relations (war, business, influence, etc.) in order to maintain and increase the value of concentrations of wealth and innovation. This is a key dynamic which, in order to be understood, requires the cooperation and support of a wide range of disciplines in a period marked by the “ecological transition” and at a time when the growing scarcity of energy and mining resources should encourage us to adopt practices designed to ensure sound management rather than significant growth.

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## CHAPTER 3

# The Territory is not the Map: steps towards a new (meta)science

Helen COUCLELIS

The starting point for this essay is the following statement from the background paper prepared for the 2011 CIST conference: “*Si l’on considère que le territoire est l’objet d’une discipline autonome, ‘la science du territoire’, alors il faut en définir les concepts, les lois et les méthodes d’analyse*” (*Debate paper*)<sup>1</sup>. Implicit in this choice is my belief that there can indeed be a *science du territoire* that is different from the sum of the disciplinary parts that have a territorial dimension. This of course is not an immediately obvious proposition. Indeed, the phrase “*sciences du territoire*” in the title of this book may suggest an emerging consensus towards defining an inter- or multi-disciplinary field along the lines of environmental studies, global studies, earth sciences, and so on. The objective of this paper is to contribute to this discussion, taking sides in support of the position that a “*science of territory*” may be rigorously and usefully defined, not at the intersection of a number of cognate empirical disciplines but as *metascience*. The argument is developed as follows. Section 1 briefly discusses some prerequisites for a new science, indicating that a science (better: metascience) of territory is possible in principle. Section 2 briefly examines primarily the work of Robert Sack on human territoriality, as well as a couple of other relevant publications from the Anglophone geographic information science literature. Section 3 discusses the notion of metascience (which is basically a systematic way of thinking about some aspect of the world), and outlines a conceptual model that could potentially serve as the starting point for the new science of territory. Finally, section 4 concludes with certain empirical and practical considerations.

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1 “If we consider that territory can be the object of an autonomous discipline, ‘territorial science’, then we can define its concepts, laws, and analysis methods” (pre-conference “*Debate paper*” p. 13: [www.gis-cist.fr/wp-content/2014/10/CIST-Colloque2011-Debate\\_paper.pdf](http://www.gis-cist.fr/wp-content/2014/10/CIST-Colloque2011-Debate_paper.pdf)).

## 1. FOUNDING A NEW SCIENCE: SOME PREREQUISITES

Nowadays the new sciences that emerge tend to be of two different kinds. On the one hand we have the successful former scientific specializations or interdisciplinary sub-fields that become sciences on their own right, such as Photonics or Media Studies. On the other hand there are the cross-cutting “meta” sciences such as System Science, Complexity Science or Information Science, which are not about finding out how the world works, but rather about setting up appropriate conceptual and methodological *frameworks* for representing the world. A science of territory as explored in this paper would be of the latter kind.

But first: What are the requirements that must be met before we can declare the birth of a new science? There are several, and here is an informal and certainly incomplete list. One practical requirement must surely be that the science in question should have a sufficiently broad audience, that is, be of interest to sufficient numbers of scientists, professionals, and others to be worth the effort of defining and supporting it. Among the conditions for a viable new science are: a theme of broad interest, preferably cross-disciplinary, the existence of related literature of sufficient quality and quantity to be taken seriously by its intended audience, and a demonstrated need, or at least desirability, for a new perspective that can provide a common language and foster a systematic approach to disparate sets of problems. To these academic requirements should be added broader societal acceptance in the sense of political support and funding potential. The *Debate paper* (op. cit.) for the 2011 CIST conference makes a strong case to the effect that a science of territory would meet this first set of criteria.

Another major requirement concerns the intellectual merit of the potential new science, which must be distinctive in its approach and methods and clear about the defining properties of its objects of study, so that it cannot be mistaken for a sub-field of something else. It should also be rich enough to help generate robust research programs that might not have existed without it. Finally, a third important requirement for a new science is that it be well integrated within the Web of the sciences as it exists at a given time. For example, astrology and parapsychology are not accepted as sciences, even though they may meet several aspects of the first two requirements, because they are outliers disconnected from practically all sciences of our age. Unlike astrology and parapsychology, a science of territory would be strongly connected with a few social science disciplines (such as human geography and political science) that explicitly study the *concept* of territory, along with a large number of other social and natural science fields that may consider diverse types of territories from their own disciplinary angle. Further, it would also be connected with at least two meta-sciences: (geographic) information science, and complexity science. It thus seems that, *in principle*, a science of territory is possible. What follows is an attempt to move the argument from the possible to the actual.

## 2. SACK'S THEORY OF TERRITORY AND THE ROLE OF GEOGRAPHIC INFORMATION SCIENCE

Unlike the related notions of space and place, which have a long and distinguished history as research themes, territory has not figured in the Anglophone literature in any significant way until relatively recently. Since about the 1980s however the concept has become increasingly prominent as an object of study, well beyond the obvious disciplines of human geography and political science. Delaney (2005) mentions in addition (here in alphabetical order) anthropology, archaeology, architecture, criminology, critical theory, environmental and social psychology, ethnography, ethology, geopolitics, global studies, history, international relations, law, sociology, and mainstream psychology among the fields contributing to that literature, along with more than a dozen journals that regularly publish related work. In that author's view no-one has examined the notion of territory as deeply or has provided as useful a theoretical framework for it as the US geographer Robert Sack (1986), whose monograph on human territoriality still stands as possibly the most complete treatment of the topic. This section provides a brief overview of those aspects of Sack's work that may be the most relevant to a potential science of territory. Further, because boundaries of some sort or other are part of the essence of territories, this section also addresses works on that topic from the field of geographic information science.

Sack (op. cit., p.19) defines territoriality as "the attempt by an individual or group to affect, influence, or control people, phenomena, and relationships, by delimiting and asserting control over a geographic area. This area will be called the territory". The author is quick to clarify that "control" – and also, "power" – as used in that work are neutral terms, that is, they do not necessarily have authoritarian or aggressive connotations. Among the hundreds of possible examples are: the control that people have over who may enter their property and under what conditions; the control that a national park has over the kinds of recreational activities that may take place within its boundaries; the control that a local government has (or would like to have) in keeping out a contagious disease; or the power a multi-national trade alliance has to impose regulations for its members to follow. For Sack (op. cit., p. 2), "Territoriality is intimately related to how people use the land, how they organize themselves in space, and how they give meaning to place". Further: "Territoriality... is an historically sensitive use of space, especially since it is socially constructed and depends on who is controlling whom and why [we may add: 'and when']". It is the key geographical component in understanding how society and space are interconnected" (op. cit., p. 3). Thus: "Territoriality, then, forms the backcloth of human spatial relations and conceptions of space... Human spatial relations are the results of influence and power. The territory is the primary spatial form power takes" (op. cit., p. 26).

Sack also makes a clear distinction between place and territory: "Unlike many ordinary places, territories require constant effort to establish and maintain... Circumscribing things in space, or on a map... identifies places, areas or regions in the ordinary sense, but does not in itself create a territory" (op. cit, p.19). This notion of human agency being central to that of territory also makes it unlikely that the methods of quantitative geography and spatial analysis

alone would be sufficient to tackle the territorial problematic. As Sack puts it: “Emphasizing distance has led to a geographical logic based on the metrical properties of space... The logic of territorial action is more complex than the logic of distance because territoriality is embedded in social relations. Territoriality is always socially constructed... and territoriality can have normative implications as well” (op. cit., p. 26).

These selected quotes from Sack (op. cit., see also p. 21) provide us with an essential though incomplete conceptual vocabulary for a potential science of the territory. First, there must exist an individual or group that *intends to exercise control over behaviours and interactions for some purpose*. Second, there must be a *geographical area* over which that control is extended, which must be *identifiable and classifiable* (as a parish, a gang’s turf, a clan’s domain, a resort, an agricultural cooperative, a marine preserve, a city, a state, an international economic union, etc.), and which must be *bounded* in some way because no territory can be an infinite plain, just as no human powers can reach out to infinity. Third, there must be *appropriate means for exercising the intended control*, such as physical or symbolic barriers or rules and regulations – written or unwritten – enforced by sanctions. These means range from the dress code for dinner on a cruise ship to the traffic and building regulations in a city and a country’s laws, to the usually unwritten rules that govern relations between the sexes, races, religions, and social classes in different societies. Fourth, a territory must be recognizable as such through some *forms of communication*, which may be as tangible as a wall, as symbolic as graffiti or a posted sign (e. g., KEEP OUT or YOU ARE NOW [...] ENTERING ZAIRE, Figure 1), as conventional as a series of coordinates on a map, or as fleeting as a pointing gesture (“this all is ours”). Further concepts and ideas deriving from the quotes above are: the differences between space, place and territory; the historically contingent use of the land; the socio-spatial organization of society; a socially constructed space; differing human conceptions of space; the normative dimensions of territory; and underlying this all, human agency and intentionality. These are only some of the notions that a science of territory should be able to address and combine into new patterns towards the study of new kinds of problems.

Figure 1. Unofficial (a) and official (b) territory markers



(a) Photo by Robert Adrian Hillman, source: [www.shutterstock.com](http://www.shutterstock.com) (b) Source: unknown

Thus, as the title of this paper suggests, the territory is not the map. The territory cannot be reduced to its visible or measurable geographic features because its essence is not primarily

physical: it is mental, rooted in human intentionality and in the strategies humans use to achieve social ends. As will be discussed below, there can be territories of the future – or of the imagination – lacking geographic reality, but there cannot be territories unrelated to a purpose necessitating some form of control.

Despite Sack's (op. cit.) skepticism concerning the ability of "the logic of distance" to handle the questions of territories and territoriality, it is evident that quantitative approaches must be part and parcel of a science of territory. Boundedness, for example, is a fundamental characteristic of territories that is clearly amenable to quantitative analysis. Researchers in geographic information science have investigated the properties of both the well-defined boundaries typical of private property and administrative and political territories (Frank et al., 2001), and of the ill-defined boundaries typical of most other kinds (Burrough and Frank, 1996). The former collection focuses on the problems of representing in GIS databases the spatio-temporal changes of areas delimited by convention, while the latter deals with the challenges of assigning boundaries to areas whose distinctiveness is often the result of natural or social bottom-up processes, and which therefore lack a clear or permanent geometric delimitation. In addition to boundaries and their effects on spatial interactions, most kinds of phenomena relating to territories should be at least partly amenable to spatial analysis methods. The question is how the ideas, concepts, approaches, and kinds of information alluded to in this section may come together in a new science of territory. The next section briefly outlines a tentative proposal to that effect.

### **3. TERRITORY AS METASCIENCE AND AS OBJECT OF DISCOURSE**

How can a science usefully be defined around a concept that seems to apply to everything from a teenager's bedroom to the United Nations, including such disparate things as a cruise ship, a gang's turf, a quarantined agricultural area, the right-of-way of a rail or energy transmission network, a country's maritime territory, a contested region, and a state? Clearly too many disciplines have a claim on that concept, so many in fact and so diverse that trying to create a traditional inter- or multi-disciplinary science around it might be futile. What would an ethologist have to argue about with – say – a historian?

The notion of metascience has started appearing in the literature in recent years to address just such dilemmas. The proper meaning of the term is still being debated, but a generalized version of "metageography" as defined by Lewis and Wigen (1997), would help advance the present discussion: "Metascience is the set of mental structures through which scientists order their knowledge of the world" (p. 35). Indeed, a traditional science is characterized not only by its empirical domain of interest but also by its distinctive approach to the study of that domain. For example, many contemporary sciences adopt the metascience of "systems" or "complex systems" in their approach, so that one may usefully analyse urban systems, ecological systems, river systems, weather systems, respiratory systems, social systems, product delivery systems, etc. These all have in common the notion of system as dynamic structure of interacting elements and relations, and thus share the system properties of self-organization,

emergence, feed-back and feed-forward, tipping points, and so on, even though they may share no empirical variables at all. Like system science, complexity science, information science, and any other metascience, a science of territory would be characterized by a set of properties – not by laws, generalizations, or hypotheses. The latter would remain the privilege of each specific empirical science utilizing the territory concept. Where a concept as broad-ranging as that of territory is involved, the advantage of defining a metascience is that it would allow communication and ideas exchange among any combination of sciences, no matter how unlike one another (e.g. epidemiology, psychology, and infrastructure planning) that are needed to bear on a particular problem.

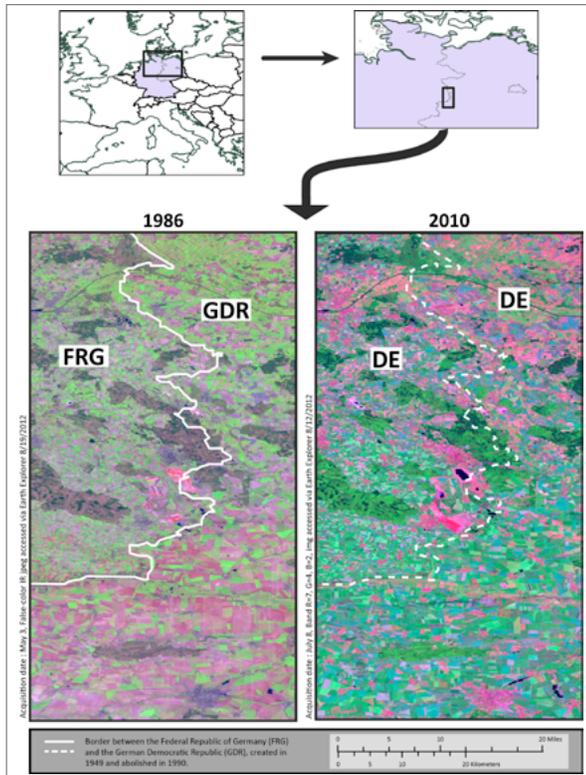
As ordering framework for an idea that encompasses things as tangible and physical as walls and pieces of land, but also notions as abstract and philosophical as human agency and intentionality, a metascience of territory should go beyond the mere notion of system. The following sketch is based on the notion of “object of discourse” as developed in Couclelis (2010) but which is adapted from earlier writers that go back to Aristotle. An object of discourse is whatever we can talk about, regardless of whether it is material or abstract, existing or planned, real or imagined. The Atlantic Ocean is an object of discourse, and so is the continent of Atlantis. Thus we can talk about the state of Israel, which at this time is an official territory (though with contested boundaries), but also about a Palestinian state, a territory that does not yet exist except as an idea.

An object of discourse has four dimensions. The *formal* dimension (as in “form”) has to do with what kind of object something is: it is concerned with those properties that distinguish one category of things from another. The *constitutive* dimension has to do with what the object is made of and in particular, its parts (material or conceptual), and how these are connected. The *agentive* dimension addresses the processes by which things come to be or their roles as agents in other processes or their function relative to some end. Finally, the *telic* dimension refers to the purpose of things or the reasons why things happen. These are four distinct but interrelated levels of meaning that together characterize a complex object such as a territory but which may be studied by different methods relatively independently of each other. Because territories are intentional human creations, their telic dimension – the reason for their existence – is their most essential property, out of which most of the others follow. The preferred logical order of their four levels of meaning is thus from telic to agentive to constitutive to formal. These levels correspond to the conditions laid out by Sack (op. cit.) for the constitution of territories, as discussed in the previous section, i.e. (a) an *intention* to influence behaviours and interactions for some purpose; (b) *means* for communicating and exercising the required control; (c) the entities being *influenced or controlled*, and (d) a *classifiable geographical area* that bears the physical expression of the means of control.

Let us take the state, a typical kind of territory as an example. Its purpose is – say – to nurture societal welfare within its boundaries and to represent and defend its interests vis-à-vis other states (telic dimension). To do so the state acts through a government that must take a large number of coordinated measures, such as to create or maintain an administrative hierarchy,

including a hierarchy of spatial jurisdictions, an army, a police force, and a variety of governmental organizations, to plan and carry out the development of the state's infrastructure, to impose laws, to sign international agreements, and so on (agentive dimension). These measures in turn seek to control the nature, powers and behaviour of the entities comprising the state, for example, the corporations, the political parties, the civil institutions, the interest groups, and the individual citizens, etc., along with the nature of the relations among these entities (constitutive dimension). Finally, a state has an indefinite number of distinguishing geographic characteristics, most prominent of which are those directly relating to the state's essence, such as location, area, boundaries, neighboring states, regional breakdown, spatial administrative units, metropolitan areas, transportation and energy infrastructure, population size, ethnic makeup, GDP, and so on. These characteristics help classify it as a European state, for example, or as an industrialized state, or as a new state (formal dimension), but cannot directly tell us whether that state is authoritarian, democratic, or something else (agentive dimension).

Figure 3. Agricultural lands in a section of the border region between the former Federal Republic of Germany and the former German Democratic Republic



Note the stark contrast in field sizes between West (small family holdings) and East (large communist cooperatives) in the 1986 image. These differences have largely faded 20 years post-reunification, as illustrated in the 2010 image. The area shown is roughly South of the Herz Mountains and South-East of the city of Braunschweig.

Source: Landsat path 194, row 024. 1986: acquisition date 3 May. TIR jpeg; 2010: acquisition date 8 July. Band 7. Both accessed via Earth Explorer 12-19/8/2012

Note however that a state's land use may reflect its form of government and ideology to some extent. A striking example of this used to be provided by the border region between the former East and West Germany (Figure 2). The trace of the border separating these politically highly dissimilar states used to be clearly visible on satellite imagery because of the very different structure of the agricultural land on either side (i.e. large, regularly shaped cooperatives versus small, irregularly arranged family farms). Thus the telic dimension (to create a true communist society) was supported by means (such as communal modes of production and the abolishment of private property) that supported behaviors and relations among workers (cooperative cultivations on state-owned land) that led to a distinctive spatial agrarian structure (large farms). The example illustrates the fact that the dimensions of an object of discourse are causally related to one another so that characteristics (and changes thereof) at any one level are normally expressed on all.

This analytic breakdown by dimensions or levels of meaning may be applied to any kind of territory, from private properties and nature preserves to international alliances such as NATO and the EU. Another aspect of the power of the notion of object of discourse is that it does not require grounding in physical reality, so that it can allow actual territories, formally planned territories, or territories that may have existed in the past as well as those that might exist in some form in the future to be discussed within the same framework. Arguably, virtual territories such as the zones of influence created by information and communication technologies may also be represented, to the extent that they meet the criteria discussed in the previous section and above. Virtual territories can indeed be more than figures of speech. They can be political, social, and economic realities: consider the virtual territories formed through censorship of the Internet by undemocratic regimes, or the increasingly regulated trade territories of online merchants.

#### **4. TOWARDS ESTABLISHING A SCIENCE OF TERRITORY**

The framework outlined above represents only one of several potential approaches to a science of territory. It suggests that in principle, such a science can exist, and that its development would facilitate collaboration and the exchange of ideas among the numerous scientific and professional fields that implicitly or explicitly have as their object of study territories large or small, formal or informal, spontaneous or planned, contiguous or not, well-bounded or not, overlapping or not, contested or not, physical or virtual, actual or potential. The great diversity of possible territories have in common the fact that they all are intentional human creations that use particular combinations of means and ends – successfully or not – to influence processes and behaviours and achieve results that usually translate into geographic patterns on the ground. A science of territory would most likely be based on these general properties rather than on any specific commonalities in empirical subject matter.

Consider the following hypothetical example, which involves agriculture, health, tourism, power supply networks, risks, conflict, etc., all of them areas of interest to several CIST

scientific strands. A quarantine area must be established in a region where a serious livestock epidemic has broken out (Figure 4). That area, which may consist of a few spatially disjoint sub-areas, may overlap in whole or in part with several different territories, such as farms and other private properties, health districts, planned summer camps for needy children, economically important tourist attractions, diverse administrative jurisdictions, the right-of-ways of the regional power supply companies or the national railways, and may even need to extend into a neighboring country. While most stakeholders may agree in principle on the need for the epidemic to be contained, there could be considerable disagreement on the mix of means (e.g. physical barriers, other restrictions, regulations, limitations on trade, inoculations), on the elements to be controlled (e.g. individual farms, groups of farms, entire regions, wildlife, human movement), and on the extent and geometry of the quarantine area itself. Moreover, a quarantine area being a temporary and temporally variable territory, any solutions may need to be repeatedly renegotiated.

Figure 4. A temporary and temporarily variable territory: quarantine sign



People have traditionally dealt with such problems through laborious negotiations, supported, in recent years, by GIS-aided scenarios built on alternative premises. A science of territory would go further than that, systematically pinpointing the inconsistencies among the stakeholders' intentions, fears, and desires, or among the means and objects of control that may be acceptable or unacceptable to each, and helping clarify the implications of such differences across the dimensions of the conceptual framework and down to the concrete geographical level.

Given the need to integrate such disparate categories of concepts, there is little doubt that a science of territory would draw broadly on both qualitative and quantitative methods and information. Moreover, the latter would most often be geographical, since a territory is by definition, among other things, an area in geographical space. Novel as well as existing methods of analysis, modelling, and visualization would need to be developed and adapted. It is beyond the scope of this paper to tackle the critically important question of methodology. This task should be left to the scientists of CIST...

Finally, it is also worth considering the form of organization that such an integrative metascience might assume. Several models come to mind, listed here from least to most structured. First is the European GISDATA model of the 1990s, run by an informal network of Geographic Information Systems (GIS) researchers with a single academic at the helm. The ESF-funded GISDATA convened a series of interdisciplinary “specialist meetings” on topics of interest to the geographic information science community, all of which resulted in influential edited books. Next is the Center for Spatially Integrated Social Science (CSISS)<sup>2</sup> at the University of California, Santa Barbara (UCSB), the mission of which was to help integrate the social sciences by highlighting the spatial dimension that underlies so much of social science research across the globe, a goal promoted through a variety of technical resources and interdisciplinary meetings (Goodchild and Janelle, 2004; Janelle and Goodchild, 2009; Janelle et al., 2009). It is not too far-fetched to imagine a “CTIS” (Centre for Territorially Integrated Science), an actual Centre based in Paris with a mission and strategies parallel to those of CSISS, but using territory rather than space as the integrative notion. A more ambitious model in terms of resources is that of the Santa Fe Institute<sup>3</sup> in the USA, a large interdisciplinary institute for the study of complex systems, with resident researchers and major outreach programs, and the ability to host distinguished scientists from around the world for short-term visits. Finally, the US National Science Foundation (NSF) has recently launched a programme called “Science Across Virtual Institutes” (SAVI)<sup>4</sup>, an effort to motivate collaboration among scientists around the globe.

To sum up: it appears that a science of territory could be defined around a number of distinctive concepts, that it could facilitate communication and problem-solving among academics and professionals in a wide range of domains, and that it could be practically organized along the lines of any one of several successful models. It is time for a call to action: “*Allons enfants du Territoire ! Une science nouvelle est arrivée*”.

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2 [www.csiss.org](http://www.csiss.org)

3 [www.santafe.edu](http://www.santafe.edu)

4 [nsf.gov/news/news\\_summ.jsp?cntn\\_id=121825&org=NSF&from=news](http://nsf.gov/news/news_summ.jsp?cntn_id=121825&org=NSF&from=news)

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## CHAPTER 4

# Formalizing Space and Place

Michael F. GOODCHILD, Linna LI

As one might expect, the French terms *espace* and *territoire* do not translate readily into English. The English term *territory* has comparatively narrow connotations, suggesting a well-defined area of land governed in a certain way, as in “Yukon Territory”, or the area dominated by an individual or group, as in “gang territory” or the territory of a bird or animal. *Space* is also a very broad term in English, and the twin terms *space* and *place* are two of the most fundamental – and contested – terms in the lexicon of the discipline of geography (e.g. Tuan, 1977; Hubbard et al., 2004), and more broadly in the social sciences and humanities. Space, or the spatial perspective, is generally held in this context to refer to the surface and near-surface of the Earth, as organized by coordinate systems such as latitude and longitude, and to concepts such as distance and direction that are measurable or computable within that space. Defined in this way, space has strong connotations of science and its aims of rigor and replicability, and is readily formalized. In recent years the rapid growth of interest in geographic information systems (GIS; Longley et al., 2011), remote sensing, the Global Positioning System (GPS), and digital technologies in general have reinforced the importance of space, and implemented many of its concepts in computing systems.

Place, on the other hand, is normally defined as a social construction. A place is a named domain that can occur in human discourse (by contrast, references to latitude and longitude in human discourse are of course extremely rare). Places may be persistent through time, or transient and related to specific events. They may be poorly defined, with indeterminate boundaries that make it difficult to determine whether a given spatial location is or is not within a named place. Places have properties, but there may be substantial differences in individual perceptions of those properties, and their importance in defining places. Thus the technologies that arose beginning in the 1960s for handling geographic information, most notably geographic information systems (GIS), have tended to avoid place in the interests of

creating digital representations, and to favor instead the spatial perspective. While the term *spatial information system* is roughly equivalent, and G is sometimes decoded as *global* or *geospatial* rather than geographic, the French term *système d'information territoriale* has no parallel “territorial information system” in English.

What follows focuses therefore on space and place, and on a problem that has grown rapidly in importance in recent years with the emergence of the digital age: the formalization of space and place in computing systems. Formalization is of course necessary for the successful representation of anything digitally. It implies standard definitions of terms, and the existence of an agreed coding scheme to translate knowledge of the real world's spaces and places into a binary alphabet. Without formalization, there can be no successful sharing of information that satisfies the criteria of science.

The remainder of the paper is organized as follows. The next section examines the spatial perspective, the power of spatial analysis, and the emergence of space as a common, integrating theme in the social sciences and humanities. The development of a Center for Spatially Integrated Social Science (CSISS) in the United States, with funding from the National Science Foundation, is a direct result of the growth in importance of the spatial perspective. The section ends with a brief review of some of the more important concepts of the spatial perspective. The third section introduces the perspective of place – the *patial* perspective; discusses its importance as the world of human discourse becomes increasingly engaged with the world of digital computing; and compares it to the spatial perspective. The fourth and final section discusses the implications of this comparison, and the prospects for a range of technologies that parallel the technologies of space.

## 1. THE SPATIAL PERSPECTIVE

Over the past four decades it has become increasingly easy to tie information to specific locations on the surface of the Earth. This process began in the 1960s with early techniques for capturing such locations from maps, received a significant boost from the development of GPS, and today has advanced to the point where it is trivially easy to identify location, often by recognizing a location on a computer-generated image of an area. Vast amounts of geo-referenced information are now available, much of it also referenced in time (*spatial* should also be assumed to imply *temporal* where appropriate in this discussion). A device as simple and ubiquitous as a mobile phone can now be used to identify the location of the user, to provide detailed assistance in navigation, and to locate nearby points of interest. The spatial perspective has clearly come of age.

At the same time these advances have opened the door to sophisticated forms of *spatial* analysis, searching for patterns and anomalies, tracking the spread of disease, or looking for correlations that may suggest cause. The spatial technologies are also extensively used to plan, by determining optimal locations for activities, or evaluating the impacts of proposed developments on their local environments. These techniques are now widely available to

researchers in the form of GIS, which have evolved to be capable today of virtually any conceivable form of spatial analysis and modeling.

The division of the academy into disciplines has always appeared somewhat counter-productive, encouraging as it does the emergence of discipline-specific practices, a narrowing of vision, and increasing difficulty in communication and collaboration. This is more than ever apparent today, when the complexity of modern scientific questions and problems points more and more to a multidisciplinary approach. Yet there are few obvious bases for improved communication. A shared language, such as English, is not necessarily a solution since its terms may be coopted and redefined by individual disciplines, as for example in the distinct meanings assigned to both the verb and the noun *map* by geography and mathematics. Statistics is a potential basis for communication, as its principles and techniques are standard, and today the statistical computing packages provide one basis for unambiguous communication between participants in a multidisciplinary project.

With this problem in mind, in 1999 the US National Science Foundation provided funding for a Center for Spatially Integrated Social Science (CSISS), based on the principle that a spatial perspective could provide an effective basis for communication across the social sciences (Goodchild and Janelle, 2004). Disciplines as distinct as criminology and economics study phenomena distributed in space and time, and may potentially gain insights by applying the tools of spatial analysis to their data. Those tools, and the associated language of the spatial perspective, might thus form an additional glue to cement multidisciplinary work. The center sponsored the development of a computer package for spatial analysis geared to the needs of the social sciences; organized a series of popular summer training programs; sponsored multidisciplinary workshops to explore cross-cutting issues; and developed a very substantial collection of online resources<sup>1</sup>.

The establishment of CSISS proved to be extremely timely, since it coincided with an increased interest in spatial perspectives in the social sciences and humanities – the *spatial turn* (for reviews see, for example, Goodchild and Janelle, 2004; Bodenhamer et al., 2010). More recently we have seen a rapid growth in new forms of geographic information generated by Web users, a form of user-generated content sometimes termed *volunteered geographic information* (Goodchild, 2007). The foundational concept of CSISS has been adopted in other parts of the world, for example in the establishment of an Australian Research Council Research Network. Janelle and Goodchild (2009) provide an overview of the Center, and an assessment of its contributions to date.

The spatial perspective incorporates several principles that differ in major respects from traditional scientific methods, at least as applied in the social sciences. One is a belief in the importance of context as a key to understanding social processes. To a geographer, this is often seen as establishing a distinction between *site*, the location of some event or process, and *situation*, the surroundings of the event or process – based on the principle that social processes are more readily understood when the situation is known, rather than or in addition to the site. Many

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<sup>1</sup> [www.csiss.org](http://www.csiss.org)

social processes would operate just as well in different sites, but not in different situations – or more formally, social processes tend to be invariant under relocation, but not under a change in context. GIS is a powerful tool for capturing, characterizing, and examining the effects of context.

Figures 4.1 and 4.2. Resources for Spatially Enabled Science

UCSB's Center for Spatially Integrated Social Science was funded by the US National Science Foundation from 1999 to 2004 to promote the use of a spatial perspective across the social sciences. Its resources are available at csiss.org. In 2007 it was merged into a new Center for Spatial Studies with a mandate to foster the use of spatial perspectives across the entire university, from engineering to the humanities. The greatly expanded program of the new center can be found at spatial.ucsb.edu. Figures 4.1 and 4.2 show the home pages of each center.

Figure 4.1. Home page of the UCSB Center for Spatially Integrated Social Science, csiss.org (2012)

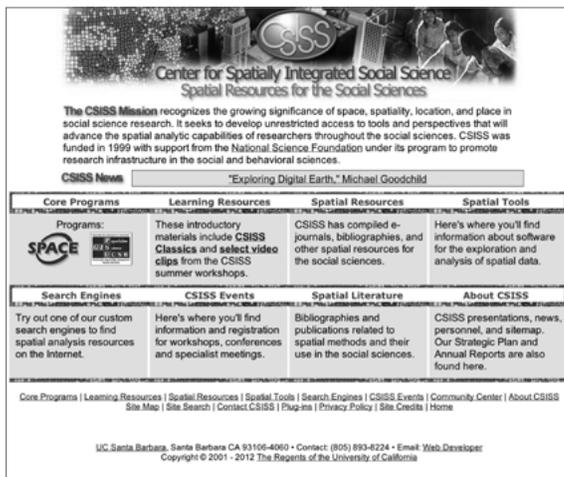


Figure 4.2. Home page of the UCSB Center for Spatial Studies, spatial.ucsb.edu (2012)



A second principle is *spatial dependence*, often expressed in the statement “nearby things are more similar than distant things” and recognized as Tobler’s First Law of Geography (Tobler, 1970; Sui, 2004). Spatial dependence conflicts directly with the independence assumption of classical inferential statistics, which requires each observation to be drawn independently from some parent population. Students who have learned classical statistics often find it very difficult to adjust to the realities of spatial analysis, with its very different assumptions about sampling. A third is *spatial heterogeneity*, the principle that conditions vary in the geographic world, that universal explanations are unlikely, and that scientific investigations should more often be *place-based*. These and other principles add strength to the argument that dealing with phenomena distributed in space and time requires specialized approaches, and that these approaches can provide a useful unifying framework for what are otherwise disparate disciplines.

## 2. SPACE AND PLACE IN HUMAN DISCOURSE

The past few centuries have witnessed a steady separation of the languages of science and everyday life. Words that humans use to convey meaning are often vague, but resolved by context or by dialogue. Thus the comment “it’s warm today” would frustrate a scientist with its inherent vagueness, but might well satisfy the needs of human communication, especially when augmented by gesture, verbal inflection, or spatial and temporal context. A scientist would resolve the ambiguity quite differently, by replacing “warm” with a well-defined reading on a system of measurement such as Celsius temperature. In a similar fashion, the growth of the spatial perspective, with its formal systems of coordinates, has provided a scientific basis for reasoning about p

henomena embedded in space and time. There is little ambiguity, for example, about the boundaries of Hungary or the distance from the Equator to the Pole, though all of these are subject to measurement error. The systems used to define latitude, longitude, and time have emerged as international standards, allowing locations in space and time to be specified unambiguously and with great accuracy.

This tension between science and everyday discourse has shifted markedly in the past decade. Human discourse has become a subject of scientific study, in the disciplines of linguistics, communication, and cognitive science, so that it is now possible to ask what people mean by “warm”, for example, using formalisms such as fuzzy sets (Zadeh, 1965). People have become engaged with the formal world of GIS and the spatial perspective, both as consumers of map information and as producers of it. As a result the contrast between Celsius and “warm” now has its analog in geography, in the contrast between latitude and longitude on the one hand, and references to places on the other. The traditional response has been analogous also: places were recognized in the formal world only if they could be unambiguously defined, for example by legal boundaries. National mapping agencies established *gazetteers*, or lists of formally recognized place-names, under the control of national committees such as the US Board on Geographic Names. Less formal places, such as “downtown”, were left out of this formal, modernist world, and omitted from authoritative maps

(for a discussion of techniques for addressing vaguely defined places in the precise structure of GIS see Montello et al., 2003).

By the 1990s it had become clear that GIS was developing in a distinctly formal direction that moved it further and further from the vague world of human discourse: that GIS in many ways *imposed* itself on its users and their ways of thinking. Burrough and Frank (1996) published a collection of papers on the difficulties of dealing with vaguely defined objects, and a growing critique of GIS by social scientists (Pickles, 1995) often targeted the simplistic geometric assumptions of GIS. It was difficult to make room for vagueness, and the kinds of reasoning favored by people rather than scientists, in the rigid planimetrically controlled world of GIS.

The names people give to places and points of interest constitute a very significant form of geographic information, so it is surprising to note the lack of interest in the “names layer” in early GIS. The US National Spatial Data Infrastructure that emerged in the 1990s (National Research Council, 1993) did not list names as one of the seven most important types of geographic data. By the turn of the century, however, this omission was becoming glaring. Web services such as the Alexandria Digital Library (Goodchild, 2004), which offered to retrieve geographic information, needed to allow their users to refer to areas of interest by name, rather than by latitude and longitude. Several workshops were organized to draw attention to the importance of place-names and the need for associated research, and a special issue of the *International Journal of Geographical Information Science* on gazetteer research appeared in 2008 (Goodchild and Hill, 2008). But this interest in place-names proved to be part of a much larger rebalancing of the tension between the formal and the informal. Turner (2006) recognized this broader trend in the term *neogeography*, a new vision of the discipline in which everyone was both a consumer and producer of geographic information, and in which the distinction between expert and amateur was less and less clear. Maps could now be generated at essentially no cost, to meet needs that were individual, transitory, and presented through devices as small as a mobile phone. Maps no longer needed to present a “god’s eye” view, but could augment directly the user’s real-time perspective.

### 3. PROSPECTS FOR A PLATIAL PERSPECTIVE

In the previous sections my intent has been to paint a picture of the spatial perspective as precise and hostile to vagueness, planimetric, and scientifically replicable. But in the broader neogeographic world these properties may not be as important as they once seemed. Places certainly exist, though they may not be fixed in space, or have precisely defined or universally agreed boundaries. Routes exist between places, though their precise planform may not be as essential to human navigation as knowledge of intermediate points of interest. Indeed, the vast sums invested by mapping agencies over the past few centuries in the production of accurate planimetric maps may in the final analysis have benefited landowners and administrators more than everyday human tasks such as

wayfinding – and Everest’s painstaking survey of the Indian Great Arc (Keay, 2000) may have had more to do with imperial domination than with anything of immediate practical significance. Consider the famous Beck map of the London Underground, which freely distorts distances and directions, and yet provides a very effective source of information to travelers, so much so that its format has been almost universally adopted by the world’s public-transit systems.

One is reminded of this apparent obsession with planimetric control when visiting countries such as Japan, where almost every map created for use by tourists is schematic and non-planimetric. At one level this is frustrating, since one never knows quite how far it is from one place to another, or in exactly what direction, but at another level these diagrams can simplify the task of wayfinding enormously, by removing superfluous detail. In essence they are a prototype of what might become a platial approach, depicting places and their relative proximities and connections rather than their precise geometric positions. The spatial problem of indeterminate boundaries and positional uncertainty is thus resolved, and the primary mode of access is by name rather than by spatial position.

A platial representation of the geographic world would treat named places and points of interest as the primary entities, and would depict the topological relations between places, including connectivity and adjacency. It would not support the accurate measurement of distance or direction, especially between objects with spatial extent, thus avoiding a problem that spatial technologies have struggled with for decades and never satisfactorily resolved. It would not support the GIS functions of overlay or spatial join, which rely on accurate positioning of features in a metric space. In short, many of the functions of GIS would not be possible. On the other hand, a platial technology would have no problem providing driving directions, and would preserve a good enough approximation to planimetric accuracy to allow for the identification of nearby features and context, albeit with substantial uncertainty. It would represent hierarchical relationships, including part-whole aspects of places, for example “The Eiffel Tower is in Paris, on the Left Bank of the Seine”.

Humans have theorized about space for centuries, and we now have formal theories of geographic information (Goodchild et al., 2007) and formal principles such as those reviewed in the previous section. Place, on the other hand, has received far less attention, perhaps because of its implicit vagueness. But once one thinks beyond the rigidity of planimetric control, it seems possible to envision a theory of place that is possibly even richer. What, for example, is the relationship between the attributes of places and the attributes of their component places? To what extent is “Paris” related to “Eiffel Tower”, “Left Bank”, “Seine”, etc.? What metrics of separation are appropriate to a platial perspective, and how do they relate to topological relationships and intervening places? What is the platial equivalent of the principle that “nearby things are more similar than distant things”? Answers to some of these questions, and more generally the development of a set of platial technologies to parallel the spatial ones, would do much to bring us closer to the ways humans think about and discuss

the geographic world – in short, to realize the vision of neogeography. Perhaps it is also possible to imagine a platially integrated social science.

Implicit in the modernist thinking that lies behind official gazetteers is the notion that there should be one, unique, authoritative view of the world, and that maps can play an important role in achieving that goal. It comes as something of a surprise to many people, therefore, that there are still disputes over boundaries and place-names in the world of the 21st Century. Microsoft's Encarta precipitated some diplomatic incidents in the 1990s, and similar events have occurred recently over Google's services. As a result, today maps.google.com depicts many of the international boundaries in the Himalayan region as disputed, including the boundaries of Kashmir and of Arunachal Pradesh. A user in India is automatically diverted, however, to google.com.in and presented with a map showing the official Indian policy, that Kashmir and Arunachal Pradesh are parts of India – and a user in China is diverted to google.cn and shown Arunachal Pradesh as Chinese territory. Computing technology finds it easy to adapt to the post-modern world in which maps are functions not only of what is depicted, but also of who is doing the depicting. A comparison of versions of Wikipedia in various languages, for example, reveals interesting differences of perspective in responses to such questions as "Which are the world's greatest lakes?".

This suggests a rather different approach to the gazetteer from the traditional authoritative one. In essence a gazetteer should be a source of *binary* geographic information, representing the relationships between features on the Earth's surface, the names given to them, and the regions where those names are used, instead of the traditional *unary* form that recognizes only the feature and its official, universal name.

## CONCLUSION

The geographic information technologies that have evolved over the past few decades have addressed only half of the space/place dichotomy, and dealt with place only to the extent that it can be treated spatially. The modernist perspective of the authoritative mapping agencies has reinforced this perspective, insisting on precisely defined boundaries of features and accurate planimetric control. The result has been a set of technologies that have imposed themselves on human society, requiring their users to learn and employ specific modes of thinking, rather than adapting themselves to the realities of human discourse and thought.

In this paper we have argued that recent trends, including the emergence of neogeography, have provided the motivation for a re-examination of the platial perspective, and the possibility of a set of technologies designed to support it. We have also outlined the kinds of questions that might be addressed by a theory of place that is as powerful as the theory of space that underlies our current geographic information technologies, and the possibility of a platially integrated social science that might be more consistent with theories of social process.

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## CHAPTER 5

# Imagining Space and the Problem of Territory

Kevin COX

Anglophone human geography has witnessed dramatic changes over the last fifty years or so. These changes started with the spatial-quantitative revolution in the late 1950s and early 1960s. Spatial-quantitative work was subsequently criticized from the standpoint of critical social theory and this introduced power as a theoretical concern into human geography's lexicon for the first time. This has been the backdrop for a theoretical interest in territory and territoriality.

Territory as a theoretical issue is therefore quite recent. It had made a much earlier appearance in the writings of academic geographers in the form of geopolitics. The writings of Ratzel, Mackinder and Bowman all come to mind. Ratzel is forever associated with the idea of *Lebensraum*. Mackinder is about territorial conflict from the standpoint of a declining hegemon at a time in which empire could no longer be expanded without impinging on the empires of others. Bowman was much more modern in his approach, anticipating the imperialism of trade, but that he was about spheres of influence and therefore territory should not be in doubt. These writings, however, were firmly set within what might reasonably be called human geography's pre-theoretical stage. There is certainly theory in them but its protagonists were quite unaware of the fact.

Anglo-American geography, at least, became a theoretical field in the late 1950s to early 1960s. This foregrounded a concept of space as relative. In contrast to conceptions of space as absolute which assumed that it could exist in and of itself, it was now recognized that it was constituted by the material. Without matter it was impossible to talk about distance, movement, accessibility or connection. Empty space was nothing and hence could not exist. A concept of relative space had certainly been present in human geography. To talk about environment or spatial distribution is to invoke ideas of relative location. What had changed with

the spatial-quantitative revolution is that relative space now became something to theorize. William Bunge's *Theoretical Geography* is a brilliant example of this. A more specific concept of relative space also emerged. In accordance with the needs of a then burgeoning planning field, this focused on the problem of location: not just the location of towns and industries but also the location choices of shoppers, migrants, commuters, the residentially mobile and the like. In other words, location was to be conceptualized in terms of fields of movement. Subsequently one could calculate relations between movement and relative location, as in the gravity model, or optimal allocations of movements to places, as in the so-called transportation problem. Territory by now had become entirely foreign to the field. No-one talked about it and no-one seemed interested.

Only with the discovery, or more accurately re-discovery, of power in the early 1970s does territory start to re-appear, and this time as a theoretical object of interest. The initial move in this direction was from Julian Wolpert. Wolpert had been central to the spatial-quantitative work and in fact had an appointment in a field closely allied with quantitative geography, regional science. From the late 1960s on, though, he started pondering the fact of conflict around location: the way in which certain locations – freeways, hospital expansions – were opposed by the people who were going to be displaced by them; an attempt to exclude these uses, therefore, and so introducing the idea of territory, though without actually naming it as such.

The other person important at this stage is Torsten Hagerstrand. In an absolutely crucial paper he had this to say: "I wonder if it is not true to say that we have been so exclusively interested in the distributional arrangements of things and quantities in a relative locational sense that we have tended to overlook the space-consuming properties of phenomena and the consequences for their ordering which these properties imply. The frequently-quoted definition of geography as a 'discipline in distance'... gives no hint of a concern for spatial competition, for the 'pecking order' between structures seeking spatial accommodation" (Hagerstrand, 1973, p. 70).

While we might take exception to his reference to spatial competition – for a concept of spatial competition was in fact at the heart of location theory, though a very particular one, as we will see – his focus on space as room rather than distance is again, as with Wolpert, highly suggestive of territory as somehow a missing dimension of spatial analysis.

With this as historical background let me turn to the papers that I was asked to discuss. Interestingly three of them seem to have been written from a standpoint within spatial or locational analysis. With respect to territory there seems to me to be in those papers an explicit assumption of separation. Territory and territoriality are seen as emergent objects that are fundamentally different from those of spatial interaction and location. The question is one of assimilation of the latter to the former: to make territory at least an object of spatial analysis and therefore to subordinate it to logics of relative space. This is very clear in Helen Couclelis' paper and implicit in those of Denise Pumain and Michael Goodchild and Linna Li. What I am

going to argue is that that particular project is not feasible. Rather there is another, different concept of space to which questions of territory and territoriality, spatial interaction and location should all be subordinated if we are to deepen our understandings of human geography. This is one of space as relational: space is now conceived in relation to social relations and those social relations in turn in relation to space.

One way of broaching this issue is to point out how spatial or locational analysis was constituted by a set of silences or exclusions; ones that turn out to be interrelated.

The first has to do with *power*. In the theory bequeathed by quantitative geography there is no room for power. Its substance theory as expressed in central place or land rent theory was borrowed from the field on which human geography was at that time trying to model itself: economics. In mainstream economic theory positions of power cancel each other out. Competition means that no one has the power to determine the prices that others will pay; hence my objection to Hagerstrand's reference to spatial competition in the quotation above. Only thus do the spatial equilibria of quantitative geography make sense.

The second silence was that of *spatial inertia*. The focus of spatial-quantitative geography was on movement and by and large that continues to be the case. Locations were always seen as movement-minimizing. What this neglects, though, is that locations also have an element of inertia. While at some point in their history they might be movement-minimizing, they may be overtaken by changes elsewhere so that that particular advantage evaporates and becomes a problem: a problem because of all the social and physical investments that have been made in place. It is certainly true that spatial inertia has long been part of the geographer's lexicon: Mackinder was talking about it as early as 1907. But it was not part of the theorizing of spatial-quantitative geography. Moreover, only by ignoring it can the notion of de-territorialization have any plausibility.

The third is *space as room*, as referred to above. For spatial-quantitative geography space has been largely understood as barrier: something to be overcome, as in the so-called "friction of distance". Movement, however, needs room: movement occurs within particular spaces like urban regions and nation states. The only way in which this was registered, though, was first, through the calculation of boundary effects, as in the difference jurisdictional boundaries made to the intercept and slope of a gravity model (Mackay, 1958; Logan, 1968); and second a demonstration of the way in which the shape of a state territory influences the distribution of migration distances within it (Taylor, 1971)<sup>1</sup>.

The final silence was the *qualitative*. Spatial analysis was seen as through-and-through quantitative. Science was about measurement. We could develop theories through the accumulation of empirical regularities which were to be evaluated quantitatively. The qualitative, as in the qualities of the objects of analysis, including the people doing the locating, were of secondary importance. There is a strong sense of this again in Helen Couclelis' paper where

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1 For boundary effects in general see Cox (1972), Chapter 7.

she sees the fact of agency as bound up with territory and territoriality but as having nothing to do with classical spatial analysis. In light of the way in which particular individuals have, through their innovations, changed spatial relations –McLean and the container or Ohno and just-in-time are two examples that spring to mind – this strikes me as an odd conclusion. This, however, would be to anticipate the remainder of this paper.

To return to Hagerstrand and the idea of accommodation or making room: exactly what is one making room for? What Hagerstrand had particularly in mind was what he called the time-space projects through which concrete objects like a national park, a new town, a shopping center or an apartment complex came about. I think that it is also useful, though, to extend the idea to making space for movements. By this I don't just mean the space entailed by lines of transportation like highways, airports, stations, cars and airplanes, though that is surely important, but also spaces in a more obvious territorial sense; more obvious because of the connection with power. Movement over long distances is taken for granted. Compared with the Middle Ages and the fragmentation of the feudal polity this seems reasonable enough. But it is emphatically subject to regulation within a delimited jurisdictional space that we commonly associate with the idea of territory: licenses to drive, to transport goods across American state lines – constitutionally entailed by the so-called "freedom of commerce" clause. And in addition, of course, a body of state law, including the right of eminent domain underpins the provision of highways, railroads, airports and other associated installations.

One can imagine, therefore, as indeed did Hagerstrand, a hierarchy of projects, all depending upon some set of conventions or laws that allow the consumption of space. A shopping center project depends on property transactions which in turn are secured by the state. It also depends, though, on other projects which, while superordinate are also subordinate to the state. Local governments zone land but only in virtue of the delegation of that power by central branches of the state. Likewise there are the countless ways in which the state mitigates transaction costs so that the shopping center will, in fact, attract customers; simple regulations like those pertaining to weights and measures or opening and closing times and liquor laws.

Power is obviously crucial to these relations. Property companies assemble land for shopping centers but that requires the social power of money. A property company's profitability in past ventures will help attract loan finance from banks. Front companies may have to be formed to conceal the assembling activity from property owners who would otherwise hold out. The simple size of the project can help smooth the way by providing an incentive to the local government that will benefit from taxes to provide any complementary infrastructure as well as the necessary re-zonings and to override the objections of small retailers who will likely go bankrupt as a result of the project. All of this is secured by the state; not just its protection of property rights but any competition laws that it has legislated.

Once in place, though, spatial inertia becomes a salient consideration. Shopping centers represent massive investments of long life. Long before the loans have been retired new,

more modern versions may have come into being in the vicinity, attracting away customers and threatening property company, bank lenders and the local government that has invested money in the requisite physical infrastructure: highways, water and sewer extensions in particular. The shopping center is now something to be protected and the newer one something to be excluded or pushed beyond that limit at which it is a competitive threat. The tension between the mobility of capital in the form of a new, more modern shopping center and the spatial inertia of the old is palpable. The circulation of capital becomes the object of concern; something to be frozen by the assertion of territoriality.

Through its concept of relative spatial analysis developed what are in retrospect, questionable abstractions; abstraction from questions of power, from the fact of spatial inertia, and from Hagerstrand's problem of making room. From one point of view, though, they were necessary abstractions. Only thus could quantitative geography act as a handmaiden to the technocratic project that was post-war planning and which, of course, continues; something that Robert Sack ignored when he claimed, as cited by Helen Couclelis, that "the logic of distance" is not "embedded in social relations". This does not mean to say that a conception of space as relative is illegitimate. What it means, though, is that any assumption that it can be apolitical is, at the very least highly dubious.

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**1.2**

**Foreign experiences**

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## CHAPTER 6

# A scientific trajectory in territorial sciences: the recent Italian experience

Roberto CAMAGNI

The relevant scientific programme launched by the Collège international des sciences du territoire, namely “*Fonder les sciences du territoire*”, implies a huge challenge on the theoretical and conceptual level. First of all, it builds around the concept of territory, something relatively familiar – though seldom properly defined – in the southern European scientific tradition but relatively unusual in the anglo-saxon tradition. Secondly, it implies a new convergence, integration and re-composition among a wide array of disciplines, going far beyond the disciplines already cooperating inside the regional science paradigm: anthropology, social psychology, social and political science, ethnology, environment sciences are supposed to pursue a superior synthesis and integration with economics – spatial, international, development, transport and industrial economics –, geography – human, urban, quantitative geography –, mathematical ecology and system sciences.

In order to contribute to this collective effort and relevant goal, so widely felt as necessary today in many disciplinary contexts and countries, the Italian recent scientific trajectory in spatial and territorial sciences will be briefly presented, and, inside it, the scientific trajectory of the Milan spatial development school, deeply involved in the national and international debate and scientific reflection<sup>1</sup>.

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1 The ‘Milan school’, animated by this author, is probably the only one in Italy, together with the Turin geographical school animated by Beppe Dematteis, with some persistence in time – it has reached a third generation of scholars – and sufficient internal complexity and differentiation.

Belong to this cohesive core group Roberta Capello and Tomaso Pompili in the second generation, and Ugo Fratesi, Camilla Lenzi, Andrea Caragliu, Giovanni Perucca in the third generation; other scholars kept a link for some time: Roberta Rabellotti, Marco Mutti, Carlo Salone, Francesca Gambarotto, Alessia Spairani.

## **1. 1980-1995: THE SEASON OF INTER-DISCIPLINARY CO-OPERATION AND SYNERGY**

In 1980 the Italian Association of Regional Science was funded, with strong linkages with the International Regional Science Association and the other European sister-associations. This was a relevant scientific event in Italy: disciplines that were totally separated began to interact and cooperate. Economists, planners, geographers, system scientists and scholars involved in the long standing tradition of studies and inquiries on the Mezzogiorno merged their forces in an innovative endeavor, encompassing the organization of the annual conference, workshops and seminars, the creation of a collection in Scienze Regionali (nowadays rich of more than forty titles) and the organization, during the 1980s, of an annual spring course in Capri addressed to planners and civil servants in regional development.

This was a quantum jump in scientific terms, as cross-fertilization happened in many fields concerned with territorial matters and a true inter-disciplinary work was carried out, with the creation of integrated concepts as those of industrial district (Bagnasco, 1977; Becattini, 1979; Camagni and Capello, 1990), *milieu innovateur* (Camagni, 1991), *réseaux de villes* (Dematteis, 1985; Camagni, 1992a; Camagni et al., 1994) and the development of innovative, integrated models in urban dynamics in the new wave of the self-organization and complexity approach (Camagni et al., 1986; Camagni and Diappi, 1991).

Far from traditional, mainstream approaches in economics, pervasive at that time, economic space was defined as a “relational space”: “the set of functional and hierarchical relations that happen on geographical space” (Camagni, 1980, p. 183). And the role of proximity space (in districts, clusters, *milieux*, local production systems...) was defined as an “uncertainty-reducing operator” in innovation activities, through its functions of socialised transcoder of information, of cooperation enhancing device in collective actions and of cognitive substrate – represented mainly by the local labour market – on which processes of collective learning embed (Camagni, 1991).

The textbook of urban economics by this author, published in Italian in 1992 and in French and Spanish subsequently (1995 and 2000) (Camagni, 1992b) was an example of this integrative – and perhaps eclectic – effort: in spite of its economic nature, the reflection included pieces of urban geography, urban planning, mathematical ecology, catastrophe and complexity theory. Mainly building on the classical economic theory, and in particular on Ricardo’s and Marx’s theory of urban land rent, the theorization included pieces of neoclassical economic theory (as the ‘new urban economics’), schumpeterian dynamic elements linked to innovation processes, a critique of recent marxist theory of land rent, an integrated dynamic model of urban life cycle based on the biological model of prey-predator interaction, an integrated self-organization dynamic model of evolution of urban hierarchy (Pumain et al., 1989) based on urban schumpeterian innovation processes.

Even more important for the Italian context, perhaps, was the creation of a new language in official spatial planning and regional programming documents, through the use of more

integrated approaches and the inclusion of economic development and sociological aspects in urban plans. Due to increased complexity and multi-dimensionality in analysis and research, efficiency in planning operations did not increase probably, but interpretative power of real processes and perhaps decision-making effectiveness did.

## 2. 1995-2010: THE SEASON OF DISCIPLINARY RE-FOCALIZATION

The following fifteen years were initially characterized by a sentiment of crisis in regional science, particularly present at the international level. Perhaps inter-disciplinary integration had gone too far, and complexity was more pretended than really implemented in scientific terms.

The scientific answer in my opinion was a re-focalization in disciplinary approaches, with increasing integration inside single disciplines rather than among different disciplines. The seeds spread around in the previous season were so many and so diversified that more time was needed to incorporate or digest them properly inside the single disciplinary contexts, and to reorient them in order to meet the new challenges of the incoming century.

Still with a prominent consideration of the Milan spatial economics and development school, four major scientific steps may be identified.

Firstly, the explicit consideration of the concept of “territory”, distinct and far richer than abstract “space”, as central for economic disciplines. This consideration could be interpreted – as far as economics is concerned – as a cognitive jump that may find its roots in different theoretical elements, namely:

- the theory of bounded rationality and decision-making under conditions of uncertainty, from the seminal contributions of Malmgren and Simon (Malmgren, 1961; Simon, 1972) to their application to industrial innovation (Dosi, 1982);
- the institutional approach to economic theory, based on a “theory of contracts”, emphasizing the importance of rules and behavioural codes, of institutions that “embed transactions in more protective governance structures” (Williamson, 2002, p. 439), reducing conflicts and allowing the realization of mutual advantages from exchange;
- the cognitive approach to district economies and synergies, encompassing the Italian school (Becattini, 1979), the French “proximity” approach (Rallet and Torre, 1995; Gilly and Torre, 2000), the GREMI approach to local innovative environments or milieux (Camagni, 1991; Camagni and Maillat, 2006), Michael Storper’s concept of “untraded interdependencies” (Storper, 1995).

Territory, as distinct from (abstract) “space” or (internally homogeneous) “region”, was defined as (Camagni, 2002):

- a system of assets and localized externalities, both pecuniary (where their advantages are appropriated through market transactions) and technological (when advantages are exploited by simple proximity to the source);
- a system of localized production activities, traditions, skills and know-how;

- a system of localized, proximity relationships, which constitute a “capital” – of a social, psychological and political nature – in that it enhances efficiency and innovativeness of local factors,
- a system of cultural elements and values which attribute sense and meaning to local practices and structures and define local identities; they acquire an economic value whenever they either can be transformed into marketable products – goods, services and assets – or boost internal capability of exploitation of local potentials;
- a system of rules and practices defining a local governance model.

The second scientific step, directly deriving from the previous one, was the convergence between formalized economic models of endogenous development (*à la* Lucas or Romer) and qualitative, up to that time un-formalized, endogenous development theorizations on districts, *milieux* and proximity relations. This convergence was explicitly advocated by Roberta Capello in her textbook on regional economics (Capello, 2007a), and realized, for example, in econometric exercises and measurements on *milieu* effects and collective learning processes (Camagni and Capello, 2002).

The third step allowed to complete the theoretical trajectory previously indicated, with the proposal, the use and the establishment of the concept of “territorial capital”, almost implicit in the previous definition of territory. Initially proposed by the OECD (2001) as a list of spatial specificities with notable meaning and role in regional development, and subsequently re-launched by the European Commission (2005) inside a general policy strategy proposal (making the best use of each region’s “territorial capital”), the concept was recently structured into a taxonomy of assets, both material and immaterial<sup>2</sup> and defined as “the set of localized assets – material and immaterial, natural and artificial, public and private, productive and social, physical, relational and cognitive – that represent the competitiveness potential of a given territory” (Camagni, 2009).

The analogy with a neoclassical production function is clear, as a supply-oriented approach is (rightly) chosen: an acceptable disaggregated production function with heterogeneous capital, taking in full evidence the elements traditionally considered as a residual, as “technical progress” in Solow’s aggregate production function<sup>3</sup>. But dissimilarities and novelties are paramount. Context conditions are analytically pinpointed, going far beyond the traditional stylized factors of capital and labour. More generally, a cognitive approach is substituting for the traditional functional approach, showing how cause-effect, deterministic relationships should give way to other kinds of complex, inter-subjective relationships which impinge on the way economic agents perceive economic reality, are receptive to external stimuli, can react

2 The taxonomy crossed two dimensions: materiality (material, immaterial and mixed goods) and rivalry (public goods, private goods and a third class of impure public goods and club goods), giving rise to nine different classes of territorial capital assets (Camagni, 2009), including human and social capital, infrastructure, public goods and urbanization economies, natural and artificial capital assets, cooperation and governance capabilities.

3 The traditional production function approach interprets regional (or national) GDP as a function of labour and aggregate capital stock availability, leaving the non-explained residual, generally very high, in a generic box encompassing the effect of some (unmeasured) factors that increase efficiency of the two explicit production factors, labour and capital (called “technical progress”). In our approach, regional capital stock is broken down in its different and heterogeneous components, measured in physical terms, bringing explicitly into the picture the single territorial specificities that are supposed to generate GDP growth.

creatively, are able to co-operate and work synergetically. Local competitiveness is interpreted as residing in creativity rather than in pure presence of skilled labour; in local trust and sense of belonging rather than in pure availability of capital; in connectivity and relationality more than in pure accessibility; in local identity, beyond local efficiency and quality of life.

As a fourth step, the concept of territorial capital was made operational through the construction of comprehensive and consistent data bases on territorial capital assets, both for Italian NUTS 3 regions (provinces) and for European NUTS 2 and NUTS 3 regions, and through the construction of an innovative econometric model called MASST – macroeconomic, sectoral, social and territorial model, applied to European regions, both NUTS 2 regions (Capello, 2007b; Capello et al., 2008) and NUTS 3 (Camagni and Capello, 2011). The conjecture about the relevance of territorial capital proved sensible and useful, and was utilized for explaining the differential performance of provinces or sub-regions with respect to their respective regions (Camagni and Capello, 2011; Perucca, 2012). Not just space but territory matters!

A similar theoretical and empirical application of the territorial capital concept was carried out concerning the role, structure, size and performance of cities. Cities (as territorial archetypes) are interpreted as special and advanced forms of local milieu, particularly engaged in front-line competition on knowledge and innovation creation, thanks to their internal and external network relationships, social capital and synergy among high-level education and research facilities and advanced firms (Camagni, 2004). Similarly, inside the literature on “optimal city-size”, the presence of differentiated endowment of territorial capital – and in particular of advanced functions, cultural and environmental amenities, efficient and compact urban form and international cooperation networks – is empirically utilized to inspect each city’s equilibrium size through a micro-funded model, estimated for 56 European cities and 100 Italian cities (Camagni et al., 2012).

### 3. PROSPECTS AHEAD: AN ENLARGED DISCIPLINARY RE-COMPOSITION

In December 2011 a general assembly of scholars in territorial matters gave rise to the Italian *Società dei Territorialisti* (Association of Territorialists)<sup>4</sup>, thanks to the scientific and organizational passionate action of Alberto Magnaghi. The Association aims at a larger inter-disciplinary integration and co-operation, adding to the already organized community of regional scientists a good share of the existing, traditionally self-referential, community of planners, and, beyond that, scholars operating on environmental matters, geographers, cultural anthropologists, political scientists, historians, specialists in landscape planning, designers, architects, geo-philosophers. The project, interestingly enough, looks very much similar to the one launched by the GIS Collège international des sciences du territoire.

The main goal of the Association, expressed in its Manifesto, is a recomposition of disciplinary approaches and knowledge around the territory, within a humanistic approach starting

4 [www.societadeiterritorialisti.it](http://www.societadeiterritorialisti.it)

from the culture of places. The scientific starting point is the evidence of the inadequacy of mainstream economic disciplines, which ended up becoming a “technology of growth”, more and more detached from the goal of social wellbeing: its “ignorance or refuse of the idea of a necessary co-evolution of production and distribution processes with the cultural evolution of the human agent and with the transformation of living environments in our planet” calls for a superior disciplinary integration.

The main principles:

- the territory as a common good, result of long-term co-evolutionary processes of the human and the natural environments;
- the inseparable link between nature and culture, territory and history;
- the centrality of immaterial or intangible capital/patrimony, made up of deposits of knowledge, know-how and competences, local cognitive capital, industrial atmosphere, entrepreneurial and institutional capabilities, local reproduction systems, life-styles, identities and values;
- the necessary reconstruction of the relationship between nature, rurality and urbanity;
- the centrality of the local dimension, with its peculiarity, identity and uniqueness;
- the dynamic nature of local identities, which represent a potential, a chance, a project for a possible future;
- the role of an active citizenship, in the direction of new self-sustainable models of society;
- the relevance of social wellbeing as *joie de vivre*, public happiness, *buen vivir*;
- a necessary recomposition of scientific disciplinary knowledge (*savoirs*), in cooperation with similar international associations.

The goal is clear: to give rise to a new scientific paradigm (and to new think-tanks too). What is now needed is a rigorous methodology, clear hypotheses and definitions, willingness to listen and integrate, selection capability of concepts, avoiding holistic terminology and the risk of a territorial rhetoric.

Starting from the territory is crucial, not just because it encompasses the material and immaterial assets on which competitiveness and wellbeing of people rests, but because it involves the actors (including an active citizenship) which are the inescapable agents of regional and local transformation processes.

The road is open for a fruitful French-Italian co-operation!

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## CHAPTER 7

# Territorial sciences in Germany

Christian SCHULZ

A few years ago, a major German television channel aired an interview with a professor of human geography on the evening news. The professor in question – the then President of the *Verband der Geographen an Deutschen Hochschulen* (VGDH, the Association of Geographers at German Universities) – spoke eloquently and with great authority on a news story about spatial planning. To my surprise, the professor was described as a *Raumwissenschaftler*, or “researcher in territorial sciences”. I do not know whether the term was his idea or the suggestion of the journalist, though the latter seems more likely. While the choice of words may seem intriguing, it is important to emphasize that the field referred to by the term *Raumwissenschaftler* is neither an established discipline nor a standard job title in Germany. However, the generic term is commonly used in specialist circles and in higher education policy, which sometimes includes disciplines such as geography and spatial planning under the broad label of “territorial sciences”. The term – a product of the promotion of territorial research in the media – is clearly more useful than the traditional, *cliché-laden* names and labels given to disciplines.

While it is important not to overstate the importance of this isolated instance, and without wishing to emphasize the broader context of media promotion, I suggest that this anecdote provides a useful starting point for an examination of the current state of the “territorial sciences” in Germany. This chapter begins by examining a range of terminological and historical questions. It will then examine current conceptual debates before focusing on the broader political and institutional context. The chapter concludes by considering the potential for further research and development in this area and the future challenges of the “territorial sciences”. Although every effort has been made to adopt a neutral position outside the discipline, my expertise in human geography will become apparent. However, this should not be seen as a sign of hegemonic interests, but is merely the inevitable consequence of my particular research interests and expertise.

## 1. THE RAUMWISSENSCHAFTEN: TERMINOLOGY AND COMPONENTS

A native German speaker would translate *Raumwissenschaften* as “spatial sciences”, not “territorial sciences”. In German, the term “territory” is more closely associated with a clearly defined and politically delimited area of physical space (i.e. the national territory of a state or the territory of a commune), but without the many nuances of modern spatial concepts (i.e. social space, relational space, discursively constructed space, virtual space, etc.). As shown by international uses of the term, and in particular by its uses in the debates surrounding EU territorial cohesion policy (*territoriale Kohäsion*), the meaning of “territory” has changed significantly in recent years (see below). To avoid any misunderstanding, I will only use the term *Raumwissenschaften* in the remainder of this chapter.

As I noted above, the field known as *Raumwissenschaften* is generally thought to include geography (both physical and human geography), *Raumplanung* (spatial planning) and, in the broad sense, regional economics, urban sociology, ecology and landscape planning. In Germany, the spatial turn in the humanities and social sciences – a turn also found in other countries – is increasingly shaping theoretical debates in these areas (Ahrens, 2001; Döring and Thielmann, 2008).

## 2. THEORETICAL DEBATES

A distinction can be made between two broad types of conceptual or theoretical approaches among the *Raumwissenschaften*:

- a range of approaches focused on location models and functional relationships and devoted primarily to quantitative spatial analysis and spatial modeling (including econometric methods and simulation and forecasting); also included in this group are various areas of physical geography involving methods largely based on positivism and the natural sciences;
- an approach inspired by the social sciences and the institutional theory of the spatial dimension of human activity, i.e. how man pervades, transforms and socially constructs spaces.

The second approach offers much potential for interdisciplinary cooperation, as suggested by the concept of *alltägliche Regionalisierungen* (everyday regionalization) and the *relationale Wirtschaftsgeographie* approach (relational economic geography).

The social, cultural and human sciences with an interest in spatial issues have also sought inspiration from social geography and its concept of *Geographie der alltäglichen Regionalisierungen*, developed by Benno Werlen (see Werlen, 1988). His concept is based on a perspective grounded in action theory, which assigns all spatial models – including socially constructed spaces and spatial perceptions – to the activity of *Geographie-Machen* (or “geography-making”) performed by individuals. This view has led to a radical shift in

the conceptualization of space, not only in social geography, but also in other sub-disciplines of human geography and in various areas of sociological and anthropological spatial research.

In recent years, German economic geography has been heavily influenced by research on the relational interpretation of spatial structures and processes (Bathelt and Glücker, 2003). As shown by the above example, this approach represents a departure from both the Euclidean model involving contiguous spatial units or divisions and the role of geometric distances – traditionally a dominant factor – in the explanation of spatial economic models. Its primary objective is to examine the relational aspects of the system of relationships between (economic) actors and the institutions and conventions that shape them, from a social science perspective. It also construes the issues surrounding knowledge transfer, learning, and reputation and trust as explanatory factors of exchange relationships, local behavior and the spirit of entrepreneurial innovation.

In the same way as the cultural turn in human geography, the spatial turn in the humanities and social sciences has led to a conceptual rapprochement between disciplines and an increased emphasis on interdisciplinary collaboration. However, traditional disciplinary roots and affiliations are still clearly visible in current research and scholarship. Post- or transdisciplinary perspectives remain uncommon and are often only apparent in the biographies and career trajectories of multidisciplinary researchers. The limits of interdisciplinary exchange are particularly apparent when humanities researchers use concepts from spatial geography fragmentarily or when social science disciplines use obsolete geographical concepts (for example, when they operate on the basis of a purely geometric understanding of space).

### 3. THE INSTITUTIONAL CONTEXT

Despite some degree of conceptual overlapping, research in the *Raumwissenschaften* in German universities remains firmly grounded in traditional disciplinary categories, though specific labels vary according to the geographical location of institutions. For example, spatial planning is mainly taught in engineering departments in technical universities, while geography tends to be more difficult to locate. Depending on the origins of the discipline in universities, geography is generally part of the *Mathematisch-Naturwissenschaftliche Fakultät* (faculty of science) or the *Philosophische Fakultät* (faculty of arts). In the first case, spatial planning is generally linked to the *Fachbereich* (training and research department) of geosciences and earth sciences, while in the second case it is part of the social sciences (i.e. empirical social sciences). The current classification system rarely reflects the real weight of physical or human geography in the corresponding institutes, but is explained by the historical and political context of the university system. Some institutes of social and economic geography are based in faculties of economics, while the institutes of faculties of pedagogy or of universities of education (the *Pädagogische Hochschulen*) devoted to disciplinary didactics are a special case.

The formal institutionalization of the *Raumwissenschaften* has advanced most rapidly in extra-university research institutions. Examples include the *4R-Institute* of the renowned *Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e.V.* (WGL), an association of 87 extra-university research institutes throughout Germany:

– The *Leibniz-Institut für Länderkunde* (IfL) in Leipzig conducts fundamental research on the regional geography of Germany and Europe and provides regional geographic data aimed at a broad audience. The IfL houses the *Geographische Zentralbibliothek*, in addition to important geographic archives<sup>1</sup>.

– The *Leibniz-Institut für ökologische Raumentwicklung* (IÖR) in Dresden focuses primarily on the environmental and ecological issues related to sustainable development and aims to develop the scientific foundations of environmentally friendly urban and regional sustainable development at both national and international levels<sup>2</sup>.

– The *Leibniz-Institut für Regionalentwicklung und Strukturplanung* (IRS), based in Erkner near Berlin, conducts research on the regulation and development of cities and regions using micro- and macroscopic approaches in the social sciences through interdisciplinary research teams and studies the main areas of research from a long-term perspective. It also has a rich collection on the history of construction and planning in the GDR<sup>3</sup>.

– The *Akademie für Raumforschung und Landesplanung* (Academy for Spatial Research and Planning, or ARL) in Hanover specializes in the *Raumwissenschaften*, focusing on issues related to sustainable spatial planning and development. From a structural point of view, the ARL differs from the other institutes in that, alongside the Hanover site, the research conducted by the ARL is mainly based on the contributions of voluntary members from the academic world or spatial planning practitioners involved in regional working groups and expert committees<sup>4</sup>.

Within the WGL, the four institutes form *Sektion B – Wirtschafts- und Sozialwissenschaften, Raumwissenschaften*, in conjunction with various institutions specializing in economics and the social sciences.

The four institutes receive public funding from the federal authorities and federated states. For example, the IfL in Leibniz is currently funded by the federal state and the Free State of Saxony. All of the institutes are regularly assessed.

Since 2005, the four institutes forming the *Raumwissenschaftliches Netzwerk 4R* within the WGL have held a biennial conference devoted to current issues in the field of spatial planning. The conference is open to representatives of the political, academic, and administrative worlds and the general public. Between 2006 and 2010, and in conjunction with the *Bundesinstitut für Bau-, Stadt- und Raumforschung* (BBSR), a public body similar to DATAR in France, the institutes published a report entitled the “German Annual of Spatial Research

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1 For further details, see [www.ifl-leipzig.de](http://www.ifl-leipzig.de)

2 See [www.ioer.de](http://www.ioer.de)

3 See [irs-net.de](http://irs-net.de)

4 See [www.arl.net.de](http://www.arl.net.de)

and Policy”. Published in English, the purpose of the annual was to examine current debates in the area of *Raumwissenschaften*, illustrated through original conceptual and empirical papers. For example, the latest edition of the annual focused on the issue of *Urban Regional Resilience* (Müller, 2011). In future, the annual overview will no longer appear as a book but will be published in the form of thematic issues of the journal *Raumforschung und Raumordnung* (in English).

The network has recently expanded to include an institution associated with the *Leibniz-Gemeinschaft*, the ILS (*Institut für Landes- und Stadtentwicklungsforschung*), based in Dortmund, resulting in the creation of the *5R-Netzwerk*. In addition to the *5R-Netzwerk*, there is also a platform known as “*10R*” designed to bring together the five institutes in addition to five other extra-university research centers.

Figure 1. The 4R Network and the location of spatial research centers in Germany



Source: [www.4r-netzwerk.de](http://www.4r-netzwerk.de)

In the classification system used by the main funder of independent research projects in German universities and public research institutions, the *Deutsche Forschungsgemeinschaft* (DFG, roughly the equivalent of the ANR in France), the *Raumwissenschaften* are not defined as a disciplinary “unit”. Geography is included in the specialized field of geosciences by virtue of the role of physical geography and is considered to be a natural science (*Wissenschaftsbereich 3*), while spatial planning is part of engineering science (*Wissenschaftsbereich 4*). The various other disciplines that could potentially be incorporated into the territorial sciences (i.e. cultural studies, ethnology, sociology, history, political science and economics) are included in the humanities and social sciences (*Wissenschaftsbereich 1*).

The current classification system has an impact on the allocation and distribution of research funds across the different disciplines. The fact that the *Fachkollegien* (the elected committees responsible for selecting expert evaluators) are governed by the same classification system is a major issue for common research projects in the territorial sciences and interdisciplinary research projects, a problem compounded by the fact that by funding the *Sonderforschungsbereiche*, the *Forchergruppen* and, in particular, the *Graduiertenkollegs*, the DFG supports project structures that generally operate on an interdisciplinary basis. Expert panels are generally set up accordingly.

The second main source of funding for public research projects in Germany, the *Bundesministerium für Bildung und Forschung* (BMBF, the Federal Ministry of Education and Research), also plays a key role. Unlike the DFG, which is specifically designed to fund fundamental research and does not issue thematic calls for proposals, the BMBF develops research programs and issues calls for proposals focusing on important current issues. Many of these calls are related in some way to the territorial sciences. Another example is the *Programm zur Stärkung und Weiterentwicklung der Regionalstudien* (area studies), or “program for the promotion and development of area studies”, created in 2008. Funding in this area is designed to improve networking, primarily in institutes and research centers in the humanities, with a view to perfecting the *Fernkompetenz* of Germany in relation to the different regions of the world.

#### **4. FUTURE PERSPECTIVES AND CONCLUSIONS**

This brief overview shows that despite the increasing interconnectedness of research questions, concepts and methodologies in the territorial sciences, the institutional framework of the new field continues to be largely governed by traditional disciplinary boundaries, classifications and groups. However justifiable or necessary it may seem from the point of view of disciplinary policy, this approach can prove problematic, particularly in terms of research funding.

In the context of the Bologna process, the reform of higher education, and in particular the development of thematic masters extending beyond traditional disciplinary boundaries (e.g. sustainable development, risk assessment, development studies, tourism, urban development and European studies), has highlighted potential opportunities for cross-disciplinary collaboration and networking in higher schools. Whether they are the result of proactive efforts driven by a belief in interdisciplinarity or were adopted by force of circumstances because of the limited resources of small institutes, which are only able to offer masters programs in collaboration with other disciplines, these developments have opened new conceptual perspectives and resulted in the development of new methodological approaches, providing students with a broader understanding of spatial research.

The increasing internationalization of research, teaching and political consulting should foster a new rapprochement between the various disciplines involved in the territorial sciences. Disciplinary boundaries and traditions vary from one country to another, but major international

projects require interdisciplinary consortia to promote disciplinary exchange between countries, but also between the various disciplines and their concepts or ideological traditions. The European Spatial Planning Observation Network (ESPON) is a major platform in this area. Internationalization and Europeanization also pose new challenges for work methods and education and training in different national contexts. In an article on the political consulting services provided by spatial planning experts, Manfred Sinz, deputy director general of the Bundesministerium für Verkehr, Bau und Stadtentwicklung (BMVBS, the Federal Ministry of Transport, Building and Urban Affairs), emphasized the increasing need for qualified consultancy on issues related to European spatial planning (Sinz, 2011). Sinz also showed that because of their budgetary implications, negotiations within the various programs are often not conducted at a European level by specialized politicians or civil servants (for a detailed study of the deterritorialization of European processes, see Chilla, 2013).

The French initiative to create the GIS Collège international des sciences du territoire (International College for Territorial Sciences) and the research conducted at the CIST are attracting increasing interest in Germany. Greater collaboration between the CIST and the equivalent associations, higher education institutions, institutes and support bodies in Germany needs to be promoted.

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CHAPTER 8

**Territorial sciences in Quebec**  
**The case of the *Groupe de recherche interdisciplinaire***  
***sur le développement régional, de l'Est du Québec***  
**(GRIDEQ)<sup>1</sup>**

Yann FOURNIS, Marie-José FORTIN

With the recent publication of a book entitled *Sciences du Territoire* (Massicotte, 2008), Quebec's research community may be said to have made a significant contribution to the social science of territory. Seen as an attempt to "redefine regional science as territorial science" (Guesnier, 2009, p. 859), the book illustrates "the construction of a unique field of knowledge and intervention at the heart of Quebec society" (Massicotte, 2009, p. IX). Without claiming to provide a comprehensive overview of regional studies in Quebec, the book challenges the common view that regional science is in crisis and provides evidence of the ongoing efforts to develop a truly interdisciplinary research field. There is no doubt that the sheer number of research horizons can be unsettling. In addition to the social conception of development presented in this chapter (see also Fortin, 2012), it is also important to note that a more traditional and equally ambitious conception of regional science (Polèse, 2009), sometimes known as the "Montreal School", continues to play a role in research, alongside approaches inspired by management (Julien, 2005) and spatial economics (see, in particular, Proulx, 2002). However, the vague and fragmented identity of the field may also be seen as a major strength of the territorial sciences in Quebec. This chapter provides the basis for understanding research in this area in the light of the main research questions addressed by one of the longest-established research centers in

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Quebec devoted to territorial research – the *Groupe de recherche interdisciplinaire sur le développement régional, de l'Est du Québec* (GRIDEQ)<sup>2</sup>.

Created in 1974 at the University of Quebec at Rimouski (UQAR) in a decade in which regional studies grew and developed significantly, GRIDEQ has contributed significantly to the development of a new field of research specific to “resource peripheries” or “resource regions” in Quebec<sup>3</sup>. While research on territories has often focused on the new economic challenges of globalization, the studies conducted by GRIDEQ have involved a different type of approach focused on local models designed to capture and explain the development of so-called “peripheral” regions (Hayter et al., 2003). From the outset, the purpose of the research conducted by GRIDEQ members was to contribute to the development of the idea of a “regionally embedded university” with universal ambitions (and not simply a “regional university” limited to the local and the particular). In other words, without ever abandoning fundamental research, the goal of GRIDEQ has always been to emphasize and promote the specific role of the humanities and high-quality research in shaping regional territories (Harvey, 1975). While it may be true that “the place where we conduct research has an influence on the questions driving research”, recent research conducted in the Lower St. Lawrence may “serve to promote the development of new knowledge and new scientific theories” (Jean, 2002, p. 180).

Over a period of approximately thirty years, GRIDEQ researchers have produced over 300 research publications<sup>4</sup> as part of a project aimed at developing specifically territorial interdisciplinary knowledge while interrogating the status of the resulting findings and knowledge (in other words, is the new field a method or an interdisciplinary paradigm? Is it a discipline, or even a meta-discipline?), the form and content of its object of inquiry (i.e. what is a territory?), and its generating mechanism (i.e. what is development?). Based on key studies, the purpose of this chapter is to examine the questions surrounding these issues in three stages: the development of the research project and of its object of study (i.e. territory or place) construed as a signifying relational space for reflecting on development. Based on

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2 Note that other research groups have examined similar issues in Quebec and have engaged in debate and discussion with GRIDEQ researchers. These include the GRIR at UQAC, researchers at UQTC and UQO, and the ENAP, due to become partners in large-scale institutional projects, such as the joint UQAR-UQAC doctoral program in Regional Development launched in 1996 and, more broadly, the *Centre recherche en développement territorial* (see below).

3 It is worth recalling that social science research in Canada has often emphasized the role of natural resources in the economic, political and social development of Canada. The result is a conception of “peripheral regions” centered on activities related to resources. For an academic definition of “resource peripheries”, see Hayter et al., 2003. In its more common (i.e. non-academic) sense, the government of Quebec defines a “resource periphery” as a “region in which the economy is based on the use and promotion of natural resources, for example mines, forests, or fish stocks” (according to the thesaurus of government activity (TAG): [www.thesaurus.gouv.qc.ca/tag/terme.do?id=10756](http://www.thesaurus.gouv.qc.ca/tag/terme.do?id=10756); accessed on 7 June 2012).

4 The process of selecting the corpus – a delicate process on account of changes in the composition of the GRIDEQ team over time – was largely based on a bibliography compiled by Léon-Pierre Dufour, which includes 327 references (articles, contributions, books) published by the core members of GRIDEQ between 1975 and 2005 (essentially by the Éditions du GRIDEQ and in peer-reviewed books and journals). This chapter refers in particular to research by Serge Côté, Bruno Jean, Hugues Dionne and Danielle Lafontaine and by current members of the *Sociétés, territoires et développement* department at UQAR, which has close ties with GRIDEQ (Jean Dubé, Marie-José Fortin, Yann Fournis, Bruno Jean, Mario Handfield, Nathalie Lewis, Dominique Morin and Steve Plante).

the traditional notion of “regional development”, the new lines of inquiry pursued by GRIDEQ generated a significant amount of research in the 1990s and 2000s, resulting in a unique contribution to the social science of territorial development. The chapter concludes by outlining the current challenges facing the new GRIDEQ team.

## 1. AN INTERDISCIPLINARY SCIENCE AS A RESEARCH PROJECT

From the outset, GRIDEQ had a clear ambition: to go beyond traditional disciplinary boundaries by including young academics from a range of fields seeking to develop an interdisciplinary approach to regional development<sup>5</sup>. The first conference organized by GRIDEQ, held in 1975 and devoted to “the question of development in rural areas” (Collectif, 1976), highlighted the increasing number of studies pointing toward an intellectual “melting-pot” designed to capture and understand the question of rurality in Quebec. In “a country marked by distance and dispersion” (Dugas, 1981) in which regions remain fragile (see Harvey, 1980), regional development is a major challenge, particularly in a society – the Lower St. Lawrence region – affected by economic difficulties and suffering from a fragmented regional identity (*Possibles*, 1978). However, as a result of the drive to recruit young sociologists at UQAR between 1975 and 1980, the center of gravity shifted toward a more radical approach, leading to a greater focus on popular resistance rather than planning and rationalization – a shift illustrated by the GRIDEQ conference on social and community development held in 1978 (Lévesque, 1979). The focus was now on a global critique of regional development, viewed as a matter of the spatial differentiation of capital accumulation, but also as a matter of state strategies for integrating populations within the state. The assumption was that territorial development reflected the resistance of local populations to the penetration of capitalism in eastern Quebec, and even the ability of local populations to establish an alternative social model of community development (Côté and Lévesque, 1982; Dionne and Klein, 1982). For a time, GRIDEQ was torn between two analytical perspectives – a “social” perspective mindful of the wide range of political and social forces implied by the concept of “regional development”, and a more “radical” perspective focused on a central conflict overdetermining and structuring the social forces mobilized around “regional development”. However, the tension was short-lived. The brutal collapse of Marxism in Quebec (“M-L”, or “Marxism-Leninism”) and the retirement of prominent academics (Harvey, Dion, Dugas) served to refocus attention on the main object of GRIDEQ research in the period 1980-2000, thus ensuring a continued focus on a social approach to regional studies.

Elsewhere, sociologists with an interest in the social dimension of regional issues soon turned away from the notion of region as an object of inquiry (Touraine et al., 1981; Bourdieu, 1980). However, in Quebec, there was continued interest in the issue, largely because of the prevailing academic conditions. One of the major foci of research in geography (Deshaies, 2010) and history (Bouchard, 1997) was the question of territory in Quebec, which involved an emphasis on the ability of actors to effect social change. Sociology, meanwhile, was engaged in a process

5 Among its founders, Guy Massicotte (history), Clermont Dugas (geography), Fernand Harvey (sociology) and Yves Dion (economics) played a key role.

of diversification and specialization –a process illustrated by sociologists at the University of Quebec at Rimouski, who gradually distanced themselves from their original discipline in order to focus on the notion of territory as a new localized and specialized object (Fournier, 1985; for a useful overview, see Jean, 1985). While the approach and the general framework remained critical, the process of diversification implied a social conception of the development of “peripheral” territories, a conception that resulted in the emergence of an interdisciplinary approach open to other disciplines also engaged in developing a “social” paradigm (such as social history and geography and critical and social economics, among others). Slowly but surely, the emerging framework grew in complexity and sophistication, largely as a result of the incorporation of major references from a wide range of disciplines, including sociology (notably Giddens; see Jean, 1997), regional science (Isard, Perroux, Aydalot, Friedmann, Weaver: see Lafontaine, 1995 and 2005), economic sociology (on the redefinition of Fordism, see Côté, 1993) and social economics. However, these perspectives remained close to the sociology of development, with increasing focus on social movements and their actors and representations (see Guichaoua, 2006). What remains to be understood is how the sociology of development is grounded in a perspective that privileges disciplinary knowledge.

Because of the limitations of traditional disciplines for understanding how societies work (particularly in their structuralist versions, whether neo-Marxist or functionalist; see Lafontaine, 1985), for a time GRIDEQ considered developing a meta-discipline (Côté et al., 1993) or promoting a shift in paradigms or “fields of study” (i.e. the fabric of research groups). However, the center was eventually forced to focus on a more modest task, in the flexible form of a process of collective reflection aimed at defining and delimiting the boundaries of an object or domain as the focus of a specific “field of knowledge” and as pertaining to the “nebulous realm of endogenous development” as an “emerging paradigm” seen as providing an alternative to classical and Marxist paradigms (Lafontaine, 2005). One of the main interests of this dual perspective is that it combines two scientific approaches long seen as being in conflict: in the short term, a science based around a fragmented and highly restricted (or modest) field (*à la* Shapere) and, in the longer term, a science tending toward a highly ambitious paradigmatic and interdisciplinary horizon (*à la* Kuhn). In other words, GRIDEQ researchers were not turning away from the central problems of sociology (i.e. the role of actors, territorial inequalities, the place of dominated social groups), but were seeking to inscribe them in the wider horizon of their territorial matrix, not unlike the wave of European research that began to rediscover territories in the early 1990s (Benko and Lipietz, 1992).

## **2. SPACE AS OBJECT: FROM PLACES TO TERRITORIES**

In terms of its object of inquiry, the GRIDEQ research project eventually came to assign a central theoretical role to the concept of territory. The geographer Juan-Luis Klein, close to a number of GRIDEQ members, has provided a useful summary of the research conducted in Quebec in the 1970s. In his view, the main challenge for researchers during this period was to conceptualize the notion of territory, caught as it was between two conceptions of

space. Studies in this area focused on local societies in order to show that they emerge from deep changes in historical structures (a space), but that, in some cases, they may also be a social substrate (a place) in which collective action shapes living conditions, resulting in the emergence of a global project in a particular territory (Klein, 2010). Here, the place-space dichotomy overlaps with the actor-structure dichotomy since, in dealing with the question of local mobilization, the central political authorities have traditionally favored the development and accumulation of economic capital. In this view, the challenge is to understand how the logic of place (i.e. the integrated and democratic management of resources) interferes with the logic of space (i.e. the sectoral management of resources, promoted by the state and its “monopolistic” logic) (Dionne and Klein, 1982). However, this perspective resulted in an overemphasis on structures at the expense of collective action. In other words, while places remained central, as a form of community sociability (or sociability) that is inconsistent or even incompatible with other spatial logics, structural theories of territorial development primarily emphasized the weight of global macrostructures (center-periphery, local-global) (Chiasson, 2000). In the late 1980s, faced with the inability of actors to oppose the erosion of center-periphery relations in Eastern Quebec, the approach led to an impasse (Dionne and Larrivée, 1989).

However, this conflict or opposition eventually gave rise to a hybrid conception of space. Against the grain of unilateral definitions, the assumption was that the focus needed to be on exogenous-endogenous relationships, or the relationships between state regulation and local action, or between functions and places. The notion of territory was seen as providing a bridge between the economy and society and, more generally, between the various conceptual elements needed to understand social life in the peripheral regions of Quebec (Massicotte, 2002). To quote Jessop, Brenner and Jones (2008), the qualitative view of territories can be understood based on an open or broad conception of “place”: on the one hand, socio-spatial relations are marked by proximity, spatial embeddedness (or rootedness) and differentiation, resulting in horizontally differentiated forms; on the other hand, the logic of place operates in combination with other socio-spatial dimensions (i.e. the territory, scales or levels and networks), which it integrates in a specific socio-spatial equilibrium or balance. Here, the specific contribution of GRIDEQ was to have focused on the matrix of territories, the many forms of which (political, economic, cultural, etc.) serve to generate “the motor units” embodied by human and social actors (Lafontaine, 2005). The result is a social approach to territory based on the notion of “relational spaces”, i.e. spaces characterized and differentiated by proximity and the social effects of proximity (sociability, solidarity, mobilization, cooperation and conflicts, among others), in mutual interaction with logics of institutional boundary definitions, network dynamics and multilevel approaches (Dionne, 1992; Lafontaine, 1989).

The significance of the resurgence of GRIDEQ in the 1990s and 2000s needs to be seen from this perspective. Against the backdrop of new influences, notably regional science and post-Fordism, the interdisciplinary focus of the center was redirected toward a dynamic constructivist conception of territory, whether regional or rural (see Jean, 1997). The complexity of places and the heteronomy of spatial logics were increasingly recognized as key factors,

against the backdrop of the re-territorialization of functions. Macrostructures came to be seen as contexts of economic, political and social opportunities, leaving limited but definite room for the real drivers of territorial development – i.e. actors. With globalization, a new political economy gradually emerged, resulting in multiple and highly unsettling logics shaping and governing socio-spatial relations but that could potentially be reconciled or even reappropriated on the basis of a logic of place involving community projects and local mobilization (Dionne, 1992; Côté, 1993). As a result of these developments, new research fields emerged, including social economics, productive innovation, rural politics and community capacity-building (or capacity development) – fields indicative of the dynamism of a social approach to territories sophisticated enough to address the political economy of space and to capture places in all their dimensions. Relational spaces of this kind are fundamental since they are the loci of development.

### 3. DEVELOPMENT AS A STRUCTURING MECHANISM OF COLLECTIVE ACTION

In short, what the proposed definition of territory involves is an exploration *through places* of the fundamental ambivalence of space, where each dimension can be thought of as both structured and structuring (Jessop et al., 2008). In this view, the notion of development must be understood in terms of an attempt to understand a reality that is both complex and active. In other words, the goal of GRIDEQ was to territorialize “development”, i.e. to show that territories form dynamic spatial configurations combining both structure and action in which collective action can play a structuring role. As a result of these developments, GRIDEQ researchers became heavily involved in supporting and encouraging local actors in the Lower St. Lawrence region to adapt their actions to the changing context of Quebec territories.

In the mid 1970s, the notion of “regional development” reflected an insoluble exogenous-endogenous dilemma inherited from the paradigm of modernization in its Quebec version – the Bureau d’aménagement de l’Est du Québec (BAEQ). In the mid 1960s, the region currently known as the Gaspé Peninsula and the Lower St. Lawrence region was the focus of an ambitious participatory policy of territorial planning. However, the policy caused tensions among the ruling elites of the Lower St. Lawrence region, resulting in a conflict between the proponents of modernization focused on “regional development” and their opponents standing for local resistance (e.g. *Operations Dignité*). Initially examined (and nuanced) in the earliest studies conducted by GRIDEQ (Collectif, 1976), the conflict was later mobilized as part of a radical interpretive framework (Lévesque, 1979) which, by reflecting the ongoing struggles in the more rural areas of the Lower St. Lawrence region, aimed to promote a popular route for development in order to escape capitalist underdevelopment (Dionne and Klein, 1982), in a period marked by action research. The 1980s were a difficult period for self-managed enterprises and were marked by academic confusion in the face of the model of “*développements à particule*” (to quote Latouche) that gradually came to replace “regional” development. In response to these developments, GRIDEQ researchers criticized the tendency to emphasize an uncertain and narrowly economic model of “local” development, at a time when rural mobilizations were changing their tactics and calling for a return to state intervention based

on a rural development policy (see, in particular, the *Coalition urgence rurale du Bas-Saint-Laurent*, created in 1990) (Dionne, 1992).

It was not until the 1990s that GRIDEQ researchers came to recognize the new configuration of development in Quebec. Incorporating a range of new concepts (such as innovation, social development and “social economy”) at the heart of the Quebec development sector, research at GRIDEQ was now focused on the notion of “territorial development” (Jean, 2006). The idea of “territorial development” reflected the emergence of a new generation of broadly bottom-up public policies and was the focus of a significant amount of research on their objects and actors – a shift that also gave GRIDEQ researchers a role as “organic intellectuals” among agents responsible for the implementation of development policies (particularly in terms of rurality, forestry, the social and cooperative economy and social development)<sup>6</sup>. In doing so, GRIDEQ researchers made a significant contribution to the emergence of a concept of development conceived as a methodological, conceptual and practical medium for envisaging the integration of social actors into territorial partnerships and arrangements – i.e. for examining the extent to which actors and mobilizations are able to influence structural variables on a territory as part of a proactive approach (voluntary projects, empowerment, self-development and community development, social movement, alternative projects and living environments, social development, social economy, integrated management) (Lafontaine, 2005). While this approach may have some drawbacks, it reaffirms the return of politics in state territories. The return of politics is not premised on the pessimistic postulate of some studies on regional development (see the case of CIRANO, Marcelin et al., 2004, a kind of think tank, according to Graefe, 2004) or the blind, self-serving optimism denounced by others (on neo-regionalism, see Lovering, 1999). Rather, it involves a form of responsible voluntarism, accompanied by a concern for territories that will probably never become large urban areas “that win”.

## CONCLUSION: CONTINUITY AND FUTURE PROSPECTS

At GRIDEQ, the territorial sciences are based on a scientific perspective, an object and a process. The scientific perspective adopted by GRIDEQ researchers involves a resolutely open social approach which, in leaving the shores of sociology, tends toward an interdisciplinary horizon. Its object is territory, construed as a place in the full sense, a social fabric shaped by multiplicity and complexity and viewed as a movement of totalization rather than a finished totality. In this view, development is seen as a dynamic and adaptive notion referring to a mechanism of transformation through which territorial mobilization may exert macrostructuring effects. The new conception of “regional development” proposed by GRIDEQ researchers achieved academic recognition with the creation of the *Centre de recherche sur le développement territorial* (CRDT) in 2003, a “strategic grouping” of the *Fonds québécois de recherche sur la société et la culture* (FQRSC) and two Canada research chairs (rural development and territorial development) funded by the

<sup>6</sup> A number of research measures and organizations provide evidence of this proximity, including the Alliances de recherche Universités-Communauté *Développement territorial et coopération* and *Défis des communautés côtières*. GRIDEQ also has close ties with Solidarité rurale du Québec, the authority in charge of managing the Politique nationale de la ruralité.

Social Sciences and Humanities Research Council of Canada (SSHRC). To conclude, it is important to emphasize the challenge of the new position of GRIDEQ in the second half of the 2000s. The emergence of a new generation of scholars means that the academic legacy of the center will need to be brought into line with current interests and recent developments in the field.

The challenge is considerable. The new members were recruited on the basis of the intellectual assumptions and premises of the previous period, but are only loosely associated with the GRIDEQ project. The result has been a significant shift in the three main intellectual foci of the center's work. First, the broadened definition of territory based on living conditions has become even broader. In this view, local territories are seen as complex and heteronomous realities, neither entirely exogenous nor altogether endogenous. On the one hand, current GRIDEQ studies focus on external/internal relations and the projects initiated by major exogenous actors (both public and private) and aim to better understand the changes they produce in territories and their societies – including the tensions and conflicts shaping the lives of territories and their communities at different levels. For example, the assumption is that in an average-sized city, the impact of a public transport route can be felt both on the local real estate market and throughout the municipality (Dubé et al., 2011). Another (related) line of inquiry focuses on the internal density of territories and the complexity of the social relations defining spaces. In other words, capturing the influence of societies on their territorial environment means combining dimensions that are often examined in isolation, on the territory or between territories. One of the strengths of research along these lines is that it has continued to broaden our perspectives by expanding the range of observed territories and by interrogating the status of canonical distinctions, such as the distinction between urban and rural territories (Morin, 2012) or between “winning” regions and “losing” regions.

The question of the relationship between actors and structures also requires an examination of the role of structural factors in determining the developmental trajectories of territories, though by focusing first on dynamic moments construed in some sense as caused by collectives that are also in motion. There are a number of avenues pursued by researchers currently working in the field. The logics of firms and entrepreneurs are first analyzed from the point of view of strong external constraints, but also in terms of the innovative strategies used by actors. Certain forms of multifunctionality may thus provide partial solutions for agricultural businesses (Handfield, 2010). Similarly, population movements between regions (young families, pensioners) require a nuanced analysis of residential dynamics, shaped simultaneously by urban forms, the real estate market and the strategies of actors. Finally, the current transformation of the territorial embeddedness of communities observed in some sectors (such as the forestry sector) or resulting from large-scale projects (such as industrial projects and wind farms) is the reflection of both major structural factors (economic crisis, traditional influence of large firms, state strategies) and a whole universe of uses, representations and values governing the potential for individual and collective action (Lewis and Flamand-Hubert, 2012; Fortin and Le Floch, 2010).

Finally, the reappropriation or redefinition of the “territorial sciences” by the new team poses a major epistemological, ethical and methodological challenge. Beyond the question of legacy (Fournis, 2012), the challenge is to strike a balance between engagement and detachment in relation to territorial actors. While recent developments may appear to imply a break away from the GRIDEQ trajectory, defined by action research, the challenge is also to promote avenues for collaboration based around common interests and methods and to engage in a process of accommodation of the scientific view (Plante et al., 2009). In view of the research project and tradition promoted by GRIDEQ for more than thirty years, this is perhaps one of the main challenges facing the new team.

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PART 2

**Territorial information, interdisciplinary  
and inter-scale stakes**



## CHAPTER 9

### **A geomeia sensor of international events**

Claude GRASLAND, Timothée GIRAUD, Marta SEVERO

Twenty years have passed since the end of what Eric Hobsbawm (1995) termed the “short twentieth century” (1914-1990) – twenty years rich in events that have changed the global political and economic map. Recent history has been marked by a succession of wars, revolutions, natural disasters, industrial accidents, business outsourcing and relocations, stock market crashes, epidemics and famines, but also by democratic revolutions, technological innovations and transnational social movements. The last two decades have also witnessed far deeper and less visible changes in the structure of the world system and the relative importance of countries on the global stage (Didelon et al., 2008). In addition, there has been a dramatic increase in information flows as a result of the rise of information and communication technologies and the development of the mass media, a process that has increasingly turned local, regional and national events into global phenomena (McLuhan, 1967).

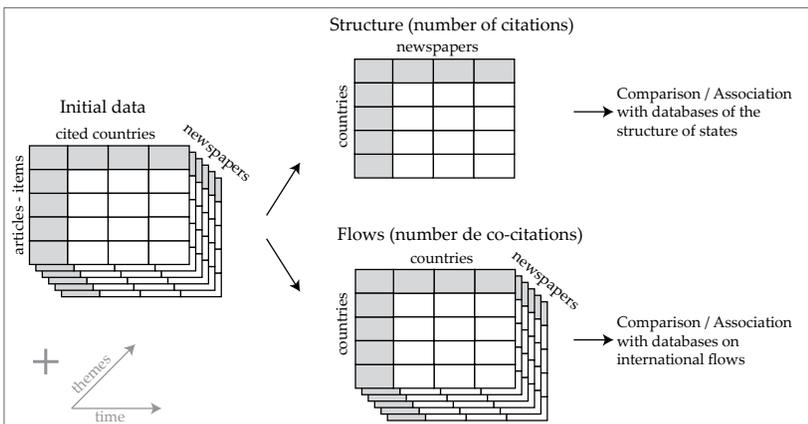
Although they have rarely collaborated (at least not in France), researchers in geography and media studies have been pursuing similar lines of inquiry in recent years, focusing in particular on the contemporary dynamics of globalization and international relations. Researchers in both fields have shown increasing interest in studying different types of flows governed by similar rules. Originally formulated in 1967, Tobler’s first law of geography (“Everything is related to everything else, but near things are more related than distant things”) – the theoretical basis of many recent studies in theoretical geography (Grasland, 2009) – has close affinities with various hypotheses proposed by Galtung in 1965 on the circulation of news (Tobler, 1969 and 2004; Galtung and Ruge, 1965). Later studies on news flows (Wu, 2000) conducted in the 1980s and 1990s also have striking similarities to recent spatial interaction models developed by geographers (Fotheringham and O’Kelly, 1989) and economists (Frankel, 1998) to describe international trade flows and trade barriers. The common denominator of

these studies (e.g. Bröcker and Rohweder, 1990) is that they depict an unequal world still governed by borders and frontiers involving areas of continental influence in the process of being redrawn – in other words, a world remote from Friedman’s “flat world” (Leamer, 2007) or McLuhan’s “global village” (1967).

In view of these developments, it was perhaps inevitable that researchers at the GIS CIST with an interest in defining and creating a new field (the territorial sciences) would eventually focus on the question of media flows as an indicator of global inequalities, but also of new forms of international relations (for example, with the emergence of supranational groups such as the European Union) that pose a challenge to the realist paradigm of the maximization of the power of isolated and autonomous states as the sole criterion of interpretation (Battistella, 2012). In developing a “Geomedia” research project aimed at bringing together experts in geography, media science and computer science, our goal is to promote collaboration between disciplines, but also to contribute to public debate by showing that events are relative (i.e. context-dependent) and by highlighting the filters governing the production of “international” or “world” events (Wolton, 2003).

This chapter examines newspaper articles as imperfect but useful indicators of public opinion and debate. Particular attention will be paid to *international news* and media coverage of foreign events. A newspaper article published in country A about an event in country B will be viewed as a flow of information (or news flow) from country B to country A. By aggregating the number of articles, we will infer temporally variable and theme-specific international information flows (or international news flows). Using methods commonly employed to study the movement of people and goods, the analysis of international information flows (or international news flows) will invalidate the concept of the “global village” and the assumptions surrounding the idea of “the end of geography” (O’Brien, 1992). Above all, the study will provide a basis for identifying distinct “media regions” based on the circulation of news.

Figure 1. A model for the analysis of international media flows



We will also show that there is another way of examining international relations through newspaper articles that involves focusing on indirect relations of co-citations of countries in the same article rather than direct relations between emitting countries and cited countries. The two proposed methods are summarized in Figure 1, which shows how we will extract both international news flows and media linkages based on co-citations in newspaper articles. A description of the corpus is needed. While a major press database such as Factiva<sup>1</sup> may appear to be the best solution, we will show that there are other approaches to understanding international media flows that involve the use of RSS feeds in real time.

## **1. ANALYSIS OF INTERNATIONAL MEDIA FLOWS USING HEAVY SENSORS: THE CASE OF FACTIVA**

International media flows, defined as newspaper articles published in a given country about another country<sup>2</sup>, are characterized by high spatial and temporal variability. Determining the *average level* of media coverage of a country is a delicate matter insofar as temporal flows of articles referring to a given country seldom involve a stationary time series and tend to be characterized by exceptional peaks. This is particularly true in the case of small countries. Exceptional peaks of media coverage are an important part of the analysis as markers or indicators of international media events (Dayan and Katz, 1992; Arquembourg-Moreau, 2003) and should not be viewed as abnormal values but as intrinsic components of time series, the behavior of which will need to be formally described based on specific statistical properties.

### **1.1. A formal definition of “peak of media coverage”**

We propose to define a media event provisionally as a “peak in a time series not consistent with the trends and patterns of previous periods”. Using this definition, different statistical representations can be proposed to identify peaks based on various parameters. Peaks have no inherent existence but depend on times scales and require fixing the granularity of the time scale (for example, one month) and the length of the time period used to define the “normal” shape of the curve from which exceptional values will be inferred (for example, 24 months). The difficulty lies in choosing the time-scale parameters and in determining the type of predictive model (trends, cycles, etc.) and statistical test for defining the exceptional nature of a leap (Box et al., 2008). To illustrate this difficulty, Figure 2 shows the proportion of the total number of newspaper articles in Factiva<sup>3</sup> that refer to Iceland based on monthly frequency (between 2005 and 2012).

Though seemingly simple, the task of visually identifying peaks in a time series will differ according to whether an arithmetic scale (i.e. a peak is the result of an increase in the number

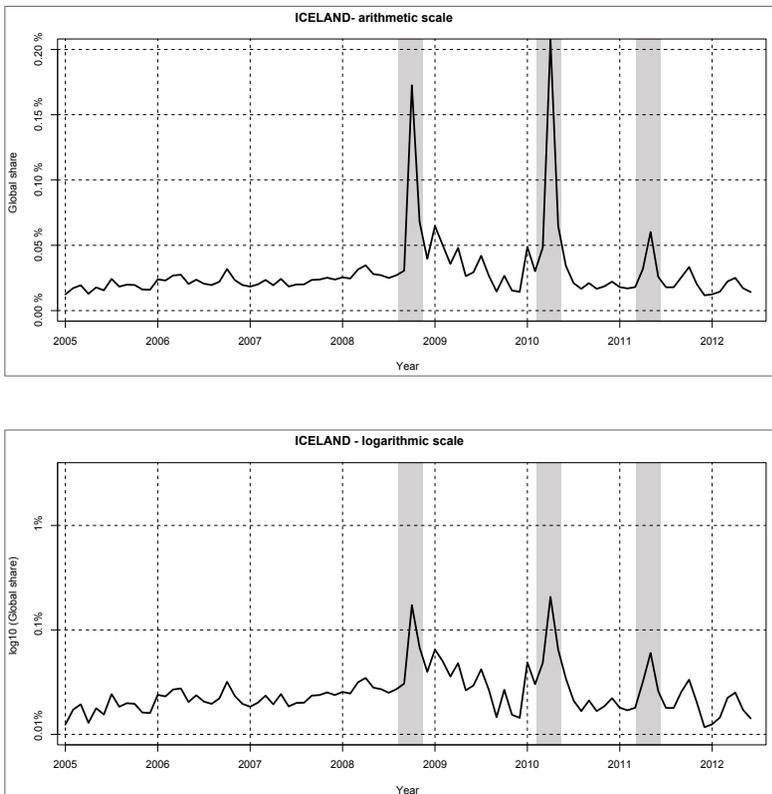
1 Factiva provides access to information on newspaper articles and other international media and is a commercial service provided by Dow Jones Factiva.

2 The definition is provisional insofar as it is not always easy or even possible to determine the national origins of a newspaper. For example, should the nationality of a newspaper be defined on the basis of the composition and location of its editorial staff? Of its owners? The location of its readers? etc.

3 All publications classified by Factiva as newspapers (i.e. the “newspapers” category) were included in the analysis. The process of identifying articles relating to Iceland was based on a combination of geographical keywords used in the Factiva database.

of articles compared to the average number in previous periods) or a logarithmic scale (i.e. a peak is a multiplication of the average number of articles in previous periods by a given factor) is used. The visual identification of the most significant peaks will also depend on whether the variance of the series is taken into account. In other words, a peak in the monthly number of articles after a period of stability (2008 economic crisis) will be easier to identify than a peak occurring after a period of significant interannual fluctuations in the number of articles (2010 volcanic eruption). Finally, links between peaks must be taken into account and should not be viewed in isolation. In other words, memory and anticipation also play a part, which explains why the second volcanic eruption in 2011 was immediately covered by the media, with press organizations anticipating a disruption to global air travel similar to the previous year. In this case, the media anticipated an event that never occurred, thus creating a gap between the objective significance of the phenomenon and its exaggerated representation in the media.

Figure 2. Media interest in Iceland in the Factiva database (2005-2012)



## 1.2. Comparison of the same media phenomenon using multiple sensors

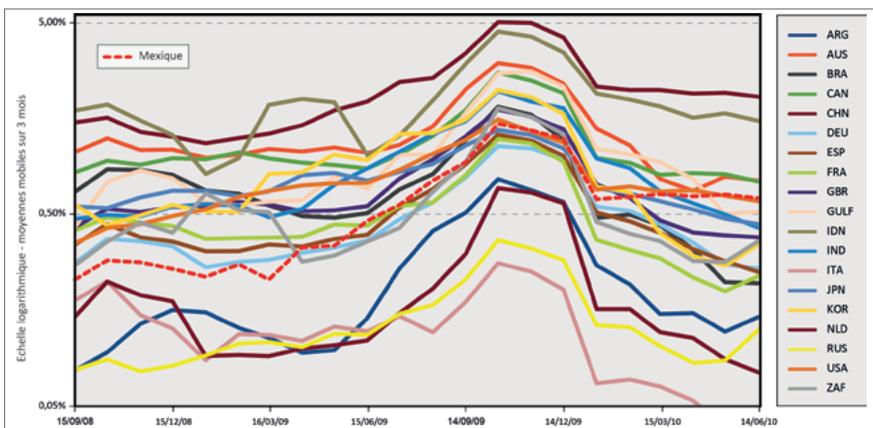
However, when studying an event based on the largest possible number of newspapers (as we have just done with Iceland), it is impossible to determine whether the event is a truly global phenomenon since we know nothing about the proportion of newspapers from

different countries that contributed the most to the increase in the total number of articles. It seems likely that the peak of media coverage related to the interruption of air traffic in the North Atlantic following the 2010 volcanic eruption was not as widely reported in north-west European and East Asian newspapers. But were there significant peaks in these countries? Conversely, what about the Fukushima disaster in Japan? In other words, in order to assess the regional<sup>4</sup> or global nature of an event, we need to take into account the national origin of news producers when analyzing international media flows.

The Copenhagen summit is a good example of an international event that can be traced in G20 countries based on an examination of the proportion of news items devoted to climate change in these countries. In this case, the media were not merely sensors but also played a key role in a global political and economic struggle to demonstrate or refute the reality of climate change (Dryzek et al., 2011).

When using a news database such as Factiva, it is impossible to determine the role of lobbies in different countries. However, it is possible to determine the global scale or dimension of the studied phenomenon and, above all, to highlight the close parallel between periods of high and low public interest (or at least media interest) in all countries. For example, it is clear that there was increased media interest in the Copenhagen summit at roughly the same time in all G20 countries, followed by a sudden decline of interest following the failure of the summit (see Figure 3). In some cases, the average level of media interest before the summit had changed by the end of the summit. For example, the Mexican newspapers included in the Factiva database showed greater interest in climate change after the failure of the summit. It seems reasonable to suggest that this phenomenon is not unrelated to the fact that the next summit is due to take place in Cancún, Mexico.

Figure 3. Proportion of the articles dedicated to climate change in G20 countries' newspapers in 2008-2010



Source: Factiva

4 The term "regional" is used here in the sense of "relating to, or concerning, a particular region of the world", i.e. an area covering several countries.

### 1.3. Comparison of different phenomena using the same sensor

A similar approach is to focus on multiple perspectives based on an examination of the destination of global media flows rather than their origin – in other words, based on an examination of how newspapers report events occurring in different countries. This approach is particularly useful for examining the correlation between levels of media interest in countries involved in or affected by the same international events. The Arab Spring revolutions are a case in point.

The proposed approach was tested on a group of countries in North Africa and the Near East (Tunisia, Egypt, Syria, Israel, Libya and Palestine) between 2006 and 2011 (see Figure 4). Between Israel and Palestine, there was a significant lag-0 correlation between media time series, meaning that events affecting the two countries were synchronous, or at least that a media peak concerning one of the two countries almost invariably concerned the other. Though trivial, this example helps to understand the approach adopted below involving similar media peaks staggered in time.

A detailed examination of the four countries affected by the Arab Spring shows, first, that there is a positive spatial autocorrelation for various time-lags (three-, four- and five-month time-lags). In other words, RSS feeds related to the same country were found to be correlated from month to month but also up to three or five months apart<sup>5</sup>. The findings indicate that periods of media interest or disinterest in these countries tended to last longer on account of the novelty of the revolutions after a period of stability (Spitzberg et al., 2012). A comparative analysis of the trend curves of different countries<sup>6</sup> does not always indicate simultaneous (i.e. synchronous) trends such as those observed in the case of Israel and Palestine but does highlight discrepancies relating to the Arab Spring. The first peaks concern Egypt and Tunisia, which started out from a stable level of media interest before experiencing a sudden peak of interest followed by a long-term trend characterized by a significantly higher level of media interest compared to before the revolution. Despite a one- or two-month lag, Libya followed a similar trajectory. However, it is important to note that Libya's pre-revolution media signal was significantly more irregular and marked by a succession of peaks indicative of a more unstable regime. There remains the question of Syria, which initially saw its media signal increase more slowly compared to the other three countries (with a time-lag of almost three months) before subsequently experiencing a continuous increase over several months. This difference is explained by the fact that the Syrian political crisis lasted longer than the crises affecting the other countries (since Syria was unable to find a rapid solution, unlike the other three countries). However, it is important to interrogate the role of the sensor formed by the media in the reporting of the crisis. It seems reasonable to suggest that for different

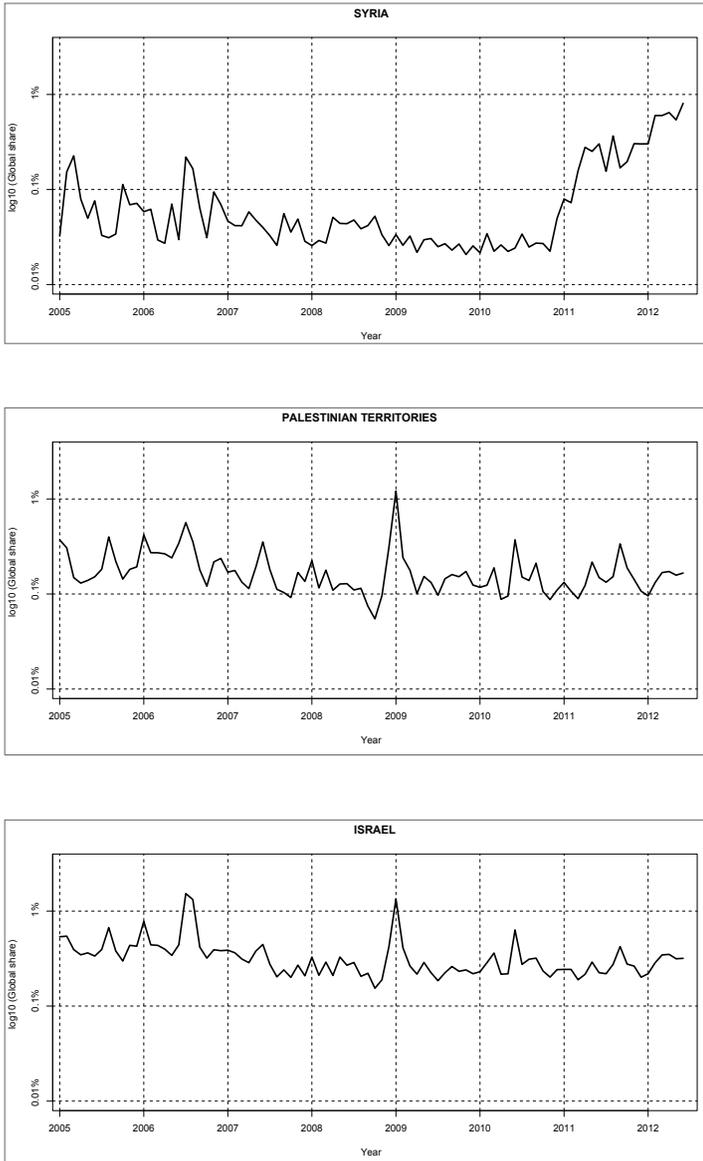
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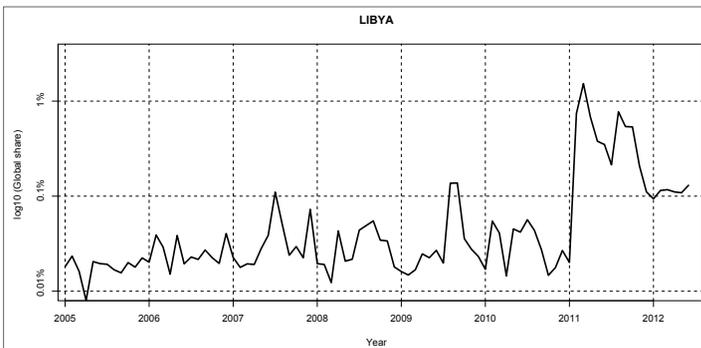
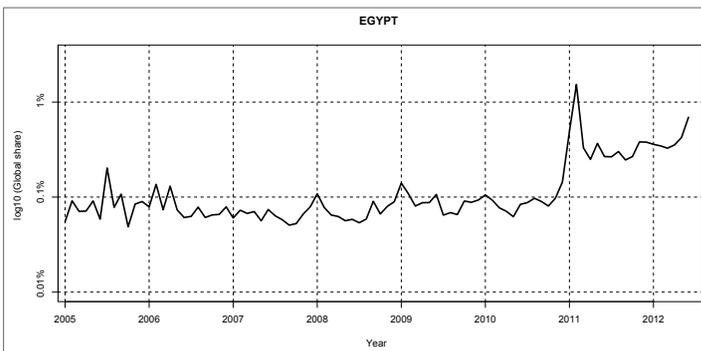
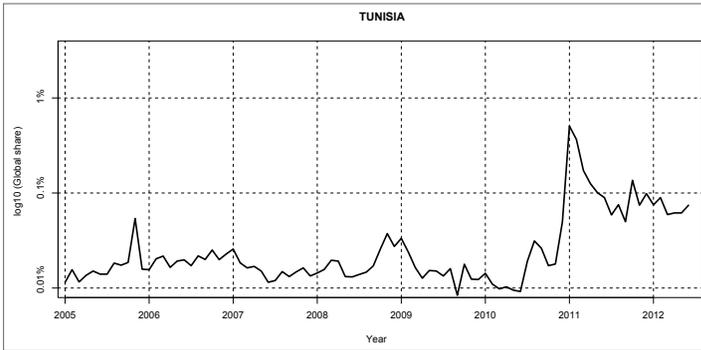
5 Statistically, this amounts to comparing graphs at different times (i.e. time-lags of several months). A significant positive autocorrelation for several time-lags indicates that the events in question occurred over several months and that the peaks corresponding to the Arab revolutions lasted for significant periods of time.

6 Statistically, this means that the monthly number of articles about country A will be strongly correlated with the number of articles in country B, either on the same date or by offsetting the series by a few months for one of the countries. When the correlation is maximal on the same date (time-lag 0), the two countries may be said to have synchronous trends. By contrast, if the correlation is maximal at time 3 for country A (and -3) for country B, the peaks of the two countries will be said to have the same form but with a three-month time-lag.

strategic reasons, the media in some countries opted (whether consciously or not) not to focus on a crisis that could potentially destabilize the region (Lesch, 2011). In this case, the media trends and curves are not simply a record of international events, but are also indicative of how events are selected and interpreted, thus providing an indication of their relative importance in the international political agenda of the countries where the journalists and readers are based. This is why it is important not to limit the analysis to an aggregate view of the newspaper articles corresponding to countries with different political agendas.

Figure 4. The relative weight of six countries in North Africa in the Factiva database (2005-2012)





Source: Dow Jones Factiva, 2012

## 2. ANALYSIS OF INTERNATIONAL MEDIA FLOWS USING LIGHT SENSORS: THE EXAMPLE OF *LIBÉRATION* AND *THE NEW YORK TIMES* RSS FEEDS

We illustrated the previous approaches using data from the Factiva database, which, despite containing a large number of newspaper articles, has a number of drawbacks (Earl et al., 2004). First, access to the Factiva database is not free. A standard university subscription has limited benefits for researchers since it is impossible to extract the content of over 100 articles

at once. This explains why the use of the database has so far been limited to counts over specific periods (i.e. days, weeks, months or years) based on the smallest number of detailed treatments. In other words, we used metadata from the Factiva database (i.e. counts of articles about a country, a topic, etc.) more than the data per se since the terms of the subscription did not include access to the full text of articles.

To conduct more detailed analyses based on the full content of articles and, above all, in order to perform spatial, temporal or thematic aggregation operations (Steinberger et al., 2005) not subject to a system of predefined keywords<sup>7</sup>, we need adapted sensors to enable users to define their own metadata based on unlimited access to the semantic content of articles or, at the very least, to a summary of their content. As a basis for a more open study of media news and the reporting of international events, we propose to use a different type of source allowing for freer and more flexible uses: the RSS feeds of online newspapers.

## 2.1. Using more sensitive sensors for a more refined analysis

An RSS feed is a stream of regularly updated content available to internet users. RSS feeds provide concise information on Web content and contain several items. Each item refers to specific content, which will generally be a text (e.g. a newspaper article or blog entry), though it may also be an image, a video or even a sound. Every feed item must comply with standards<sup>8</sup> to ensure a degree of homogeneity and includes a number of compulsory fields (i.e. date, title, description and link to content). In this sense, RSS feed items may be seen as highly simplified, freely accessible and downloadable articles. Using automated requests, users can access the summary of an article to extract the required information. For example, we might focus on co-citations of countries included (i.e. cited) in RSS feeds. This provides a basis for studying relations between countries in the light of international media events. The proposed approach can be illustrated by a case study of a group of countries in North Africa and the Near East (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Palestine, Syria, Tunisia and Turkey) based on RSS feeds of the “international” section<sup>9</sup> of *Libération* and *The New York Times* between 11 May and 9 August 2011.

## 2.2. Toward a stereoscopic view of international news

Even based on just two newspapers, a comparative analysis of different sources provides different perspectives on international news. The 11 Maghreb and Mashreq (M-M)<sup>10</sup> countries included in the sample were found in 30% of the *Libération* RSS feeds (international section),

7 For example, the Factiva thesaurus focuses heavily on economic issues, which involve highly refined codings. By contrast, Factiva is far less precise on topics such as political and environmental risks and social and cultural issues. Even if a free text search remains possible, there are significant limitations to their use in Factiva for users who do not have the most comprehensive subscription package.

8 RSS2.0: [www.rssboard.org/rss-specification](http://www.rssboard.org/rss-specification)

9 Generally speaking, the main daily newspapers publish more RSS feeds corresponding to the different sections of the newspaper.

10 Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Palestine, Jordan, Lebanon, Syria and Turkey.

compared to just 20% of *The New York Times* RSS feeds (international section). Although the number of *The New York Times* RSS feeds was greater than the number of *Libération* RSS feeds (2,944 compared to 1,891), the newspapers' coverage of Maghreb and Mashreq countries was broadly similar between 11 May and 9 August 2011, with both papers publishing between 30 and 60 weekly RSS feeds<sup>11</sup> throughout the study period (see Table 1). Geographical proximity may account for the greater interest of *Libération* in southern and eastern Mediterranean countries (Herkenrath and Knoll, 2011). However, other types of proximity (of a more political or economic nature) also play a role in the choice of countries. Little difference was found in the coverage of the two countries in crisis within the region. Libya and Syria received the greatest media attention, though Libya was cited slightly more often in *The New York Times* (26% compared to 25%), while Syria was cited more often in *Libération* (30% compared to 26%). However, *Libération* was found to be significantly more active in covering countries with historical ties to France, whether in the case of the Maghreb (17% compared to 7%) or Lebanon. Conversely, *The New York Times* showed greater interest in Egypt, Jordan, Israel and the Palestinian territories, i.e. the territories forming the strategic priorities of the US in the region (see Figure 5).

Table 1. Weekly number of RSS feeds from the international section of *Libération* and *The New York Times* relating to 11 Maghreb and Mashreq countries between 11 May and 9 August 2011

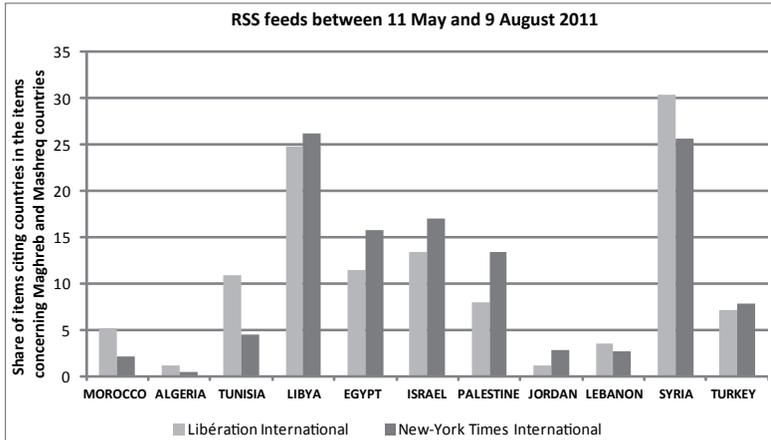
Week		<i>Libération</i> (international)			<i>The New York Times</i> (international)		
From	To	Total	M-M Number	Proportion in total M-M flows (%)	Total	M-M Number	Proportion in total M-M flows (%)
11 May	17 May	185	65	35%	238	55	23%
18 May	24 May	111	35	32%	261	62	24%
25 May	31 May	171	46	27%	244	46	19%
1 June	7 June	123	30	24%	228	45	20%
8 June	14 June	135	48	36%	240	45	19%
15 June	21 June	135	52	39%	212	51	24%
22 June	28 June	124	36	29%	246	55	22%
29 June	5 July	155	44	28%	219	46	21%
6 July	12 July	138	44	32%	228	40	18%
13 July	19 July	131	44	34%	211	38	18%
20 July	26 July	159	43	27%	201	28	14%
27 July	2 August	183	34	19%	224	43	19%
3 August	9 August	142	55	39%	192	40	21%
<b>TOTAL</b>		<b>1,891</b>	<b>576</b>	<b>30%</b>	<b>2,944</b>	<b>594</b>	<b>20%</b>

Increasing the number of newspapers and extending the study period provides a basis for defining *direct international media relations* connecting observer and observed countries. The idea is not new and was the focus of many studies in the 1980s and 1990s following

<sup>11</sup> A weekly perspective was adopted for reasons of coherence (i.e. the weekly cycle of the newspapers) and sample size (a percentage value is not statistically significant below a certain number of articles, i.e. if the sample size is too small).

a UNESCO report on the role of the media in the perception of international inequality (Wu, 2000). However, operating at a newspaper-specific level provides greater accuracy based on the assumption that two newspapers from the same country may produce different representations of international news. Another important consideration is that RSS feeds provide an effective royalty-free tool for monitoring international media flows in real time.

Figure 5. The relative importance of Maghreb and Mashreq countries in *The New York Times* and *Libération* RSS feeds citing countries in the region



### 2.3. Analysis of the connections between events in geographic and media space

A complementary approach is to study *indirect international media relations* based on joint citations of countries in the same article. For example, an article in *The New York Times* on the Israel-Palestine conflict defines two direct media relations (i.e. USA-Israel and USA-Palestine), but also an indirect media relation (Israel-Palestine). Because of the nature of the events, there are many such relations in this particular case. Co-citations of countries in the same article either involve observable facts related to a specific event (e.g. “Border incidents: Israel lodges complaint to UN against Syria and Lebanon – the complaint follows violent clashes at the border with Syria and Lebanon on Sunday during the commemoration of the Palestinian ‘Nakba’”) or are the product of intellectual constructs produced by outside observers and resembling a series of distinct events in a unified narrative (“The Spring of Arab Hope – Tunisia, Egypt, Libya, Syria, etc. The story of the revolutions that have changed the face of the Maghreb and the Near East”). In our sample, 15% of the articles published by *Libération* and 16% of the articles published by *The New York Times* cited at least two countries among the eleven countries included in the study (see Table 2). In each case, just over 2% of the feeds cited three or four countries. However, it is important to note that the international co-citation rate given here is incomplete since citations of other countries outside the region were not taken into account (USA, France, Russia, Saudi Arabia, etc.).

Table 2. Co-citation frequency of countries in *Libération* and *The New York Times* RSS feeds relating to 11 Maghreb and Mashreq countries between 11 May and 9 August 2011

Number of cited countries *	<i>Libération</i> (international)		<i>The New York Times</i> (international)	
	Nb	%	Nb	%
1	492	85	498	84
2	71	12	82	14
3	11	2	12	2
4	2	<1	2	<1
Total	576	100	594	100

\* Amongst the 11 countries comprised in Maghreb-Mashreq

Based solely on media flows in the eleven studied countries, we can construct a network or matrix of media links indicating, for each pair of countries, their citation rate in the same RSS feed. We may then infer a co-citation network as a basis for the analysis of the connections between events in media space.

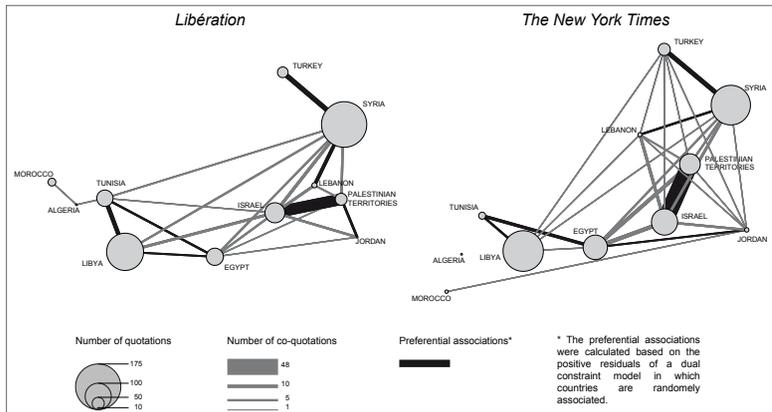
As shown in Figure 6, co-citations appear to be strongly related to geographical proximity, with the highest co-citation rates almost invariably involving countries with a common border. However, there are also co-citations of geographically more distant countries, particularly Syria, a country connected by both newspapers to three other countries affected by what the media have come to describe as the “Arab Spring”. Finally, we note that the number of co-citations is not always proportional to the total number of citations of a country. For example, Libya is characterized by a high rate of media autonomy since the vast majority of RSS feeds relating to Libya make no reference to other countries (87% in the case of *Libération* and 96% in the case of *The New York Times*). Conversely, the Palestinian territories are seldom cited in isolation (24% in the case of *Libération*, 33% in the case of *The New York Times*), which can be explained by the fact that they are almost invariably associated with Israel in the media.

Therefore, co-citations are not randomly distributed among countries but are an indication of the effects of various forms of proximity, including media proximity (in the sense of association with the same events) and geopolitical proximity (in the sense of involvement in the same events). By using a simple statistical model, we find preferential associations, i.e. positive residuals corresponding to countries that were associated more frequently than expected based on a random distribution of countries in the news. The picture that emerges is of three groups of countries:

- The *North African “Arab Spring” group* (Egypt, Libya, Tunisia) is found in both newspapers.
- The *Israel-Palestine group*, possibly associated with Jordan, forms a structural media pair related to an unresolved geopolitical conflict generating a constant flow of events.
- The *Syrian civil war group* highlights the importance of common borders in the context of a civil war resulting in waves of refugees fleeing to neighboring countries (Turkey, Lebanon). It also indicates frequent links with Israel, the Palestinian territories and Egypt.

Despite its limited scope, the analysis of the experimental data highlights the potential usefulness of statistical treatments based on light sensors formed by newspaper RSS feeds. In the case of a heavy sensor such as Factiva, we believe that the analysis of the RSS feeds of a hundred or so newspapers could provide a more nuanced and ultimately more accurate picture of the international media system<sup>12</sup>.

Figure 6. Number of co-citations of 11 Maghreb and Mashreq countries in the international RSS feeds of *The New York Times* and *Libération* between 11 May and 9 August 2011



## CONCLUSION

Because of the many events that have contributed to redefining the world political and economic map over the past twenty years, but also as a result of increased information flows at an international level, research on global events now requires an interdisciplinary focus involving geography, computer science and media science. Starting from events occurring throughout the world rather than places, the challenge is to assess the international impact or, more precisely, the spatio-temporal diffusion of events by viewing media sources as both sensors and filters.

The purpose of this chapter was to test a method for analyzing global events based on the analysis of international news items published in the press. Using the spatial and temporal multiplicity of media sources capturing and reporting events spread out in time and space, future research should focus on analyzing international events on the basis of the source of news and the links between the source and the reported events. While it may be impossible to attribute a factual value to an event reported in the media, the trace of the event can be observed in different sources and the temporal and spatial "signature" of the event can be examined in detail. We intend to further investigate this question by using a multitude of light sensors (i.e. RSS feeds) rather than focusing on the analysis of a broad sample of heterogeneous articles.

<sup>12</sup> Provided the sample is selected on the basis of spatial criteria and a limited number of redundant sensors (measure of content similarities between newspapers).

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CHAPTER 10

**The territorial dimensions of climate and  
cultural changes in the Bronze Age in the  
Eastern Mediterranean and the Near East**

Catherine KUZUCUOGLU

The geographical focus of this chapter is the area known as the “Eastern Mediterranean”, specifically Egypt, the Levant, Anatolia and the territories of the Syrian interior and Mesopotamia. The climate of this region is characterized by dry summers, mild winters and cyclonic rainfall, predominantly in winter and spring. Climatic differences are determined by latitude, from the south (Egypt) to the north (Anatolia), and by the distance from the source of humidity, from the Mediterranean coastal areas to the interior regions. Mountainous areas (the Golan Heights, Lebanon and the Anti-Lebanon Mountains, Taurus Mountains, Zagros Mountains) have a different climate with increased precipitation and runoff in the foothills.

**1. THE CLIMATIC AND CULTURAL CONTEXT FROM THE NEOLITHIC TO THE  
BRONZE AGE IN THE EASTERN MEDITERRANEAN AND THE NEAR EAST**

During the Holocene (the last 11,000 years), climate factors and trends provided both opportunities and challenges for human societies in the Eastern Mediterranean and the Near East. The increase in temperatures and humidity during the early Holocene (9000 to 4500-4000 BC) accompanied the development of agriculture during the Aceramic and Ceramic Neolithic and during the expansion of Chalcolithic societies. Between 6000 and 4500-4000 BC, the climate stabilized, with high levels of precipitation resulting in what has become known as the “Holocene climatic optimum” (Kuzucuoglu and Roberts, 1997). Beginning around 4500 BC, between the early Holocene (a wet period) and the late Holocene (a drier period), this transitional period does not provide a clear climate signal since the chronology and characteristics of the period

vary in different regions (Roberts et al., 2011; Kuzucuoglu, 2012). For example, in the Balkans and Central Anatolia, the period began in the early fourth century BC, compared to 3500 or 3300 BC in Northern Anatolia (Tecer Lake: Kuzucuoglu et al., 2011) and the Levant (Soreq cave: Bar-Matthews et al., 2011). The next three millennia were marked by three rapid climate signals characterized by a significant decrease in precipitation. The first of these signals occurred in the late fourth millennium BC, with a severe drought lasting approximately 150 to 200 years (between 3300 and 3000 BC). The spatio-temporal variability of the signal is explained by the location of paleoenvironmental and paleoclimatic records (marginal territories, sustainability or non-sustainability of surface and/or underground water resources, distance from the sea/continentality, etc.: Kuzucuoglu, 2009). In Anatolia, the drought occurred at roughly the same time as the cultural transition between the Early and Late Chalcolithic (fourth millennium) and the Early Bronze Age (third millennium). The cultural/climatic parallel does not apply in Mesopotamia and the Levant, where the Chalcolithic/Early Bronze Age transition occurred several centuries before the transition in Anatolia and the Balkans). The cultural characteristics of the transition – which involved a shift rather than a radical break – also vary from one region or territory to another. The intensification of agriculture and technological development (particularly the control of water resources) in the Chalcolithic period continued during the Early Bronze Age (Huot, 2004). These developments had a major impact on the natural environment, with land clearing, the exploitation and conservation of land resources, animal husbandry and cereal-growing, and the discovery of new lands playing a major role. From the Early Bronze Age (third millennium BC) onward, these trends were accompanied by the emergence of increasingly complex societies characterized by territorial specialization, the development of trade, the emergence of centralized city-states and palace economies, and the development of irrigation, among other things (de Miroshedji, 1988; Wilkinson, 2003; Rosen, 2007; Kuzucuoglu, 2012). The impact of these changes, combined with the effects of the exploitation of land and water resources, led to increasing conservation problems (particularly salinization and erosion) and natural resource management issues (notably overexploitation and distribution) in the third millennium BC (Geyer, 2001; Kuzucuoglu et al., 2004).

From 2500 BC onward, the decrease in precipitation that characterizes the end of the “Holocene climatic optimum” began to affect the entire Near East. Initially characterized by alternating dry and wet periods, the decrease in precipitation had no impact on the expansion of societies in the Early Bronze Age. However, between 2300 BC and roughly 1900 BC, the region was affected by several periods of severe drought interspersed with wet periods. The dry signals formed by periods of severe drought occurred around 2300 BC, 2150 BC and 2000 BC, each lasting between 50 and 100 years. With their effects accumulating over time, they became increasingly worse over an expanding area covering territories increasingly sensitive to decreased humidity. The impact on vegetation and water resources was considerable. During this period, severe drought episodes were interspersed with more humid periods. From 2300 BC on, climatic instability and deterioration in the Near East and the Eastern Mediterranean caused environmental responses that varied according to (i) the sensitivity of the territories to precipitation decrease, and (ii) the fragility, rigidity and resilience of the prevailing socio-economic and cultural systems (van der Leeuw, 2003).

A second crisis occurred in the late second millennium BC, at the end of the Late Bronze Age. The period was marked by at least two severe droughts (1250-1150 BC, then 1050/1000-900 BC). The corresponding cultural period, still known as the “Dark Ages” among historians, was not a long period of drought since there were a number of humid phases between 1150 and 1050/1000 BC (Kuzucuoglu, 2009 and 2012). Nevertheless, in cultural terms, this was a period of radical change and destruction.

## **2. CHANGES IN TERRITORIES AT THE END OF THE EARLY BRONZE AGE AND THE LATE BRONZE AGE: THE RELATIONSHIPS WITH THE CLIMATE CRISES OF THE LATE THIRD AND EARLY SECOND MILLENNIA BC**

At the end of the fourth, third and second millennia BC, the history of Bronze Age societies in the Eastern Mediterranean was marked by simultaneous cultural crises. Various known as “transitions”, “dark ages”, or “intermediate periods”, these crises govern the periodization of the Bronze Age, with chronological variations of 50 to 200 years from one region to another. The Early Bronze Age ended between 2300 and 2000 BC, the Middle Bronze Age around 1550-1450 BC, and the Late Bronze Age between 1200 and 900 BC. The effect of the cultural crises was to undermine the stability or even destroy the structure and organization of complex regional economic and political systems. The timing of many crises also partly coincided with climatic events characterized by repeated drought periods between 3250-3000, 2550-2500, 2300-1900 and 1250-900 BC (Kuzucuoglu, 2009 and 2012). The first two periods of climatic instability posed major challenges in terms of resource conservation and the survival of socio-economic systems. The decrease in precipitation in drought-sensitive areas had a significant impact on territorial resources (i.e. water, soil and vegetation), posing significant challenges in terms of the quantity and distribution of agricultural produce, food and financial resources, the effectiveness of production systems and the distribution and control of these territories (among other things). The prevailing socio-economic systems of some political entities were severely affected, thus impacting the structure of local territories. In some cases, the deterioration of the natural components of cultural systems may also have posed a threat to the existing political systems and led to conflicts. This chain of events was invoked by Weiss et al. (1993) to explain the collapse of the Akkadian Empire around 2150 BC. The interpretation given by Weiss et al. has been a major contributing factor in the heated debate over the role of climatic determinism in human history (see, among others, Dalfes et al., 1997; DeMenocal, 2001; Diamond, 2005; Rosen, 2007; Schwartz, 2007; Kuzucuoglu, 2009; Roberts et al., 2011). The persistence of the debate and the resulting confusions<sup>1</sup> are a reflection of the challenges posed by the impact of current climate change on our own societies.

The synchronicity of cultural, climatic and environmental changes in the Eastern Mediterranean in the late fourth, third and second millennia BC suggests that more research is needed on (a) the origins, processes and effects of these changes and the interrelationships between

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<sup>1</sup> For example, the date of a political event is sometimes used to date a climatic event, and vice versa; this example shows the extent to which climatic determinism leads to ignoring cultural issues in the history of ancient Eastern Mediterranean societies.

them and (b) the territorial dimension of these changes (i.e. whether they were of a climatic or cultural nature). This second point raises several questions:

- What was the territorial dimension of the impacts of climate change on the natural and man-modified environment? In other words, what were the spatial dimension and distribution of these impacts?
- To what extent does the territorial variability of environmental responses to climate change depend on the territorial variability of cultural periodization or on the variability of the modes of land use and occupation?
- To what extent was the territorial redistribution of cultural systems a manifestation of pre-existing economic, socio-political and demographic challenges exacerbated by the rapid changes in environmental constraints?
- Is there a relationship between the responses of societies and the type of territory?
- To what extent did climatic factors interact with the territorial redistribution of populations and their activities?

Some answers have emerged from recent research on changes in the uses of territories (whether urban, rural, cultivated and pastoral) and in the territorial limits or boundaries of regions affected by roughly simultaneous climatic, environmental and social crises. In addition to the challenge of adapting to climate and environmental degradation to ensure social stability, the pressure to find rapid and effective solutions was made greater by the fact that the territories in question were located in highly “sensitive” areas – i.e. areas where decreased precipitation increase the vulnerability to drought. Some examples of socio-environmental and socio-climatic crises are given below, focusing specifically on the end of the Early Bronze Age in central Syria (Geyer, 2001 and 2009) and the southern foothills of the Taurus Mountains (see, in particular, Weiss et al., 1993; Wilkinson, 1997 and 2003; Kuzucuoglu and Marro, 2007).

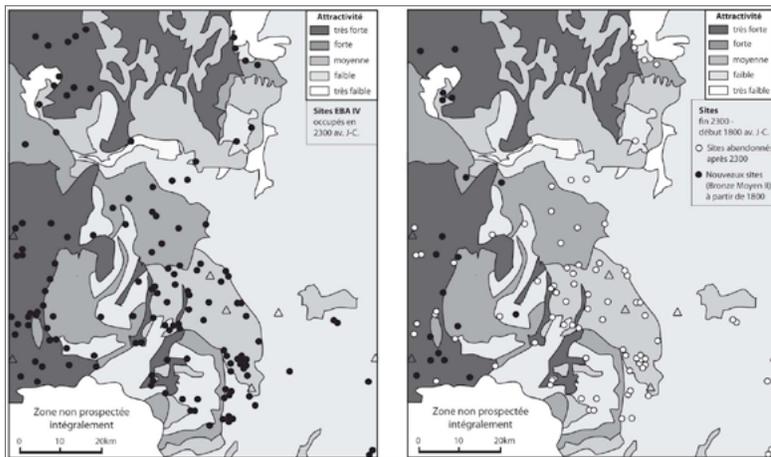
### **3. THE END OF THE KINGDOM OF EBLA IN CENTRAL SYRIA IN 2300 BC**

The area of central Syria studied by Geyer (2009) includes basalt plateaus to the west (mean annual rainfall = 300-350 mm) and an arid plain to the east (mean annual rainfall = 150 mm). On the plateaus (basalt to the west, limestone to the north), some areas are unattractive because of the poverty of the soil and the lack of surface water. On either side of the contact line between the plateau and the plains (see Figure 10.1), the territory is marked by phases of settlement and abandonment. The most pronounced periods of settlement expansion in the plains to the east occurred in the Late Neolithic, the Early Bronze Age IV (2500-2300 BC), and during the Hellenistic and Byzantine periods. During the periods of settlement contraction to the west, the population left the eastern steppe, moving to the more humid plateaus to the west and into the valleys (see Figure 1).

During the period of the Kingdom of Ebla (2500-2300 BC), the frontier of permanent settlement in the territories moved further eastward into the steppe territories. Meanwhile, new villages were founded in the high basalt plateaus to the west. However, in around 2300 BC, as the

Near East became increasingly arid, the Early Bronze Age IV sites in the easternmost areas were abandoned, and the territorial limit of permanent settlements shifted back to the edge of the western basaltic plateaus. In these higher areas, some EBA IV sites disappeared (in addition to sites in the lowland steppes), although several other sites lasted until the Middle Bronze Age (1800-1500 BC). In these more humid plateaus, new villages were also founded between 2300 BC and 1800 BC in the high valleys and in closed depressions where new opportunities for access to water were created by digging wells in the basalt. Thus, increasingly dry periods between 2300 and 1900 BC led to the exploitation of new territories. This “conquest” of new lands and territories was made possible by changes in agricultural practices, i.e. in the relationships between the societies of the late Early Bronze Age and their natural environmental constraints. These latter changes were primarily related to technological advances, resulting in previously inhospitable areas becoming potentially attractive zones. Similarly, in the Levant, Rosen (1997) demonstrated the key role of social changes in such technical developments during EBA IV. These examples provide new explanatory models of settlement and abandonment in societies of the late Early Bronze Age in the Near East and highlight the limitations of simplistic deterministic models of the role of climate in cultural change.

Figure 1. Continuously occupied sites and abandoned sites between 2300 and 1800 BC and new sites founded after 1800 BC in the north west of the Syrian plateaus (field survey data)



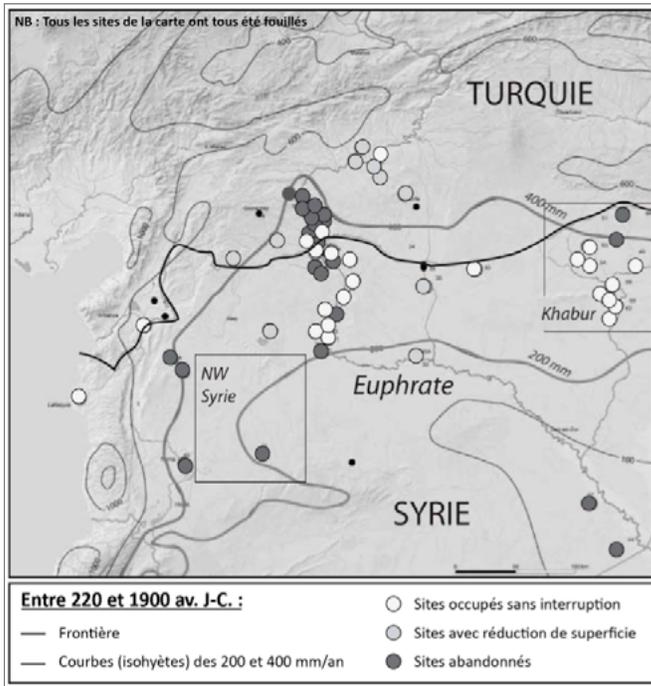
Source: Geyer, 2009.

#### 4. THE COLLAPSE OF THE AKKADIAN EMPIRE IN THE KHABUR RIVER BASIN (CIRCA 2150 BC)

As a result of the influence of the city-states of southern Mesopotamia, the Khabur region (a northern tributary of the Middle Euphrates in Syria) experienced major developments in agriculture in around 2900 BC. The increase in production went in hand with increased food availability and population growth, two key factors in the expansion of urban areas from 2700 BC onward. State centralization and organizational stability also led to a period of cultural

development. Around 2550-2500 BC, a first peak of aridity affected the most fragile semi-arid areas of the southern foothills of the Taurus mountains piedmonts. This was followed by a relatively long wet period lasting roughly 150 to 200 years<sup>2</sup> and ending in around 2300 BC in the marginal areas of the Near East (including the Khabur) by a second drought phase. In the Khabur region, most of the small sites that formed a dense network of land use were then abandoned, while the Akkadian Empire was formed. Over the next 150 years, the empire was organized on the basis of a small number of large urban areas surrounded by satellite villages devoted to agriculture. The economy of the empire developed practices based on the exploitation of increasingly specialized territories (Collective, 2007) as part of a system designed to figure benefit the central state. Around 2150 BC, the empire collapsed as a result of major economic, social and political difficulties and a series of military setbacks. After this period of political and economic instability and disorder, all, or nearly all, the Khabur sites remained uninhabited for one or two centuries (see Figure 2). The population movements caused by the desertion of most of the Khabur sites have yet to be traced (Weiss et al., 1993). However, what we do know is that the populations with easy access to water continued to engage in traditional diversified production (Collective, op. cit.). After many wars and much chaos, a new state and a new dynasty emerged to replace the previous system.

Figure 2. Continuously occupied sites and abandoned sites between 2200 BC and 1900 BC in the Middle Euphrates and Khabur valleys and north-western Syria (excavated sites only)



Source: Kuzucuoglu and Marro (eds.), 2007

2 Since the confidence intervals of the archaeological/historical and paleoenvironmental chronologies are greater than the rapidity of certain events, it is difficult to determine the precise order of roughly simultaneous cultural changes and climate changes.

The arid period described by Weiss et al. (1993) as “the 4200 BP extreme arid event” occurred around 2150-2100 BC. But what exactly happened? A closer examination shows that underlying crises compounded the economic problems. Conflicts were made worse by the fact that the socio-political system was extremely resistant to change and intent on protecting its privileges. The result was that it failed to develop rapid and effective solutions (Van der Leeuw, 2003). The highly centralized political, economic and social system of the Akkadian Empire was made more vulnerable by the fact that it had developed a system of territorial specialization (Collective, op. cit.), resulting in an unequal distribution of power, wealth and resources. At the same time, the dependence on exchange networks increased with the needs of the population and the elites. With the rising tensions and conflicts, the rigidity of the Empire and of Akkadian society more generally eventually led to the collapse of the system (Kuzucuoglu, 2012).

## **CONCLUSIONS**

The research presented in this chapter shows that geographical characteristics such as rainfall, latitude, distance from the sea, relief, soil and subsoil are key determinants of the spatial and temporal variability of the responses of ecosystems and human systems to global climate changes. We also showed that attempts to trace the causes and events that led to major cultural upheavals and imbalances in the Eastern Mediterranean at the end of the third millennium BC and efforts to determine their relationship with rapid climate changes (periods of severe droughts lasting 50 to 100 years) are often based on poor time resolution ( $\geq 40$ -50 years). In short, given that dating techniques do not generally allow for greater accuracy on two parallel sequences (i.e. cultural and climatic), it is important to remember that determining cause and effect sequences is still very difficult.

Nevertheless, the examples of central Syria and the southern foothills of the Taurus Mountains and the resulting comparisons provide an illustration of territorial variability during periods of climate destabilization. They also illustrate the dependence of territorial variability on 1) the varying sensitivity of environments in space and time and 2) the tendency of modes of occupation to change as a result of technological innovations and changes in behavior generating new opportunities as well as the new-found attractiveness of previously inhospitable areas. There is nothing to suggest that the changes examined in this chapter were caused by large population displacements and that invaders caused the disappearance of the system as a result of a catastrophic collapse. Rather, the findings challenge deterministic explanations that establish a direct causal link between the disappearance of civilizations and global climate changes (for example, “the 4200 BP event”).

These observations highlight the ability of human societies to adapt by adopting new practices and developing new perspectives on the environment. There is an obvious sense in which adaptation and adaptability are linked to instabilities caused by external factors (for example, as a result of climatic factors – consider the case of the Kingdom of Ebla) or internal factors (for example, as a result of a redistribution of wealth and power – consider the case

of the Akkadian Empire). Under these conditions, the causes of events such as the collapse of the Akkadian Empire are to be found in the rigidity of the imperial system and its inability to promote social change by way of adapting to the radical changes affecting its territories in a rapidly changing environment.

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## CHAPTER 11

# Exploring population dynamics on the Web

Gilles PISON, H el ene MATHIAN,  
Christine PLUMEJEAUD, J er ome GENSEL

The challenges posed by global population growth and changes in population distribution are a major focus of the interactive cartographic environment “*La population en carte*” developed by the French National Institute for Demographic Studies (INED)<sup>1</sup>. The purpose of the tool is to contribute to public debate interactively by showing the spatial dynamics of demographic processes and factors (such as fertility trends and migration) that contribute to changes in population distribution (Le Bras, 1993; Pison, 2009). The tool uses data from the United Nations Population Division (United Nations, 2011) to provide a range of country-level indicators based on annual measurements and estimates from 1995 to the current year, in addition to forecasts up to 2010 (based on periodic reviews).

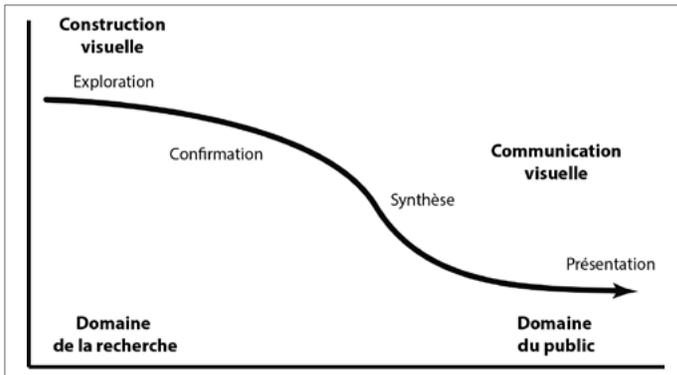
Specifically, the aim was to develop a cartographic environment capable of providing an accurate picture of demographic trends (changes and patterns) at different geographical levels (global and national levels and converging and diverging trends), as well as changes in different spatial organizations and geographical disparities. Using animation and interactivity, the environment enables users to explore their own interests and to become both actors and spectators by engaging in spatio-temporal exploration. Given the nature of the target audience, the challenge was to strike a balance between two conflicting objectives: to make knowledge accessible to a non-specialist audience in a user-friendly format while offering methods of representation and visualization designed to promote reflection and involving a more exploratory form of cartography (see Figure 1, Cauvin, 1996; DiBiase, 1990).

The application is based on previous research by members of the HyperCarte Project (Grasland et al., 2005). In recent years, HyperCarte researchers have developed

<sup>1</sup> [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

sophisticated representation methods and tools based on the premise that there are many different ways of mapping social phenomena (MacEachren, 1994). The basic assumption is that cartographic representations depend on the nature of the phenomenon, the preconceptions and hypotheses of the cartographer, and the objectives, needs, practices and culture of the end users. The application is a user-friendly interactive cartographic atlas providing animated representations designed to facilitate understanding of complex indicators. In the same way as a traditional visual approach, the representations synchronize maps with statistical graphs to highlight trends at different geographical levels (Andrienko et al., 2001). Their originality lies in the fact that they offer a playful and accessible approach to key concepts in geography (such as proximity, similarity and the relationships between places) in order to promote a better understanding of trends and changes. One major advantage of interactive tools is that they encourage users to develop their own questions and to explore their own interests based on the “what”, “where” and “when” triad (Peuquet, 1994). The aim is to stimulate thought while providing an introduction to core notions such as changes in the whole and its parts, differences in demographic trends, patterns, trajectories and neighborhood effects, or even different views of country-specific trends in different neighborhoods.

Figure 1. From basic to exploratory cartography



Source: Cauvin (1996), based on DiBiase (1990)

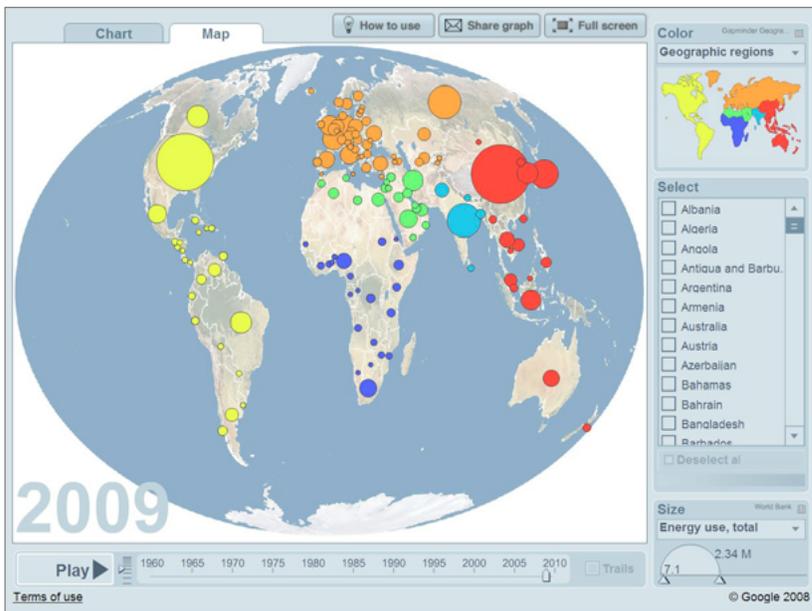
As a result of the development of new technologies (notably Web cartography), we are now able to create environments capable of generating multiple cartographic representations (Koben, 2001; Josselin and Fabrikant, 2003). The result is that mapping and cartography have become more “democratic”. Visualization tools aimed at the general public have become increasingly popular in recent years. Tools such as Google Public Data Explorer<sup>2</sup> and Gapminder<sup>3</sup> – both of which are aimed at a large audience – provide animated graphic and cartographic tools for data visualization, with, in the case of Gapminder, an emphasis on educational and general public uses (Lindgren, 2010). Modern exploratory tools allow users to manipulate and visualize data from different perspectives – i.e. both over time and from a country perspective. Different colors are used to provide information at two levels:

<sup>2</sup> See [www.google.com/publicdata/directory](http://www.google.com/publicdata/directory)

<sup>3</sup> See [www.gapminder.org/world](http://www.gapminder.org/world)

country-level information and continent-level information. The maps only use cartographic representations with proportional circles (see Figure 2). The challenge is to determine the potential of this kind of environment for comparative spatial and temporal analysis. For example, with only a time slider at their disposal, users may face the risk of “change blindness” highlighted by cognitive scientists (Rensik, 2002), meaning that it is almost impossible to detect all changes between two successive representations of the same “scene” if there are many differences of detail and, above all, to arrive at an overall interpretation. Therefore, interactivity contributes significantly to the analysis since it should provide a basis for distinguishing change and permanence and for differentiating patterns of change using stills and videos. However, it will only help if a suitable representation method is used (Andrienko et al., 1999).

Figure 2. Detail of Gapminder World



Source: [www.gapminder.org/world](http://www.gapminder.org/world)

We opted to use simple tools and resources to ensure, first, that they could be integrated in a Web interface and, second, that they would be accessible to a young and/or non-specialist audience. The approach is not dissimilar to OECD eXplorer (an online visualization tool<sup>4</sup>), which provides a comprehensive interface in terms of visualization and exploration tools for synchronizing spatial, temporal and thematic representations. The interface provides sophisticated exploration tools designed to inform the work of experts. As such, they are too complex to be accessible to non-specialists. To compensate for this, the site offers “preloaded stories”, which have yet to be visualized in the same environment. The tool only simplifies access to the results of analysis by preconfiguring the analytical scenario but without simplifying the method of analysis. Our aim is to simplify the process upstream

4 Organization for Economic Cooperation and Development; see [stats.oecd.org/OECDRegionalStatistics](http://stats.oecd.org/OECDRegionalStatistics)

to give users control over the construction of their own stories. To facilitate use, particular attention was given to aesthetics and ergonomics<sup>5</sup>.

## 1. ONE ATLAS, FIVE POINTS OF VIEW

The “*population en cartes*”<sup>6</sup> atlas consists of five tabs. The focus is on spatial analysis. The aim was to develop five points of view to provide users with the resources needed to examine and understand similar demographic patterns among geographically proximate locations, thus encouraging users to view space as a continuous support for interactions involving different distances explored from a local or global perspective.

One section with three tabs represents spatial dynamics and boundaries (i.e. delimitations) at a country level. Another section with two tabs displays continuous maps. Previous studies conducted as part of the HyperCarte Project (Grasland et al., 2000) have demonstrated the utility of comparing distance measurements using both discrete and continuous measurements to better understand the spatial dimension of social phenomena.

Animation and interactivity are the two key characteristics of the atlas. Time is the focus of the first three tabs and is represented by a timeline. The timeline is synchronized with the relevant maps and graphs. Traditional animation tools are used, enabling users to engage interactively with maps and graphs at a real-time rate. Users can also select specific dates or engage interactively with the map at their own pace. Tools for exploring the behavior of countries or groups of countries allow for a detailed analysis of country-level differences and comparisons with global trends. The other two tabs involve a more unusual approach to space and do not provide a means of visualizing trends over time. Here, the temporal positioning tool is replaced by a dimensioning tool. In other words, users are encouraged to play on the scale of phenomena. Each of the tabs will be examined in turn. We describe the functionalities of the tool and demonstrate the value of each approach for understanding diversity and heterogeneity at a global level.

## 2. GLOBAL POPULATION TRENDS AND THEIR COMPONENTS

The first tab, called “The world” (in French, “*Le monde*”), is the Welcome screen, providing a traditional animated representation of national indicators. Users select an indicator and are shown a global map or cartographic representation of the indicator for the current year. On the right-hand side, a graph shows the changes in the value of the indicator at a global level between 1950 and 2100. The curve includes two graphically distinct sections: from 1950 to the present (based on observations) and from the current year to 2100 based on projections (UN projections, 2011)<sup>7</sup>. Users can select any year between 1950 and 2100. The map adapts

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5 The application was developed by Opixido using Flash.

6 See [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

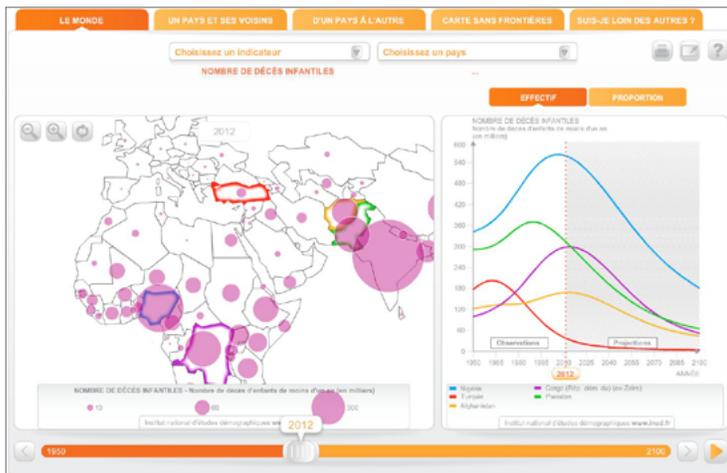
7 Like the other tools and resources available on the INED website, the interactive atlas will be regularly updated to provide the latest available data. The data will be updated every other year since the database on which it is based draws on United Nations population projections (reviewed every two years). The assumption is that the future is unpredictable and that population projections evolve in line with the underlying hypotheses.

to the chosen year accordingly (see Figure 3). Users can also view an animated representation of changes and trends between the two dates to display synchronized maps, graphs and charts.

The representations are based on the world map in 2010. Therefore, the representation of the situation in 1950 is not an accurate reflection of the geography of the time since some countries either did not exist or no longer exist, or had different borders<sup>8</sup>. The point is that the tool uses familiar (i.e. contemporary) reference points and provides a basis for comparing current and past values based on UN estimates.

Users can choose from among 25 demographic indicators (see Appendix). The variability of rate-based indicators (e.g. birth rate) is represented by lighter and darker shades covering the land area of each country, while the variability of size-based indicators (e.g. population size) is represented by circular shapes proportional to the value of the indicator and located at the center of each country (see Figure 3).

Figure 3. Tab 1 “Le Monde” (the world). Example of an effective type indicator, the annual number of child deaths



Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

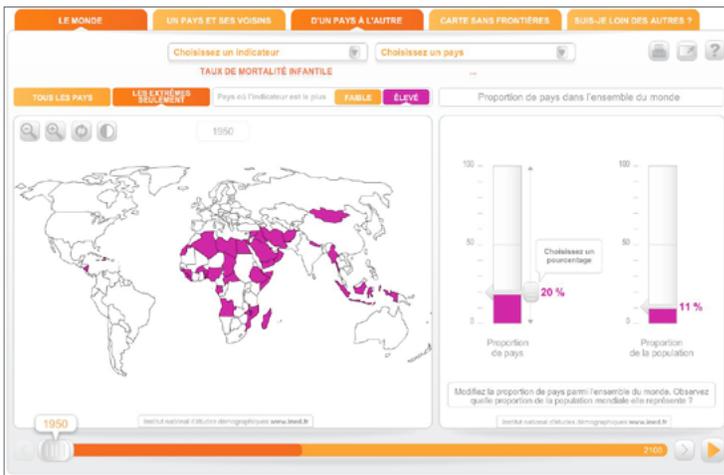
Users can select one or several countries either on the map or by scrolling down the “Choose a country” list. The graph shows trend curves for the indicator in different countries (see Figure 3).

In the case of rate-based indicators, users can choose to view all world countries or only countries with extreme values. In the latter case, only those countries with the highest (or lowest) indicators are highlighted – for example, in the case of Figure 4, the countries (top 10% out of a total of 200 countries or territories) with the highest infant mortality rate in the world in 1950. In the graph section, the level of the left gauge is controlled by a cursor,

<sup>8</sup> Using fixed geographical areas corresponding to the current world map has the disadvantage of erasing the history of border changes – a limitation that teachers need to be aware of when using the tool in class.

enabling users to interact with the proportion of countries with the highest (or lowest) indicators. The right gauge, which is synchronized but with which users cannot interact, shows the corresponding proportion in terms of population for the selected countries (11% in the case of Figure 4). By varying the chosen year or period between 1950 and 2010, we see that countries (top 20%) with the highest infant mortality rates have tended increasingly to be located in sub-Saharan Africa, whereas in 1950 the worst affected countries were spread throughout the southern hemisphere.

Figure 4. Tab 1 “Le Monde” (the world).  
 “Extremes only” function (example of infants death rate)



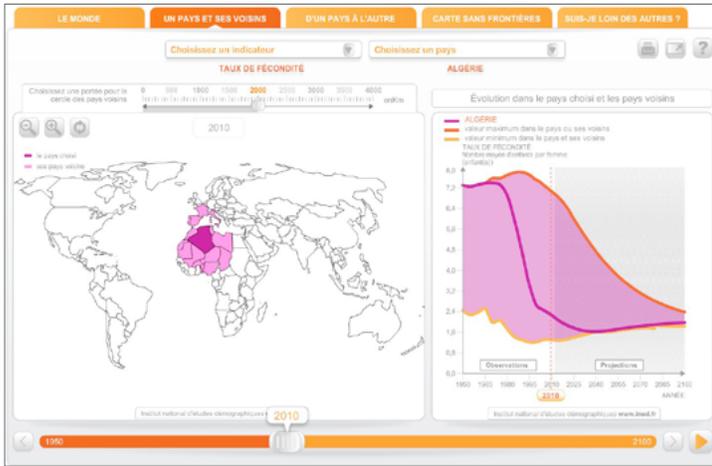
Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

In this case, the tool highlights the most and least populated countries, the wealthiest countries, the youngest and the oldest countries, etc. Users are thus able to focus on the distribution of key variables.

### 3. LOCAL DYNAMICS: NEIGHBORHOOD EFFECTS AND CONTEXTS

The second tab, called “A country and its neighbors” (in French, “*Un pays et ses voisins*”), focuses on differences and similarities, enabling users to compare neighboring countries. Users select a country to compare the selected country with neighboring states. The number of neighboring countries can be adjusted by selecting a geographical range (see Figure 5). The aim is to examine national trends by comparison with neighboring countries and to illustrate local spatio-temporal heterogeneity. The graph compares the selected country with trends in neighboring countries by showing how the extreme values of the selected area have changed over time. For instance, Figure 5 shows that Algeria went from having the highest fertility rate in the region (i.e. Algeria and neighboring countries) up to the late 1960s to having a comparatively low fertility rate, illustrating a process of local homogenization. This type of observation – which provides both policy-makers and the general public with a basis for reflection and analysis – is only made possible by interactive visualization.

Figure 5. Tab 2 “Un pays et ses voisins” (A country and its neighbors). Example of Algeria

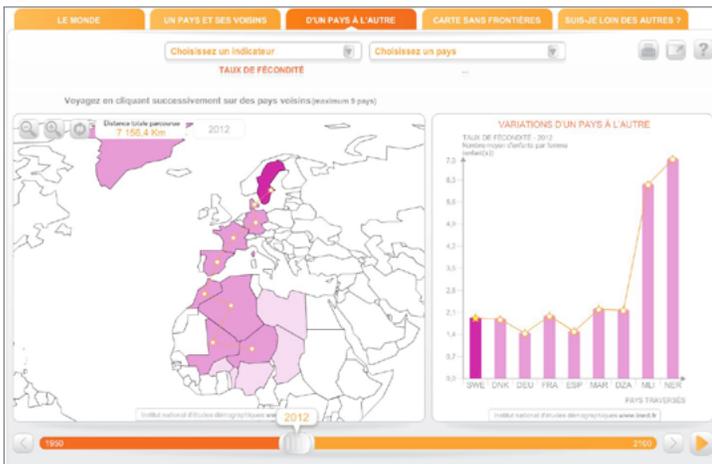


Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

#### 4. INVESTIGATING TRENDS IN SPATIAL DISCONTINUITIES

The third tab, called “From one country to another” (in French, “*D’un pays à l’autre*”), also focuses on diversity and heterogeneity as part of a comparative approach to neighboring countries. The aim is to provide illustrations of the notions of spatial gradients and discontinuities. Users can draw a route on the map between several neighboring countries<sup>9</sup> (see Figure 6). The synchronized graph shows changes in the value of the indicator from one country to another in the form of a transect showing gradients and discontinuities. Trends can be highlighted using the time slider.

Figure 6. Tab 3 “*D’un pays à l’autre*” (from one country to another). Example: travelling from Sweden to Niger



Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

9 Users can only move between neighboring countries (i.e. countries with a common border).

The example shown in Figure 6 begins in Sweden before passing through Denmark, Germany, France, Spain, Morocco, Algeria, Mali and Niger. Consider, for example, the fertility rate. The graph on the right shows that the fertility rate in 2010 was around 2 children per woman from Sweden to Algeria but above 5 children in Mali and Niger. In 1950 (use the timescale at the bottom of the page to select a year), the fertility rate varied between 2 and 3 children per woman from Sweden to Spain, but there is a sudden increase when moving from Spain to Morocco (over 6 children per woman). By viewing changes on the graph since 1950 (click on the “play” button in the bottom right corner), we see that the discontinuity (the break at the level of the Mediterranean in 1950) moved further South to reach the Sahara in 2010. This process occurred over the last thirty years of the twentieth century. The Maghreb countries were affected by a rapid decline in fertility, with their rates matching the fertility levels of countries in the North and in the Mediterranean region. Age at marriage increased significantly and birth control became common. Today, similar trends are seen in the southern Sahara, although the process began later and is occurring more slowly.

Users can see how other indicators vary by following the same route from Sweden to Niger. Consider, for example, the rate of urbanization (defined as the percentage of the population living in urban areas) (select “Rate of urbanization” in the “Select indicator” tab). The gradient is in the other direction: in other words, the rate becomes increasingly low as we move southwards. It also varies more regularly, with less geographical discontinuity compared to the fertility rate, and the evolution of the gradient over time is continuous, with the rate of urbanization increasing everywhere regularly.

## 5. MAPS WITHOUT BORDERS

This page shows “Maps without borders” (in French, “*Carte sans frontières*”), providing representations of demographic phenomena in a given year. The values of the indicators are smoothed to provide a continuous representation of geographical variations in a given area<sup>10</sup>. The representations are based on calculations that provide a basis for assessing a given phenomenon based on a regular grid by the method known as “the potential method”. It involves measuring the intensity of a phenomenon by computing (i.e. adding up) “what happens around it”, weighted by an inverse function of distance<sup>11</sup>. Users can visualize the spatial continuity of economic and demographic phenomena without the bias introduced by maps with borders (Grasland and Madelin, 2001). The proposed smoothing acts as a filter showing the structure of the spatial distribution of the studied variable. Users focus on the general pattern of world organization. One of the parameters associated with the distance function, i.e. geographical range, materializes the geographic resolution of the analysis. Geographical range is associated with the rate at which the function decreases with distance: the smaller the geographical range, the more refined the level or scale of

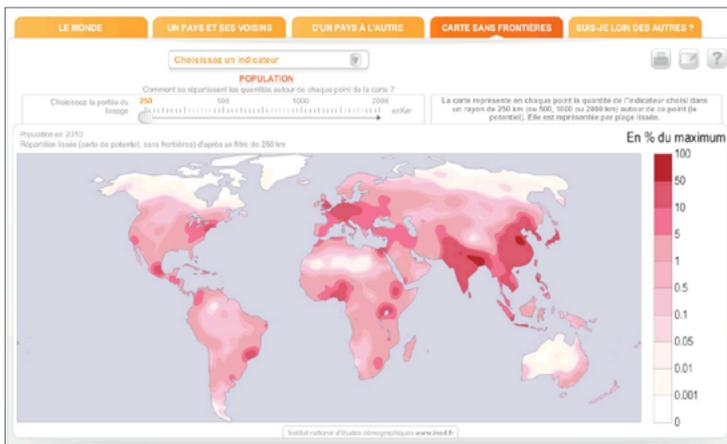
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<sup>10</sup> The data are initially disaggregated to move from an irregular zoning (correspond to national borders) to a regular grid (with cells of identical size and shape) before being re-aggregated using a continuous smoothing technique.

<sup>11</sup> Here, the method is applied using a Gaussian kernel.

analysis. When the geographical range is increased, the global distribution structures are highlighted, and the phenomenon is generalized. The map is vectorized and the limits of the thresholds corresponding to changes in potential intensity are represented by isolines. Users can visualize areas with high or low values for the studied variable and can choose from among ten demographic, economic and environmental variables. The values of the variables are the most recently updated values (in this case 2010). By varying the range (between 250, 500, 1,000 and 2,000 kilometers), users can select a more refined analysis or opt for a broad overview. Figure 7 shows the distribution of the potential of population on different continents with a smoothing of 250 km<sup>12</sup>.

Figure 7. Tab 4 “*Carte sans frontières*” (map without borders).  
Potential of population within 250 km



Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

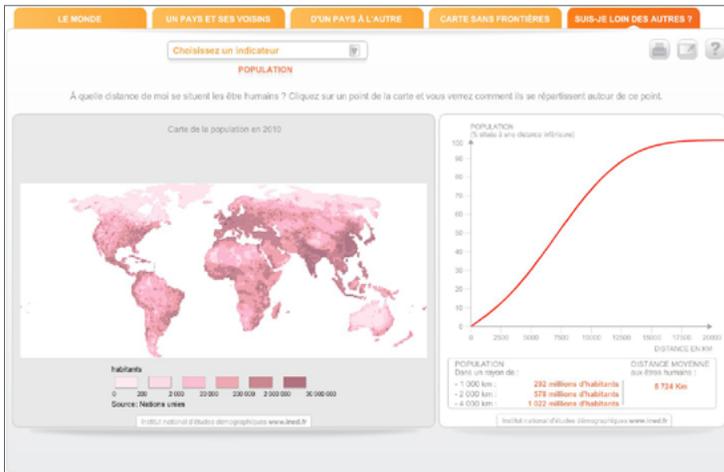
## 6. FROM THE LOCAL TO THE GLOBAL

The “How far away am I?” (in French, “*Suis-je loin des autres ?*”) option provides a representation of the spatial distribution of a phenomenon based on the distance from a point selected by the user. For four of the previous indicators (GDP, population, CO<sub>2</sub> emissions and water consumption in 2010), users position themselves at a point on the potential map (in the matrix format in this instance) and can request information on the distribution of the quantity represented by the indicator in relation to that point. The aim is to offer a system of spatial representation that enables users to situate themselves in relation to the spatial distribution of a quantitative variable (or stock). A curve showing the accumulated potential highlights the distribution of the quantity relative to the distance from the selected point by showing the proportion

<sup>12</sup> Technically, the maps are pre-computed at the Laboratoire d’Informatique de Grenoble ([www.liglab.fr](http://www.liglab.fr)) using the potential method developed by Grasland et al. (2000). The computing code of the method (hyantes: hyantes.gforge.inria.fr), available under a free license, was developed by the HyperCarte research group (Plumejeaud et al., 2006). The calculations are performed using a regular grid on which all the variables are distributed proportionally to the known population in 2000 (see the UNEP-GRID website: [geodata.grid.unep.ch/results.php](http://geodata.grid.unep.ch/results.php)). The method is similar to the technique used to produce the maps of the interactive CD-ROM “6 milliards d’hommes... et moi” (Pison, 1999).

of accumulated stock in a given neighborhood in relation to the total stock. Users are shown the rate of potential increase of the variable by varying the neighborhood size from a restricted zone around the chosen point up to an area covering the entire land surface. The total potential at the maximum distance (i.e. maximum neighborhood size) is equal to the total quantity – for example, 7 billion human beings (based on population as the selected variable; see Figure 8).

Figure 8. Tab 5 “Suis-je loin des autres ?” (How far away am I?). Potential curve of the population. Example of the curve associated to Paris (black point)



Source: [www.ined.fr/fr/tout\\_savoir\\_population/cartes\\_interactives](http://www.ined.fr/fr/tout_savoir_population/cartes_interactives)

The curve is accompanied by information on the amount of accumulated potential at 1,000 km (292 million inhabitants in 2010 based on population as the selected indicator and Paris as the selected location), 2,000 km (578 million) and 4,000 km (1,022 million), and the average distance from the 7 billion inhabitants of the world (5,724 km). This represents the distance to be covered from the selected location in order for the neighborhood to include half the total sum of the variable in each unit or area. If population is the variable, the average distance is shorter in densely populated areas than in sparsely populated areas, where long distances must be covered before reaching densely populated areas (or population centers). In short, the tool provides users with an idea of the distance of the selected location from areas of high concentration (i.e. distance from population centers, in the case of population).

In the same way as the other resources available on the INED website, the interactive atlas will be updated regularly to provide the latest available data. The data will be updated every two years based on United Nations population estimates (also revised every two years).

## CONCLUSION

The interactive mapping tool “*La population en carte*” developed by the French National Institute for Demographic Studies (INED) enables non-specialists to explore global population trends based on a range of animated and interactive resources. The tool provides

innovative methods for exploring and analyzing demographic phenomena interactively, including the position of a country compared to its neighbors (for local comparisons), itineraries (highlighting continuities and discontinuities from one continent or country to another), a particular location in the world (showing a demographic potential at a certain distance from this location regardless of borders) and a long observation period (the assumption being that the frame rate of the animation can be controlled).

Using interactive visualization techniques allows users to explore global population data (see, for example, the HyperAtlas<sup>13</sup> tool). The “*La population en carte*” tool is accompanied by demonstration videos explaining the functionalities of the application based on current issues in demography and related areas.

Benefiting from the INED’s close links with the educational world and the general public, the tool provides a basis for conducting research aimed at examining the cognitive dimension of our proposals and their contribution to the understanding of spatio-temporal phenomena (such as global population trends) and will be of benefit to both students and policy-makers.

## APPENDIX

List of indicators available for each tab

French name	English name	Tab 1, 2 and 3	Tab 4	Tab 5
<i>Population</i>	Total population	x	x	x
<i>Densité de population</i>	Population density	x		
<i>Nombre de naissances</i>	Births per year	x	x	
<i>Taux de natalité</i>	Crude birth rate	x		
<i>Taux de fécondité</i>	Total fertility	x		
<i>Nombre de décès</i>	Deaths per year	x	x	
<i>Taux de mortalité</i>	Crude death rate	x		
<i>Espérance de vie à la naissance</i>	Life expectancy at birth	x		
<i>Nombre de décès d'enfants de moins d'un an</i>	Infant deaths	x	x	
<i>Taux de mortalité infantile</i>	Infant mortality rate	x		
<i>Accroissement naturel</i>	Total population natural change	x		
<i>Taux d'accroissement naturel</i>	Rate of natural increase	x		
<i>Accroissement migratoire</i>	Net number of migrants	x		
<i>Taux d'accroissement migratoire</i>	Net migration rate	x		
<i>Accroissement total</i>	Population change per year	x		
<i>Taux de croissance de la population</i>	Annual rate of population change	x		
<i>Population de moins de 20 ans</i>	Population under 20	x	x	
<i>Population ayant entre 20 et 64 ans</i>	Population aged 20-64	x		
<i>Population de 65 ans ou plus</i>	Population aged 65 or over	x	x	

13 See chapter 16 in this volume.

Population de 85 ans ou plus	Population aged 85 or over	x	x	
Proportion de la population de moins de 20 ans	Percentage of population under 20	x		
Proportion de la population ayant entre 20 et 64 ans	Percentage of population aged 20-64	x		
Proportion de la population de 65 ans ou plus	Percentage of population aged 65 or over	x		
Proportion de la population de 85 ans ou plus	Percentage of population aged 85 or over	x		
Age médian de la population	Median age		x	x
Richesse (produit intérieur brut – PIB)	Gross domestic product (GDP)		x	x
Emissions de CO <sub>2</sub>	CO <sub>2</sub> emissions		x	x

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## CHAPTER 12

# **Spatio-temporal analysis of territorial data with metadata**

Christine PLUMEJEAUD

Spatial planning has much to gain from the growing interest in territorial information, an emerging field providing a rich resource for research and practice in this area. However, because of the wide range of data producers, measurement scales and data collection intervals, territorial information is highly heterogeneous, making the process of data analysis and comparison a highly complex task.

Exploratory data analysis provides tools and methods for addressing this issue. Many recent software tools developed in this area involve using sophisticated statistical analysis methods and provide a means of visualizing statistical analysis results in interactive geovisualization interfaces. However, because they have tended to focus on the exploratory and statistical capabilities of tools, recent solutions have tended to ignore metadata despite the insights they provide into the data production process and their use for dealing with data heterogeneity. For example, metadata may help to account for outliers.

The purpose of this chapter is to demonstrate the value of using both data and metadata in a tool designed for spatio-temporal exploration and analysis, interfacing with a database of territorial statistics. The tool was developed in Java and combines geostatistical methods developed using the R language. Among other things, the tool can be used for outlier detection. The chapter begins with an account of the motivations behind the proposed approach and examines the issue from the point of view of a critique of recent research in exploratory spatial data analysis (ESDA: Anselin, 1993). Part two examines the method and possibilities of analysis offered by the tool, while part three discusses some of the issues raised by the study and use of heterogeneous data.

## 1. THE CASE FOR A JOINT EXPLORATION OF METADATA AND OUTLIERS

The aim is to develop models and methods for analyzing and comparing heterogeneous territorial data from a wide range of sources, including from national organizations such as INSEE and supranational institutions such as the UN and EUROSTAT, at all geographical levels and over different periods. The task of data comparison is made difficult by the existence of different measurement and processing methods, even if the methods in question share the same definition of the phenomena they seek to explain. The detection of outliers, defined as data points that deviate significantly from other values (whether geographical, temporal or thematic), has two advantages: first, thematically interesting values can be identified more quickly; second, measurement errors can be detected.

A comprehensive description of data sources is needed to identify errors. In other words, we need to describe metadata. Based on a profile of ISO 19115 applied to territorial data (Plumejeaud et al., 2010) describing information at three levels of granularity (dataset, indicator and value), we can trace the provenance of data and assess their reliability.

This study aims to contribute to the field of exploratory data analysis (EDA) developed by Tukey (1977). The aim of EDA is to identify and describe patterns and trends in data and relationships between data. Data mining is an interactive, iterative and dynamic process. In other words, users play a central role in the data mining process since they develop and refine their investigations in the course of interacting with the system. Data mining preceded and led to the emergence of EDA. EDA integrates the spatial and temporal dimensions of information in data mining and visualization. Statistical capabilities are essential for exploratory spatial data analysis. The recognition, analysis and measurement of types of spatial association using spatial autocorrelation calculation are one of the most traditional functionalities (Anselin, 1993). Another aim is to provide methods for comparing different temporal trends in order to identify different patterns of change and evolution (Andrienko, 2005). EDA also draws on the concept of multiple synchronized views (using maps, charts and graphs) of the same subset of variables (Monmonnier, 1989).

Interactivity, multiple viewpoints and the development of statistical methods are key features of current EDA tools. Most EDA tools can be used either as a whole or as software components (in the form of statistical libraries, independent of the presentation of results) to detect outliers. Spatial analysis tools such as SADA, GeoDa, CrimeStat, Quantum GIS, TerraLib and GRASS GIS offer spatial analysis functions combined with data visualization and mining functions. Some of these tools allow for the use of scripts for data analysis written using the R language<sup>1</sup>, a free language used by statisticians.

Despite producing a wide range of data mining tools and methods, the emerging field of EDA has not considered the problem of data heterogeneity. None of these tools provide information on metadata in a non-textual format, for example based on maps or interactive

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<sup>1</sup> See [www.r-project.org](http://www.r-project.org)

representations enabling users to connect information on the dataset with the calculated results. Current software tools ignore the metadata associated with the data since the model used to import data does not include metadata.

## 2. OUTLIER DETECTION AND ANALYSIS USING QualESTIM

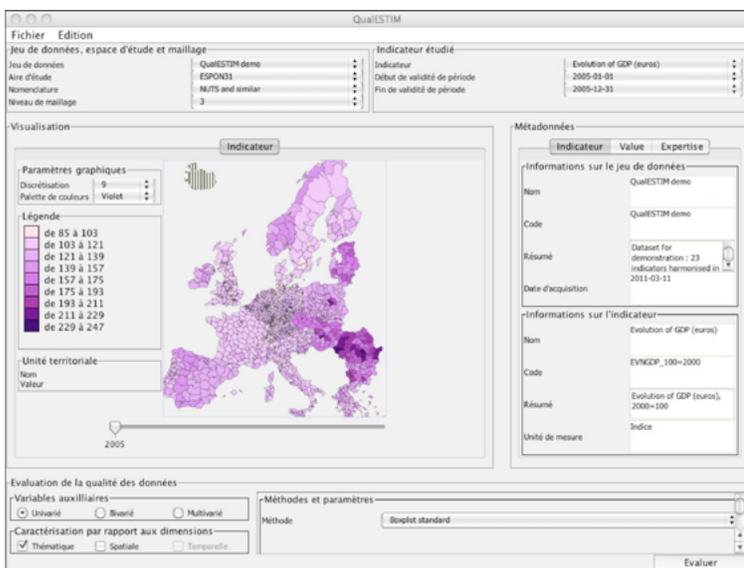
The proposed tool, QualESTIM (developed in Java), is designed to detect outliers by combining several methods of (geo)statistical analysis. QualESTIM can also be used to compare (geo)statistical analyses with the metadata on an interactive basis, thus providing a means of determining whether the outliers in question are explained thematically or are due to an anomaly in the data production process.

The proposed method requires the use of an iterative analysis cycle based on the “Overview, Zoom and Filter, Details on Demand” approach developed by Schneiderman (1996). The aim is to gain an overall overview of the data in order to focus on subsets before filtering the data based on specific criteria and requesting additional information on certain data.

### 2.1. Overview

In the first stage of the process, the user selects a dataset via an interface that allows them to query the database. A first map with a time slider provides a general view of the distribution of the data and the amount of missing data (Figure 1). Here, we are still at the overview stage.

Figure 1. QualESTIM interface: spatial distribution of the GDP growth rate between 2000 and 2005 in Europe (NUTS 3)



Source: C. Plumejeaud - QualESTIM, 10 October 2011 (screenshot)

The data are extracted from a spatio-temporal database based on an identity model that takes into account changes over time in the units (Plumejeaud et al., 2009). The model focuses on geographical units with a validity period, an identity (name, code, center, etc), a spatial extension (the geometry of the units, which is time-stamped) and a thematic section describing the statistical indicators available for the units and the values associated with their validity periods. The model is structured in such a way as to account for the hierarchical dimension of spatial organization, which will be reused to query the database. It describes zonings (and their different versions) as subsets of units forming a division of the territory at a certain level that are valid for a certain period. For example, there are six versions of NUTS, the Nomenclature of Territorial Units for Statistics (1980, 1988, 1995, 1999, 2003 and 2006), each of which define five administrative units, divisions or levels (from communes to states). Spatial analysis methods take into account the geometry of the units on which the indicators are based. These geometries vary in different versions of the nomenclature. In terms of interface and requests, it is therefore essential to transparently select, for each method, the zoning version corresponding to each date of the period of analysis of the indicator. Likewise, users may wish to limit their requests to particular areas or spaces (for example, EU-15, the Atlantic Arc) corresponding to a subset of units on which all the zoning levels are not valid nor all the indicators available. In other words, the choice of study area must be synchronized with the choice of zoning, as does the choice of indicator with the period of study. The socioeconomic units with missing values are automatically eliminated from the analysis.

The database also contains a set of metadata collected based on a profile of ISO 19115 adapted to statistical data (Plumejeaud et al., 2010) providing information on data provenance. The same indicators<sup>2</sup> may come from different datasets, with different values for the same unit at a given time. The values of an indicator from a given dataset are not necessarily collected or calculated in the same way on the geographical space or the time period considered. Therefore, metadata providing information about both data provenance and the source of the indicator are extracted and displayed at the same time.

The data from the database are converted into the input format of the R language, the language used in QualESTIM using a specific module. In the case of spatial data, i.e. the geometries of geographical units, R uses a specific data structure as a spatial attribute associated with the statistical values (see Bivand et al., 2008).

## 2.2. Zoom and filter

The user can then focus on a subset of values highlighted using outlier detection methods. The methods shown in Table 1 provide a means of detecting outliers. Developed using the R package, these methods were made available by the National Centre for Geocomputation as part of the ESPON 2013 Database project (Harris and Charlton, 2010). In the filter stage, the user selects and configures a method and runs the program.

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<sup>2</sup> The same name, description, unit of measurement and classification will be used.

Table 1. List of geostatistical methods available in QualESTIM

Method	Dimension	Number of auxiliary variables
Standard boxplot	thematic	0
Adjusted boxplot	thematic	0
Bagplot	thematic	1
Mahalanobis distance	thematic	1 or +
Principal component analysis	thematic	1 or +
Multiple linear regression	thematic	1 or +
Hawkins test	spatial	0
Local mean	spatial	0
Local regression	spatial	0 or +
Geographically weighted regression	spatial	0 or +

### 2.3. Choice and configuration of methods for detecting outliers

In the graphical interface, users must select a method for assessing the quality they wish to run on the selected dataset. Users specify the number of auxiliary variables they wish to be related to the main indicator. The auxiliary variables are other development indicators. The “univariate” field means that only the main indicator is studied, while the “bivariate” and “multivariate” fields indicate the number of auxiliary variables. For example, in the case of a bivariate analysis, users might select Gross Domestic Product (GDP) as the main indicator and the unemployment rate as the auxiliary variable (over the same time period). The dimension of the analysis must also be specified. Users can choose one or several dimensions (i.e. thematic, spatial or temporal). In the case of the spatial dimension, the methods used assess the variability of the values based on spatial neighborhoods, while in the case of temporal methods the focus is on measuring temporal variability.

The list of available methods is then updated based on the number of auxiliary variables and the dimensions selected by the user. In the method model, there is a correspondence between the type of analysis (dimensions and number of variables) and the methods incorporated into QualESTIM. For example, the method known as the “boxplot” uses a univariate data set and provides a distribution analysis without taking into account date or location search for the values in the tail distribution. By contrast, multiple linear regression considers the variability of a multivariate data set from a spatial perspective. Each method requires specific parameters and configurations and the interface is updated according to the chosen method.

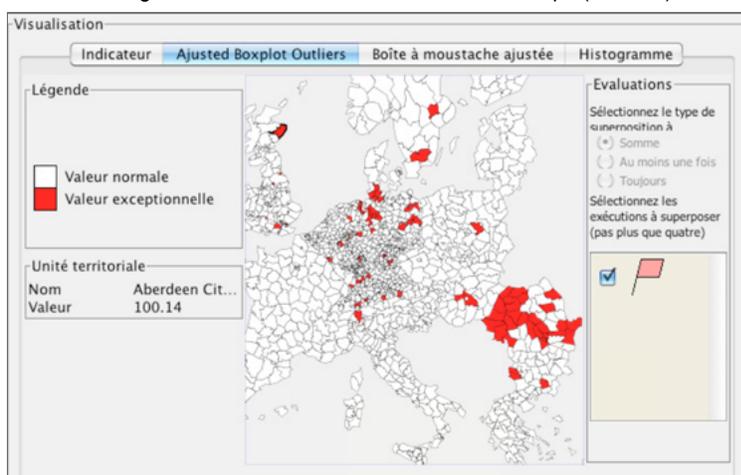
If the user wishes to perform a spatial analysis of the “GDP” indicator in a multivariate data set, they will have a choice of methods at their disposal, including multiple linear regression, local regression and geographically weighted regression. If they opt for the multiple linear regression method, they will need to specify several parameters, including the geographical range or scale of the analysis (for example, 80 kilometers) and the indicators they wish to link to the main indicator (for example, unemployment rate and European agricultural subsidies).

## 2.4. Displaying and combining the results

The results of the statistical analysis are shown in the “Visualization” section of the interface (see Figure 2). The “Indicator” tab shows the map with the raw data selected by the user. The “Outliers” tab can be used to visualize the most recent assessment conducted using the chosen method. The other tabs include all the other types of graphs calculated using this method (histogram, boxplot, etc.).

The interface is designed to enable users to compare results produced by different methods. A flag is associated with each analysis report produced using a given method. The color of the flag is chosen randomly and does not have any particular meaning. Users can access old reports by selecting the corresponding flag. By mousing over the flag (see Figure 3), a bubble is shown containing information about the report, such as the date of execution, but also more descriptive information such as the method and parameters used.

Figure 2. Map of exceptional values and analysis reports produced by the box plot method on the GDP growth rate between 2000 and 2005 in Europe (NUTS 3)



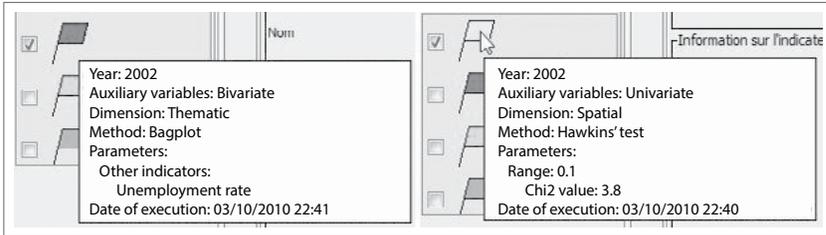
Source: C. Plumejeaud - QualESTIM, 10 October 2011 (screenshot)

Since the analysis reports generated by each method are not necessarily consistent for the same indicator value on a spatial unit, we propose several methods for combining results to provide an overall view of the analyses. Combining results involves overlaying the maps in the “Outliers” tab based on three methods proposed to users. “Aggregation” involves darkening the color of a territorial unit when the number of runs of methods that define its value as exceptional increases. The “minimum” selects and represents those territorial units that never have an indicator value defined as exceptional by all the analyses performed, while the “maximum” selects and represents those territorial units whose indicator value is always considered exceptional.

A time slider allows the user to select a date for visualizing results for the selected indicator. For an annual indicator covering, for example, a ten-year period, the method provides an

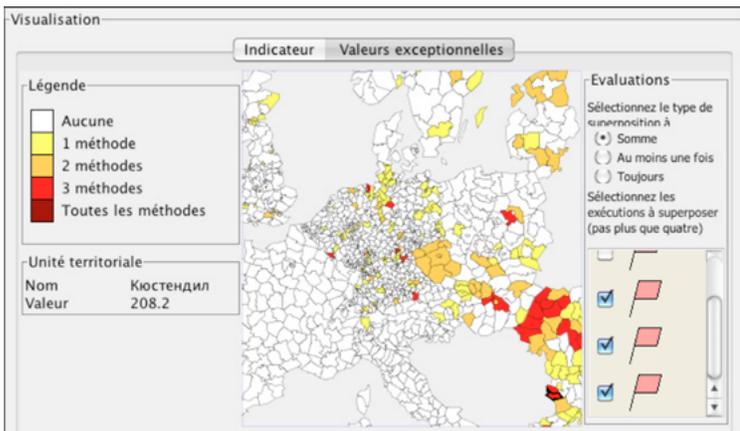
analysis of yearly values. Therefore, the results may vary from one year to the next. The user can move the time slider to visualize the results for each year in the selected time interval.

Figure 3. Description of the analysis parameters associated with the selected run



The filtering process can be repeated ad infinitum and provides a means of combining several results in the same view (see Figure 4), thus highlighting the values that are considered exceptional from different points of view (spatial, temporal and thematic). The execution of each method selected and configured by the user generates an analysis report, consistent with the ISO 19115 standard, which can be exported to enrich existing metadata.

Figure 4. Results compound from several geostatistical methods



Source: C. Plumejeaud - QualESTIM, 10 October 2011 (screenshot)

## 2.5. Details on demand

Finally, the user can request details on demand to find out more about the origin of the values identified as exceptional by one or several methods. By clicking on a territorial unit, the user can view the metadata corresponding to the unit, the indicator and the associated dataset (see Figure 5). The name of the indicator, its code, a summary, a unit of measurement, the name of the dataset and the date of acquisition are shown. This information is important since it indicates the provenance of the analyzed values based on several levels of information.

Figure 5. Information on data provenance in the “Metadata” tab of QualESTIM

The screenshot shows a 'Metadata' window with three tabs: 'Indicateur', 'Value', and 'Expertise'. The 'Value' tab is active. The window is divided into three sections: 'Reliability', 'Source', and 'Supplier'.  
 - **Reliability:** 'Estimation value' has a checked checkbox. 'Estimation method' is a dropdown menu with the text 'Estimation according to the upper value known and the temporal contribution (cf. Roussier, 83)'.  
 - **Source:** 'URL' is 'http://database.espon.eu/database'. 'Extracted on' is '2009-01-01'.  
 - **Supplier:** 'Official supplier?' has a checked checkbox. 'Name' is 'ESPON 2013 Database Project'. 'Code' is 'ESPON 2013 Database Project'.

Using the metadata from the database in this way provides a basis for linking the resulting information with an assessment of the quality of the values obtained. For example, the user will see that a particular data source often provides a significant number of outliers, which may cause them to revise the estimated quality of a group of values (whether upwards or downwards).

### 3. LIMITATIONS OF THE APPROACH

The use of the prototype, designed to query a complex, hierarchical and ever-changing territorial database though using relatively basic criteria (by geographical region, by zoning level, and by indicator and validity period in the base), highlights areas for further research on spatio-temporal data analysis.

We need to develop methods for combining indicators collected on different zoning versions to increase the possibilities of analysis. The indicators between 1980 and 1990 in Europe are generally associated with the 1980 or 1988 version and are difficult to combine with the data in the 2003 or 2006 versions of NUTS. Therefore, it may be interesting to provide “on-demand” activation of methods for transferring indicators into the studied zoning version.

Further research is also needed on *temporal neighborhoods* and combinations of variables with different measurement frequencies and *temporal inertia*. For example, demographic variables may be used with a wide tolerance range (for example, ten years), given their rate of change (roughly twenty years, i.e. a generation), while the average price of oil per barrel, which varies weekly, should be restricted to one month. It is therefore necessary to consider temporal scales according to the nature of the variables in order to determine what is comparable and at what rate over time.

## CONCLUSION

This proposal demonstrates the value of integrating metadata in a tool designed for the spatio-temporal analysis of territorial information, particularly since the purpose of the tool is to facilitate outlier detection and analysis. In the prototype, I suggested combining the results of several (geo)statistical methods and analyzing them in based on metadata adapted from the ISO 19115 standard for territorial statistics.

One major challenge is the analysis of the temporal evolution of a statistical model in addition to the examination of contextual constraints, which requires considering the hierarchical structure of territorial statistical information (Plumejeaud, 2011) as a basis for using more original methods of analysis than those proposed in the prototype. Finally, this chapter highlights the need for a new research model that takes into account the varying rates at which indicators change and the problems related to using data associated with incompatible zoning versions.

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PART 3

**Territorial sciences and social demand**



## **3.1**

### **Grenoble experience**

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## Matching the territorial sciences with territories: conditions and determinants

Grégoire FEYT, Pierre-Antoine LANDEL, Élise TURQUIN

### 1. THE DUAL FOCUS OF THE TERRITORIAL SCIENCES

A territory is not a given but a construct. In other words, the territorial sciences cannot be understood independently of those who form, define and shape the field. This is what distinguishes the science of territory from the more general field of research with an *interest in territories*. It is important to note from the outset that the notion of territory is a relatively new concept (Antheaume and Giraut, 2005) and that territorial action has long gone without, and indeed continues to operate without, a clearly defined disciplinary basis. Given these assumptions, the territorial sciences face three concomitant and interrelated challenges: to define and (re)interrogate their object of study (i.e. territory); to produce cognitive and reflective reference points with a conceptual and operational purpose; and to develop associated responses to questions that remain to be identified and articulated (i.e. formalized) in collaboration with the territory construed as a *subject* (i.e. as a stakeholder).

In building the foundations of the new field, research in the territorial sciences needs to consider the dialectic between action and research by focusing on two issues. First, researchers need to re-examine the assumptions and expectations (whether explicit or implicit) of the “natural” interlocutors of territories (i.e. national and regional institutions, local and territorial authorities, socio-professional structures, planning agencies, and associations, among others). But they also need to reflect on the content and status of the associated engineering practices. In recent research, the question of *territorial needs* has generally been approached from a “functionalist” perspective rather than in terms of the development and legitimation of a new academic discipline. In short, we must ask whether territories need the territorial

sciences. If they do, we will need to determine the conditions under which territories and the territorial sciences can become both recognized partners and legitimate frameworks in their own right within their respective spheres (i.e. scientific and academic in the case of the territorial sciences, decisional and organizational in the case of territories).

Posing the question in this way implies examining the relationship between experience and knowledge in an increasingly complex context and from an increasingly complex perspective. The challenge of determining the future direction of research and practice requires a range of skills and resources, including research partnerships and regional, national or European calls for projects, but also networks bringing together practitioners and researchers and involving expert assessments and forecasts, in addition to the wide range of perspectives on the “territorial question” provided by students in their theses, dissertations, practical workshops, internships and work placements.

After examining the emergence of the *territorial phenomenon*, this chapter provides a critical review of empirical solutions developed under the banner of territorial engineering, primarily by actors in the field. Drawing on both academic and “cultural” developments in this area, we will examine the *conditions* required for a sustainable, effective and balanced relationship between territories and the territorial sciences and the attention given to this issue in the process of building the new field.

## **2. THE CONCEPT OF TERRITORY AND ITS SCIENCES: AN EMERGING FIELD**

### **2.1. A radically transformed context**

As an increasingly important concept in a wide range of disciplines, the notion of territory has established itself as a new analytical framework, an intervention tool and a strategy of response and adaptation. In France, the concept of local development (Pecqueur, 1999) was superseded by the idea of territorial development in the mid 1980s (Gumuchian and Pecqueur, 2003). Similar trends have been observed in other countries. The emerging paradigm is largely the result of the dynamics of globalization, with countries throughout the world facing similar challenges, including economic and social restructuring to meet the challenges of economic and financial liberalization, business mobility in the global market, and the loss of local identity.

National responses to the changing conditions of development have been broadly similar in the north and the south. Major trends include economic liberalization (whether voluntary or forced), the withdrawal of the state in favor of market forces, and the mobilization of territories at an infranational level “as spaces for the action of states and for political mobilisation, economic change and cultural defence” (Keating and Loughlin, 1997, p.11). Our understanding of the concept of development has evolved considerably as a result of these developments, with the notion of compensation being gradually replaced by “the integration of territories” in global flows and networks (Koop, 2007).

Although the notion of local development is still widely used, two arguments have been advanced to justify the increased emphasis on territorial development.

The first argument is that local development is too closely associated with self-centered economic development. By mobilizing qualities that are specific to territories but that are sought outside them, the aim of territorial development is not to focus on optimal resource allocation but to create new territorial resources (Koop et al., 2010). The assumption is that it is by drawing on these resources, and in particular specific qualities involving local heritage and identities (Landel and Senil, 2009), that territorial actors are able to achieve competitiveness through differentiation.

The second argument involves the emergence of new modes of governance. Because of the emphasis on decentralization and the promotion of civil society as an agent of development, territories are no longer the preserve of the state or policy-makers. The assumption is that other actors also resort to the concept of territory to solve their economic, social or environmental problems through “learning” organizations (Jambes, 2001). In addition to the emergence of contract-based policies aimed at promoting the development process at an infranational level, governance also involves “the production of rules by actors in order to regulate the economic, productive and social system” (Angeon and Houédété, 2006). Governance thus places the coordinated approach at the heart of development, based on the assumption that actors are able to come together to create their own structures, rules and norms.

This explains the proliferation of territorial bodies, structures and authorities and the rise of territorial mobilization at all levels in the 1980s<sup>1</sup>, in addition to the territorialization of public policies and the recent emergence of contract-based agreements in public policy-making. These developments have created new complexities for project management, intervention coordination and governance as a result of the involvement of an increasingly diverse range of actors. “Territory” originally emerged as a new research focus over a decade ago (De Bernardy and Debarbieux, 2003), and it soon became apparent that the notion was not immediately capable of serving as an operational and transdisciplinary instrument for supporting policy-making. At a European level, the first integrated programs were developed on the basis of exclusive relationships between the European Commission – engaged in promoting principles of action without a precise framework – and actors and practitioners in the field. At the initiative of networks involving both actors and researchers, research-practice partnerships were gradually developed and promoted as part of the broader emphasis on territorial development.

## 2.2. Constructing and articulating autonomy

The multiplication of territories has created a complex situation, as shown by a recent study of the Parc Naturel Régional de la Chartreuse. Designed to coordinate planning and

<sup>1</sup> In 1985, the European Union created the Integrated Mediterranean Programmes in response to the problems created by the accession of Spain and Portugal to the European Community. This was followed in 1988 by the first LEADER programmes (standing for “*liaisons entre acteurs du développement rural*”), accompanied, in 1991, by the creation of the AEIDL network (European Association for Information on Local Development) at a European level.

development initiatives throughout its territory, the park is currently governed by four overlapping frameworks (LEADER, SCOT, *contrat de pays*, and *pôle d'excellence rurale*) generating eleven different intervention "perimeters". The authorities have become involved in all areas, by choice or necessity, and, in some cases, by order of the government. As a result of this confusion, they have devised their own modes of action, resulting in a proliferation of rules and regulations designed to signal and promote their contribution to a project or territorial charter, but also to aid the process of territorial management and planning. Competitive contracting, a process aimed at bringing together different partners (i.e. central government, local/regional authorities, associations, and businesses, among others) around diverse or specialized issues, has emerged as the dominant framework for defining and coordinating territorial public action. In the absence of a formal hierarchy governing the relationships between the various partners involved, power, and in particular the power to act, resides primarily in the ability to coordinate a diverse range of norms and disciplinary approaches. The context and "atmosphere" shaping developments in this area have required or justified the development of a form of *territorial engineering* articulated around four main objectives or functions: diagnosis, forecasting, contracting and assessment. Today, these conditions have increased the range of areas considered and, by corollary, the nature of the types of engineering knowledge and practice involved (energy, waste, networks, transport, biodiversity, etc.).

These developments have led to a growing need for action-related knowledge, skills and concepts. Therefore, beyond the question of the techniques used, we need to reflect on the construction of knowledge and its integration into decision-making. Driven by the constant need to develop effective and politically acceptable solutions, actors mobilize unique experiences located in time and space that cannot be transmitted as such. Before even considering the question of promotion and transmission, data and information need to be processed and analyzed in a way that interrogates and challenges the tools used to understand and represent the complex multi-thematic and multi-scalar nature of territorial issues. It is perhaps in this area that the weight of expectation on research is greatest.

### 3. UNCOORDINATED RESEARCH SOLUTIONS

#### 3.1. A long-standing but ongoing relation

Territorial bodies and practitioners have been collaborating with scholars in research projects and experiments for over thirty years. Many developments in this area have been highly productive, and some have even resulted in major studies and contributed to the professionalization of university degrees. They have also given rise to original collaborative and transdisciplinary approaches and processes and to professional, academic and personal trajectories that have benefited territories and/or university activities<sup>2</sup>.

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<sup>2</sup> See, for example, the national event devoted to "university-territory interfaces" (*Penser les interfaces Université(s)-Territoire(s)*) held in October 2011 in the Val-de-Drôme with the support of the Association des régions de France and the Association de promotion et de fédération des pays. Analyses and evidence relating to these issues can be found at [uniter.rhonealpes.fr](http://uniter.rhonealpes.fr)

However, unlike current practices in the area of applied research, R&D and promotion in other academic fields (such as engineering or medicine), the findings of studies conducted on, for and with a given territory have rarely been associated with conceptual or methodological advances capable of being diffused and transmitted as such, as can be the case, for example, with a procedure, a product or a patent. Since they are often conducted from a multidisciplinary perspective, studies in this area have often struggled to define the academic framework needed to legitimize and promote their findings among the academic community – a problem that the territorial sciences may help to solve. In this sense, the emphasis on promoting relationships between territorial practice and research has not so far resulted in, or at least allowed for, the emergence of frameworks, programs or protocols recognized by the various spheres involved, as is now common in many academic disciplines through structures designed to ensure transfer and promotion.

### **3.2. Engineering solutions**

It remains that territories *need science(s)* more than ever. Their need for science and research is also increasingly complex in terms of both form and content. The main actors of territorial decision-making – i.e. elected representatives, technicians and intermediary bodies, among others – must find ways of responding to the increasing complexity of policy-making in terms of content and implementation, independently of the strictly political dimensions of the issue. The increasing complexity of policy-making is the result of a number of interrelated factors, including the increasing diversity of the issues and levels that need to be taken into account, the increasing number of professional fields and skills that need to be called upon, the increasing specialization of procedures, and the increasing weight of technical norms and monitoring and assessment requirements.

Because they are required to provide operational solutions to unprecedented needs in terms of knowledge and methods, territories, from rural enclaves to dense urban areas through peri-urban areas, are increasingly encouraged to resort to specialist engineering. A growing number of disciplines in the “hard” sciences are starting to examine territory as an object of research and intervention in its own right, and a wide range of engineering fields (including practitioners in agronomy, the environment, digital technology, energy, and management, among others) (Landel, 2007) and training providers and courses have followed in their wake. Most of these disciplines have a long-established relationship with engineering and are capable of providing effective solutions to the needs of territories, provided these relate to clearly defined issues in disciplinary terms. However, while the solutions devised by academic researchers are undoubtedly effective, their integration in the global approach required by territorial action can be difficult (an issue that is often overlooked). It is precisely the challenge and necessity of transdisciplinarity and the integration of the scientific approach to territorial action that have driven researchers to develop partnerships with territorial actors (Gumuchian et al., 2003).

### **3.3. An overarching research model**

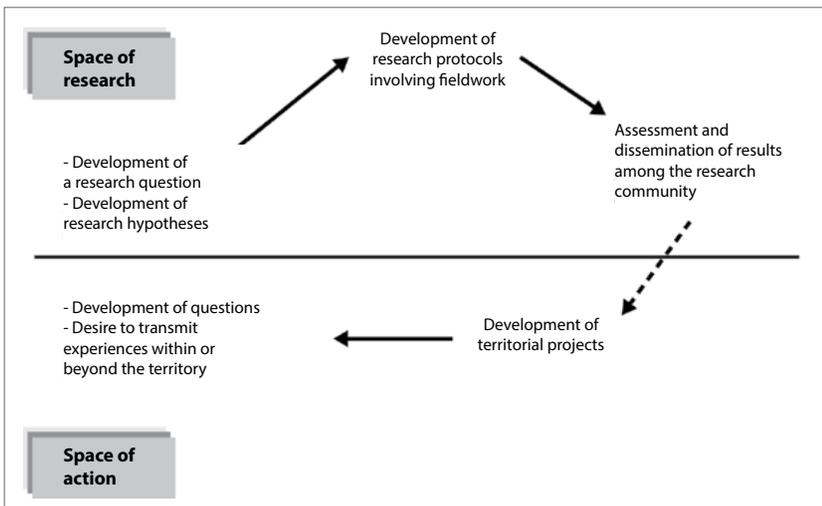
One of the main assumptions of the new approach is that research develops alongside action through the work of multidisciplinary research teams. Research remains grounded in the

traditional methods governing the construction of research questions, hypotheses and protocols adapted to specific research areas. However, while the findings of research are always actively debated and promoted at an academic level, the benefits for actors in the field have remained limited.

Action and research involve conflicting perspectives and approaches. Some argue that conceptualization can never undermine the virtue of action, while others posit that action cannot disprove the scientific value or validity of research findings. The problem is that actors in territories are only marginally involved in the process of defining research questions, or what we might call the process of problematization. It is also important to note that research in this area is based on observation protocols in which comparative analysis plays an important role.

In practice, personal relationships and geographical proximity play an important part in the choice of field of study. As a result, many other potential fields are de facto excluded. This relationship between two distinct spheres reveals the limits of territorial research as a tool in the service of action (see Figure 1).

Figure 1. Research and action in the field of territory: two layered spheres



Research in this area raises the question of *territorial intelligence*, a concept that combines territorial culture and information intelligence (Janin et al., 2011). *Territorial culture* refers to the behaviors, social skills and practical know-how of a given territory, but also to its diversity and its “social ecology”, and provides a basis for developing collective cognitive and reflective skills and for defining the relations between actors and their environment (from the local to the global). *Information intelligence* refers to the forms, channels and systems of information that contribute to the construction of the shared knowledge and territorial representations necessary to develop, monitor and assess territorial projects (Roux and Feyt, 2011). The challenge is to provide tools and methods of observation, analysis, mediation and dissemination related

to (i.e. consistent with) these forms of intelligence. The assumption is that we cannot simply rely on a purely instrumental approach. In other words, in order to define and experiment with these tools and the underlying concepts, the territorial sciences need to engage in dialogue with territories.

## 4. TERRITORIAL RESEARCH AND ACTION: AN EMERGING MODEL

### 4.1. Three types of knowledge

The 1980s saw the emergence of processes of development, enhancement and promotion among professional networks, associations and NGOs<sup>3</sup> (De Zutter, 1994) involved in examining the shift from experience gained from temporally and spatially situated actions to the construction of knowledge transmissible within and beyond the immediate context of the involved organizations. We will refer to these processes as capitalization. In the area of territorial development, the aim is to promote the capacity of actors operating in a given territory to determine the context of territorial development. The point is to reinterpret trends and developments, to understand the key issues at stake and to embed them in a collective process with a view to determining the role of actors within the territory.

Empirical approaches developed at a European level<sup>4</sup> have shown that the development of territorial knowledge involves three dimensions:

- Previously acquired knowledge transmitted from generation to generation,
- Knowledge from outside, or external knowledge,
- Knowledge generated on the territory based on endogenous resources.

Previously acquired knowledge transmitted from generation to generation involves a form of localized knowledge transmitted by actors operating within the territory through complex channels. This type of knowledge provides a basis for developing historical representations of resources, trends, continuities, discontinuities and major (i.e. long-term) changes at work within the territory.

External knowledge often involves methodological knowledge derived from comparative approaches and generated by debates and disagreements among practitioners and their professional networks. The expertise developed by consultants in response to specific issues plays a key role here. Because of the focus on comparative benchmarking, there is a tendency to overlook the uniqueness and complexity of specific situations by ignoring the conditions of transferability.

3 The following online study examines a number of such procedures: "*Analyser et valoriser un capital d'expérience, Repères pour une méthode de capitalisation*". Available at: [p-zutter.net/textesen-francais.html](http://p-zutter.net/textesen-francais.html) or [www.eclm.fr/fileadmin/administration/pdf\\_livre/9.pdf](http://www.eclm.fr/fileadmin/administration/pdf_livre/9.pdf)

4 The following website includes all the studies published by the cellule d'animation and the LEADER European Observatory between 1993 and 2002. Among other things, the website includes "Dossier no. 10" on "Rural Innovation", entitled "Research, Transfer and Acquisition of Knowledge in Aid or Rural Development", a reflective guide on the construction of knowledge in the field of rural development based on different methods and approaches developed as part of the LEADER programme.

Knowledge generated on the territory involves a focus on local experiences aimed at knowledge transmission either within or outside the territory. This often involves a process of rupture or discontinuity involving a wide range of issues and forms of expertise. The aim is to interrogate and problematize experience by confronting it with the views of actors outside the territory. Researchers can potentially play a major role by examining issues in a wider context on the basis of which the territories can develop appropriate response strategies.

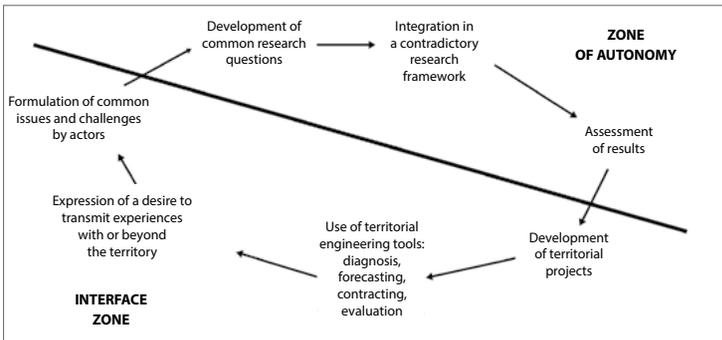
#### 4.2. A hybrid perspective between research and action

We suggest that the territorial sciences must define their relationship to practice and action by combining the three types of knowledge with the aim of capitalizing on experience to produce knowledge. This process requires an interface between territories and researchers and other sources of expertise (i.e. other territories, consultants, state workers and technicians and local authorities, etc.).

The first stage involves a process of exchange as part of an attempt to reconstruct the history of a territory and its evolution in an ever-changing environment, a process resulting in the identification and development of key questions and issues. The aim is to develop a basic framework of interrelated questions on the basis of historical and thematic issues or topics. The assumption is that these questions will provide a basis for the co-construction of a common aim or project shared by a group of actors and justified on the basis of the shared ground of the questions raised.

The second stage involves developing a platform of collaboration (focus groups, observatories, tools of representation, methods of negotiation and mediation, etc.) allowing for the confrontation of conflicting perspectives. The aim is to promote external perspectives (i.e. perspectives from outside the territory) through interventions by experts or researchers or to encourage dialogue between territories based on protocols that help to understand how they operate. The result of this process is the identification of potential resources on the basis of which a project can be developed. This enables territorial actors to appropriate the relevant resources, thereby justifying the territorial embeddedness of the resource.

Figure 2. The capitalization of practices in the field of territorial development



In the third and final stage, territories incorporate these elements in order to develop their own projects using the identified resources. It is precisely the irreversible process of capitalization and the distinction between raw information and transmissible knowledge that enable the understanding needed to achieve a degree of autonomy. Figure 2 illustrates the mechanism governing the development of a space of autonomy in which the process of capitalization is constructed.

Given the nature of the four instruments involved in constructing a territorial project, capitalization may be seen as a form of assessment insofar as it is based on the development of an external perspective (or outsider's view). However, while assessment is used to evaluate a policy, capitalization is used by actors within the territory to facilitate the construction of communicable (i.e. transmissible) knowledge based on the practices and experiences at work within the territory.

### **4.3. The application of research to territorial practice and the impact on territorial engineering**

Cooperation between research and practice is, first and foremost, a form of cooperation that benefits both researchers and actors. However, beyond this, there is the question of development and visibility, in both the academic and the territorial sense. Multidisciplinary approaches – which are necessarily dependent on the contingencies of practice – often struggle to find a space for expression and recognition in a system and academic culture founded on significantly different epistemological principles. The same issue arises when attempting to apply the findings of research findings to *territorial practice* in the broad sense, i.e. to actors not directly involved in cooperation with researchers. As noted above, advances in the territorial sciences seldom result in or extend to patents and procedures. Therefore, examining *territorial needs* in the generic sense requires examining the nature of and responses to territorial needs, also conceived on a *departicularized* (i.e. generic and generalized) basis.

Platforms for shared expression of the “hybrid journal” type (involving researcher-practitioners and even elected representatives) remain to be explored and legitimized. The same goes for the development and implementation of “research-training” sessions designed to promote dialogue and cross-fertilization between experiences and concepts<sup>5</sup>.

However, territorial practitioners, who are now almost invariably graduates with Masters degrees with close links to research, remain effective vectors. Faced with the *territorialization* of engineering based on the “hard sciences”, the conceptualization and theorization of engineering is both an epistemological necessity and an “existential” imperative for the territorial sciences. At the heart of their role and vocation, the concern to integrate the issues and challenges that make up (i.e. shape) a territory generates professional practices and attitudes at odds with the representations and expectations that territorial actors may have of engineering. It may be true that researchers in the territorial sciences are often involved in

<sup>5</sup> For further details on the two examples of the research-territory interface (and others), readers are referred to the measures developed over the past fifteen years in French-speaking Switzerland with the Communauté d'études pour l'aménagement du territoire (CEAT; see [ceat.epfl.ch](http://ceat.epfl.ch)) and in Wallonia with the Conférence permanente du développement territorial (CPDT; [cpdt.wallonie.be](http://cpdt.wallonie.be)).

professional training, and it may also be true that their training and research activities feed into one another. However, it remains that as an academic community, researchers in the territorial sciences have so far been unable to determine the motivations behind their attempt to develop a framework designed to produce and promote a specific type of engineering.

## **CONCLUSION: THE TERRITORIAL PRESSURE TO LEGITIMIZE THE TERRITORIAL SCIENCES**

The territorial and academic worlds will need to undergo major changes that may well cause them to converge. Researchers and academics may see the emphasis on practice and fieldwork (i.e. empirical reality) as an opportunity to enrich and challenge their theoretical, methodological and interdisciplinary frameworks and approaches. However, it is clear that a range of factors, including university autonomy, the changing practices of research assessment and promotion, openness to “academic competition” and the development of calls for large-scale projects, will eventually force academics to re-examine (and possibly rethink) their priorities and their “relationship to the world”, at the cost of creating a tension between their research interests and the pressure to respond to the needs of society. While territories are firmly committed to promoting the value and necessity of cooperation with the academic world as a way of changing their professional and decision-making practices by adopting new cognitive and methodological approaches, these initiatives – which can be likened to what R&D is in the industrial world – are only marginally recognized in the territorial sphere, whether in terms of public utility or the professional assessment of the practitioners involved.

Despite these constraints, which are of an essentially cultural nature, recent developments provide all the necessary ingredients to ensure that expectations and resources, experiences and innovations, and empirical and advanced conceptual knowledge can converge in a consistent and productive framework. However, a unilateral approach is clearly not enough. Beyond strictly epistemological matters, *the task of laying the foundations of the new field* requires justifying its existence: what better legitimation is there than to be able to say that the territorial sciences exist because they are a response to the needs of territories and societies? In either case, the challenge for both the territorial sciences and territories (or for theory and practice) is to develop, promote and express a shared form of *intelligence* and *doctrine* as part of the dialectical interplay between action, research and innovation. However, we cannot afford to ignore the instrumental use of research by territories and the conditions needed to promote a more mature relationship between researchers and practitioners as a way of moving beyond instrumentalization.

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**3.2**

**Territorial sciences and actors**

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## Lessons learned from 14 years of the GEOIDE Network

Nicholas CHRISMAN

There are many factors in developing a knowledge management infrastructure, but perhaps the most fragile involves mobilizing people from diverse backgrounds to work together. This chapter will consider the challenge of mobilizing interdisciplinary collaboration from the perspective of a particular research network in Canada, the GEOIDE Network.

Canada has a long record of innovation in science management, in part due to its multiple heritage (France, England) and proximity to USA. Canada went through periods of centralized science typical of the early twentieth century with the National Research Council (cf. Thistle, 1966), actually more of an institution of government-funded researchers, similar in concept to CNRS in France. Canada also established science funding councils in the 1978<sup>1</sup> that took precedence for university-based research, along the lines adopted in the United States in the post-war expansion of research funding (Lomask, 1976) and more recently instituted in France as ANR<sup>2</sup>. By 1989, various tendencies in Canada led to the creation of an institution to engage researchers more closely with “recipient communities” (such as industry and government). This entity was called the Networks of Centres of Excellence (NCE) (Atkinson-Grosjean, 2006). The NCE built new kinds of institutions, “networks” in place of “centres”. Much of this could seem like bureaucratic smokescreens for the same old arrangements, but these networks do operate differently. The practices of NCE can provide some lessons for the interdisciplinary efforts since 2010 of the GIS-CIST to build a network for the development of the “*sciences du territoire*”.

This paper will derive much of its empirical component from one network: GEOIDE, founded in 1998 under the full title “Geomatics for Informed Decisions; *géomatique pour*

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1 [www.nserc-crsng.gc.ca/NSERC-CRSNG/History-Historique/chronicle-chronique\\_eng.asp](http://www.nserc-crsng.gc.ca/NSERC-CRSNG/History-Historique/chronicle-chronique_eng.asp)

2 ANR = Agence nationale de la recherche, established in 2005; [www.agence-nationale-recherche.fr/missions-et-organisation/missions](http://www.agence-nationale-recherche.fr/missions-et-organisation/missions)

*les interventions et décisions éclairées*". GEOIDE provides an example of a fourteen year experiment in conducting research linking various sectors, and eventually how this became a model for other similar entites around the world. GEOIDE is interdisciplinary, international and designed around delivery to user communities (industry, government, and non-profits generally). Since this is also the design of the GIS CIST, it is pertinent to consider the history of the Canadian experiment.

## 1. GEOIDE NETWORK: COLLABORATION DESIGNED FOR PUBLIC BENEFIT

Fourteen years ago, a team of geomatics researchers at the Université Laval, the University of Calgary and the University of New Brunswick, built a national collaboration of government, industry and the research sector to win a highly competitive competition (Chrisman and Thomson, 2012). The result was the GEOIDE Network (GEOmatics for Informed DEcisions), funded by the Networks of Centres of Excellence (a permanent programme of the Government of Canada) for these past fourteen years. It has engaged teams of researchers from 34 institutions across Canada with over 500 partners in every sector. The inputs and outputs are easy to catalogue, but it is the benefits for society that matter.

GEOIDE assembles researchers across Canada, in a range of fields including termed "geomatics" in Canada (including surveying, geodesy, photogrammetry, remote sensing, image processing, geography, planning, and geographic information science). It also mobilizes domain specialists from various environmental sciences, engineering, and the social sciences. Over a fourteen year period, GEOIDE has funded a total of 121 projects, with a total investment of 79.3 million CAD (at current exchange rate 65 million euros)<sup>3</sup>. Over this period, 395 research scholars from Canada have participated in the projects, and a total of 1,437 students. In addition, 174 industrial affiliates have been engaged, alongside 95 governmental entities at all levels. Researchers from around the world have been linked formally and informally from 146 institutions (research laboratories, universities and the like). In terms of traditional output measures, GEOIDE projects report 2,675 peer reviewed papers and another 2,070 in non-peer reviewed outlets. So, in the traditional measures, GEOIDE has been a big research enterprise, but it must show results beyond this.

## 2. INTERDISCIPLINARY MIX – WHAT IS IN A NAME?

The mix of disciplines involved in GIScience or geomatics has fallen out differently from place to place, from country to country. The role of institutions has varied, with strong state support in some places, and more industry role in others. Overall, this multi-disciplinary convergence presents an interesting case study in the history and sociology of science and technology. The naming of the field itself demonstrates this diversity of approaches, as well as signaling the complexity in building true international coherence. The long-established disciplines of cartography, surveying, geography, and geodesy have merged in various ways in different countries. For example, cartography as an academic subject is mostly practiced

<sup>3</sup> [www.geoide.ulaval.ca/geoide-mission.aspx](http://www.geoide.ulaval.ca/geoide-mission.aspx)

inside geography departments in North America, but this is not the case in most of Europe. Surveying as an academic subject has declined in North America despite the dramatic technological advances in the field. M. Paradis saw this coming in 1981, and used his opportunity as keynote speaker to develop the new term “geomatics” for the Canadian professional milieu (Paradis, 1981).

In most countries there have been mergers, but which disciplines have merged with others is not guaranteed. The more recent fields of photogrammetry, remote sensing, geographic information systems have been merged in some places with some of the older disciplines under the title of geocomputation or geographic information science (Goodchild, 1992). In Canada, the term “geomatics” (*géomatique* in French) took root twenty-five years ago as a covering term for the whole collection of undertakings to collect, analyze and distribute geographic information (Gagnon and Coleman, 1990). In Australia, the term “spatial sciences”<sup>4</sup> has become the rallying term for the same coalition. The term “*sciences du territoire*” promoted by this volume (and the organization behind it) is hard to translate into English with the same degree of clarity as it holds in French. For the purposes of this chapter, I will retain the Canadian term “*géomatique*”, with a willingness to understand how this term separates us from some groups as much as it aligns us.

Whatever the name, the interdisciplinary nature of GEOIDE is crucial to its results. GEOIDE covers many disciplines, from mathematics, engineering, natural sciences to social sciences and health. Table 1 shows a snapshot from one point at the end of Phase III (2009).

Table 1.

Departments	Nb of researchers	% of total
Geomatics	23	17.3
Geography	19	14.3
Earth Science (Geology, Geophysics, Atmospheric Sciences)	19	14.3
Civil and other Engineering	18	12.8
Computer Science	12	9.0
Statistics (Mathematics)	9	6.8
Environmental Studies (Biology, Landscape Ecology, Ocean)	8	6.0
Forestry	6	4.5
Medicine (with Public Health, Kinesiology)	6	4.5
Physics	5	3.8
Planning (with Landscape Architecture)	4	3.0
Archæology	3	2.3
Business	2	1.5

This particular mix reflects the disciplines involved at that time to solve one set of challenges. Each new project would bring a new collection of disciplines; there is never a fixed list.

<sup>4</sup> [www.sssi.org.au](http://www.sssi.org.au)

Figure 1. Samon smolt with PIT-tag



Source: Photo montage courtesy of Julian Dodson

Figure 2. Antennae before they are covered with stream substrate



Source: Photo courtesy of Patricia Johnston

A single example of a GEOIDE project offers a glimpse into its scientific process and results. Atlantic salmon hold great value to ecosystems and to humans. The economic value of wild Atlantic salmon stems largely from the sport fishery, worth tens of millions of dollars annually. The species is, however, in decline across its natural range, prompting a call to action for resource managers and the science community. A GEOIDE team adopted an integrated approach to salmon habitat from headwaters to estuaries; mobilizing fluvial geomorphology, biology, and geomatics technology. One key element investigates mortality of salmon smolt in their perilous journey from fresh water to the ocean. By using various geomatics techniques, including the innovative use of passive sensor tags inside the float sac of the smolt (Figure 1), they have been able to resolve open scientific questions about a smolt's navigation capacity and its ability to sense salinity and the location of the ocean.

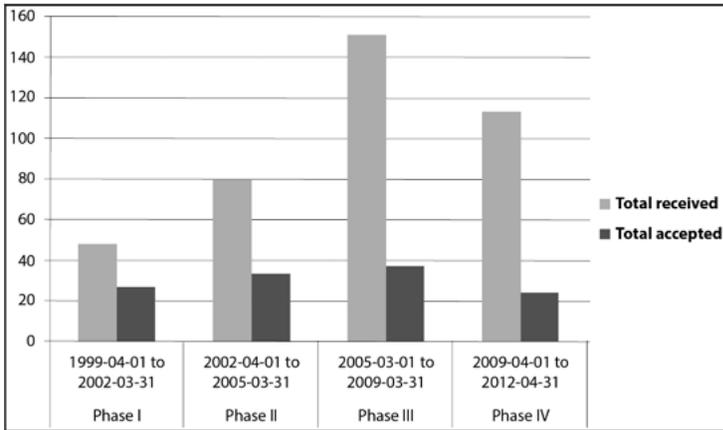
Arrays of antennae in the stream bed (Figure 2) have enhanced spatial and temporal resolution by orders of magnitude (Johnston et al., 2009). A previously unknown "commuter" behavior of salmonid juveniles has been observed and validated by subsequent research. The researchers contend that they would not have detected this behavior without the interdisciplinary breadth of their network project (Dodson et al. 2012). The project's affiliates (government resource managers, sport fishermen, first nations and the hydro-electric utility) are directly interested in the scientific results since new knowledge of how salmon interact with their environment will influence land management decisions and public policy on rivers and estuaries.

### 3. MISSION

The core of the GEOIDE's mission is to promote the development of geomatics research in a way that delivers benefits to Canadians. Unlike "curiosity-driven" research councils, NCE favors an interaction between «receptors» and the research community. Through this two-way flow, the traditional linear model of a linear pipeline of "technology transfer" is abandoned. Projects have been selected for their robust interdisciplinary communication and for their collaborations with a user sector in industry, government, or the non-profit sector. Substantial additional funding is expected from these user sectors, and GEOIDE has been more and more successful in obtaining cash contributions, in some cases matching the research council funding 1:1. Overall, the recent average is closer to 1 (from users): 2 (from the councils).

GEOIDE has operated on the basis of open calls for proposals, followed by peer-review. As Figure 3 demonstrates, over the history of GEOIDE, the rate of selection has become more and more rigorous. The acceptance rate started at 56%, and fell to 21% in Phase IV. Phase III saw more proposals, but for somewhat smaller projects with an acceptance rate of 25%. (Each Phase had approximately the same funding per year, but Phase IV accepted some larger projects.) The network did not turn into a clique of insiders who divided up the spoils; there was substantial turnover, along with certain teams that were able to continue funding in a more and more selective peer-review process. This practice may be hard to implement in other countries, since the research authorities are unlikely to devolve authority to an entity such as GEOIDE.

Figure 3. Proposals submitted and funded by Phase, 1998-2011



In preparation for Phase IV (2009-2012), specific themes emerged through a process of strategic planning for the last NCE-funded round of proposals. The three themes were purposely broad but also designed to avoid too much duplication.

*Mobility*: centers on tracking and predicting the motion of people and objects. User representatives include transportation sector, logistics enterprises, and security services. Researchers working on tracking technology, space-time models and simulations, and dispatching analysis at various scales form the teams working on this theme.

*Environmental change*: centers on modeling changes in the earth system, fast or slow. User representatives include natural hazard response agencies, geomatics industry representatives, and environmental policy-makers. Researchers working on instruments, remote sensing applications, and sustainability policy dimensions join this grouping.

*Distributed sensors*: centers on advanced technology to measure the environment and deliver innovative information products to users. User representatives include instrument manufacturers, geomatics service providers, and infrastructure managers from government and private sector. Researchers working on sensors, distributed network interactions, and integrative software form teams on this theme.

#### 4. INNOVATION

One of the central goals of the NCE programme and the Canadian government is to create new enterprises, or to spur innovation in existing companies. GEOIDE projects have led to at least 20 patents, and many more licensed technologies. A few spin-off companies have resulted, most of them still in business. For example, SimActive, Miovision and Intelli3 were created by GEOIDE-trained students, with support from GEOIDE Market Development Funds and from other partners<sup>5</sup>. Perhaps the most successful spin-off had the shortest existence,

<sup>5</sup> [www.simactive.com](http://www.simactive.com); [www.miovision.com](http://www.miovision.com); [www.intelli3.com](http://www.intelli3.com)

as GeoTango was acquired by Microsoft within weeks of its creation<sup>6</sup>. The technical directions of GEOIDE research point the way for Canadian contributions to Web mapping, positioning technologies, image processing algorithms, business intelligence and many more. The current projects continue with augmented reality, volunteered platforms, and distributed sensors – the areas of strong growth potential.

## 5. TRAINING OF HIGHLY QUALIFIED PERSONNEL

Over many years, the Network has funded over two hundred students each year. Over the life of the Network, over 600 students have completed graduate degrees (Masters and PhDs). Results of the cumulative investment have been particularly clear as a generation of graduates from the network have taken up positions across the geomatics community. These students were trained in a different manner, placing greater emphasis on interdisciplinary teamwork.

Perhaps a third of the students moved directly into industry jobs, but the new generation is most visible in the academic sector. Over the past four years, 18 former GEOIDE trainees have taken tenure-track positions in academic departments across Canada. In some geomatics departments, half of the new junior hires have been GEOIDE students from earlier Phases. Twelve of the 95 researchers in the Pilot projects for Phase IV are former GEOIDE trainees, including two project leaders and three deputy leaders. As a result, research leadership in the Network is turning to new faces with real experience in networking.

No single student can represent the complete experience of the whole network. Taken as a group, however, this new generation of geomatics professionals working in all sectors of the geomatics community is already making an impact on the economy, in the form of new businesses and innovation within existing companies. On the academic side, the research community is being renewed and the spirit of networking firmly established. These students are an enduring legacy of GEOIDE and an indicator of future accomplishments (Devillers et al., 2012).

## 6. INTERNATIONAL CONNECTIONS

Over the years, GEOIDE developed stronger relationships with an increasing number of international partners. In 2006, GEOIDE hosted a workshop that assembled the scientific directors (or equivalent) from organizations representing France (MAGIS-SIGMA-Cassini), Ireland (NCG), Australia (CRCSI), Netherlands (RGI), USA (UCGIS), European Union (AGILE), and Latin America (IPHG). Subsequently, connections have been made to Mexico (CentroGeo) and South Korea (KLSG). Each organization has its own origins and distinct objectives. Some are research networks much like GEOIDE, with funding for research initiatives. GEOIDE has actively engaged with these groups, sending representatives to their national meetings, attending their workshops, and bringing their teams to GEOIDE events. These efforts have led to enlarged teams (affiliated foreign researchers increased from 17 to 39 in Phase III), bringing Canadian expertise to a new worldwide leadership position. GEOIDE has joined with

<sup>6</sup> [www.directionsmag.com/articles/microsoft-and-geotango/123232](http://www.directionsmag.com/articles/microsoft-and-geotango/123232)

Australia, Mexico, Sweden, and South Korea to create an organization termed the Global Network for Networks<sup>7</sup>. This unincorporated entity seeks to promote common operations and enhanced exchange.

## CONCLUSION

GEOIDE, founded in 1998 under the full title “Geomatics for Informed Decisions: *géomatique pour les interventions et décisions éclairées*” provides an example of a fourteen year experiment in conducting research linking various sectors, and eventually how this became a model for other similar entities around the world. GEOIDE has been interdisciplinary, international and designed around delivery to user communities (industry, government, and non-profits generally).

It will take a more detailed review of GEOIDE to extract all of the lessons learned by all the parties. Perhaps the most apparent lesson for a group such as GIS CIST is how long it takes to see results. One does not change culture and expectations immediately, no matter how much money and other resources are mobilized. The GEOIDE Network adjusted to the circumstances, and adjusted those circumstances as well. The main result of 14 years of funding may reside in the students of the network. A whole generation has been trained in collaborative interdisciplinary projects. Some moved from students to project leaders, launching careers much faster and maintaining their network connections across long distances.

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<sup>7</sup> [globalspatial.org](http://globalspatial.org)

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CHAPTER 15

**The impact of advances in the territorial sciences  
on school geography**

Nacima BARON

As in any discipline, the process of building the school geography curriculum is a complex and delicate matter determined by largely uncontrollable factors. Beyond any particular government ministry or educational community, curricular changes in geography invariably involve (and indeed affect) many people, including students' parents, academics and politicians. Debates over curriculum reforms also often involve simple, not to say simplistic, binary oppositions. Consider, for example, the conflict between tradition and innovation. Recent proposals for curriculum changes in geography have been met with much resistance to any proposed conceptual, methodological or pedagogical innovations (Kociemba, 2008). Geography is also torn between the sheer range and diversity of issues, places and perspectives that it encompasses – a diversity at odds with the narrowness of the material conditions (in terms of time and budgetary constraints) governing the subject. Lefort (2010) also emphasized the increasing social pressures on geography – pressures that contrast sharply with the more realistic approach to geography as a school subject based on a restricted range of topics.

Given these constraints, the challenge is to conduct fundamental research in a particular field while giving due consideration to the external pressures placed on geography. The question that arises is this: How can we reconcile the range of knowledge and skills that are deemed necessary to enable a young person of 18 to become an enlightened and emancipated citizen with time and budgetary constraints, the often strained relationship between professional associations and the French Ministry of Education, and the practice of geography teaching, from the *lycées* of Clichy to those of Neuilly?

This chapter is a personal account of my experience as a member of the committee in charge of the French geography curriculum over the course of three years. Focusing on the case of

France, the aim is to provide an insight into the research objectives of the CIST and to lay the foundations for an original epistemological perspective. In both cases, the task is both programmatic and pragmatic.

## **1. DEFINING A FIELD OF KNOWLEDGE: A PROGRAMMATIC AND PRAGMATIC TASK**

The programmatic task is the more obvious one. The attempt to name and define a new conceptual and methodological field and the task of devising a reasoned set of geographical questions pose similar challenges. Those involved in defining the boundaries of a new field and those responsible for defining the content of the curriculum aim to develop and articulate concepts with similar meanings using specific techniques and methods to select and categorize the relevant concepts in order to construct a coherent and substantive framework. Their aim is also to establish connections between key notions from both a hierarchical and a systemic perspective, while also sharing the same doubts and concerns, haunted as they are by the fear of omitting something important or of including details that will be soon become irrelevant in an ever changing world.

In both cases, the practical nature of the task is clearly apparent. The assumption is that effective strategies need to be developed in order to transmit knowledge and skills (i.e. academic knowledge and skills, but also pedagogical knowledge and skills) to professional communities (i.e. academics and researchers, but also teachers) haunted by the fear of a loss of status and faced with the prospect of painful reforms. The question of timing and temporality is a key aspect of the process of change. The reform of French higher education, the question of the links between universities and “grandes écoles”, the structure and organization of Masters degrees, the remit (or boundaries) of doctoral schools, the future of the humanities, and the links between geography and engineering via the territorial sciences have had a major impact on the focus and direction of recent research. It is also important to note that the recent *lycée* reform is not unrelated to more general public policy reforms and the recent job cuts affecting the educational sector. A good example of this is the reform of the *Première* curriculum in the context of a narrow political agenda. Between the announcement of the *lycée* reform in mid-November 2009, the details released by the Ministry about history and geography in early December and the presentation of the findings of the working group on 20 January 2010 (followed by several weeks of negotiation with union representatives and teacher associations), little time was wasted in pushing forward the proposed reforms. In both cases, the attempt to (re)form a field of knowledge was governed by a large number of constraints as conflicting conceptual perspectives were made to compete against a backdrop of conflicting interests and pressures.

Though they both occurred in the early 2010s, the two processes (i.e. the construction of a new field and the curriculum reform) have different aims. While there are no glaring differences, the definition of a field of knowledge concerned with the concept of territory is not necessarily consistent with the practice of teaching a subject with territory as its object of study. Indeed, it is almost impossible to overstate the complexities of the relationship between advances in a social

science discipline (academic geography) and the theoretical and practical frameworks of a school subject (school geography). However, contrary to what we might think, this is not a new problem. Rhein (1982) highlighted the complexity of this issue three decades ago – an issue related to the hybrid nature of French geography, a discipline at the interface of several fields. In my view, a debate or dialogue needs to be initiated that brings together secondary school teachers and researchers in the field based, for example, on the foundations laid by Thémines (2011).

This chapter focuses on secondary school curricula in geography. The concept of territory has become a major focus of the French curriculum in recent years. The result has been the emergence of a distinct and distinctive educational project – distinct by virtue of its configuration (actors, regulatory environment, operational constraints) and by virtue of its approach to a particular research project. Based on the principle of the medieval *disputatio*, in which the clerk argues both for and against the same statement, I will examine both sides of the debate – i.e. the arguments of the political authorities and central institutions and the arguments of the teaching community surrounding a transition construed as a shift from “traditional geography” to “territorial pedagogy”.

## **2. TERRITORY, SUSTAINABILITY AND GLOBALIZATION: THE NEW CONCEPTUAL TRINITY OF SCHOOL GEOGRAPHY?**

The recent reform of the French geography curriculum is based on three key notions: sustainability, territory and globalization. The concept of territory is viewed as a central component of the new conceptual trinity and is assumed to draw its substance from the other two components, which are adapted and defined as required (i.e. global territory or sustainable territory). The argument advanced by Lefort (2008) provides a basis for determining whether the three notions are merely a passing fad or a reflection of the fundamental paradigms of contemporary thought – or indeed whether they pertain to “metadiscourse”. Whatever their nature, the institutional recognition of the three notions is intrinsically linked to the attempt to include or subsume all levels and scales, from the global (i.e. the planet as a whole) to the local (the street, the neighborhood). While key concepts are generally taught from a global perspective (particularly in *Seconde*), current *Première* and *Terminale* programs focus primarily on France and Europe, including daily territories (whether “experienced” or not) and local (or neighborhood) areas and entities.

The magic triad formed by the concepts of territory (construed as a framework), sustainability (construed as a collective challenge for action) and globalization (construed as the dominant force of geographical change) has had a major impact on geography teaching before *collège* (middle school). However, it is important to emphasize that the territory-sustainability-globalization triad is only taught at *lycée* level. The aim is to consolidate primary and middle school curricula and to ensure that the curriculum follows a natural progression as part of a building process designed to avoid repetition and to emphasize the links and connections between different topics. The idea is that the topics taught at *collège* need to be developed and consolidated at *lycée* level. As emphasized by the *Inspection générale*, the programs developed

between 2009 and 2011 were designed with a view to “getting the work done”, the assumption being that there is a natural progression from primary to middle school and from technical and vocational pathways (culminating with the overhaul of the vocational baccalaureate) to purely academic pathways.

Performing a pivotal conceptual role in the new approach to geography teaching, the concept of territory implies a vertical perspective at odds with the traditional spatial approach, which posits that the curriculum is based on the study of successive “blocks”, regions or areas (i.e. France, then Europe, then the United States, etc.). Because of its complex stratification, the assumption is that the concept of territory lends itself more easily to consolidation and development. For example, a given topic in *Sixième* may also be taught in *Première*, though from a different perspective. In this sense, the meaning of pedagogical action is no longer a given, but is constructed in class and (therefore) constantly reconstructed. A given approach and level of territorial representation combined with a given thematic focus (for example, urbanization) provides a way into a complex field of meanings from which the teacher will need to select a core focus in line with the formal learning objectives, the grade (or year), and the time allotted to a particular topic. The term “territory” is sufficiently flexible to provide a basis for explaining many observable phenomena or realities. In this view, the concept of territory is seen as a lever, and its use in practice is justified on two grounds: first, it is assumed to be in tune with the major conceptual and methodological advances of contemporary research in the humanities and, second, it is a more accurate reflection of major global trends and developments.

The pedagogical flexibility of the concept of territory is well-suited to the structure of the curriculum as a set of thematic issues and to the increasingly important role of case studies in current educational practice. Because they are always contextualized, case studies provide clear benefits. The emphasis is on a narrative approach that aims to make key notions and concepts easier to learn. Case studies also provide a basis for cartographic representations and mapping activities (consider, for example, the return of sketches in so-called regional geography). Though not presented as an accumulation of factual knowledge (which is often the case in courses based on competitive exams), the “territory” topic – now an integral part of the curriculum – gives students the illusion that they understand the complexity of the institutional relationships between political actors. The moment of truth of the core or main activity in class is the summative assessment of the case study, which may involve an attempt at generalization and comparative discussion involving different territorial entities and case studies. The question that arises is: What kind of argument or reasoning – and indeed what heuristic judgment – can be made on the basis of an isolated case that is, by definition, unique and non-reproducible?

### **3. GEOGRAPHY: A BELEAGUERED FORTRESS?**

The broader context of the reform of high school geography curricula is the recent *lycée* reform, a key objective of Nicolas Sarkozy’s term in office. Asking teachers to move from the spatial paradigm to the territorial paradigm at a time when the profession is being hit by a loss of status and privileges as well as undergoing a major process of functional reorganization is

an extremely complex and sensitive issue. Inevitably, the broader context has an impact on the perception and reception of the new curriculum.

The general causes of discontent among teachers include the climate in *lycées* and the more general challenges of teaching and education. Among geographers, there are more specific causes for concern. Modules in *Seconde* have for the most part been dropped because lessons cannot be split in two (particularly in ICT education). Geography, like history, is also in a precarious position in the final year of science baccalaureates (*Terminale scientifique*). Another cause of discontent is that since the masterisation of competitive teacher training exams (*concours*) in 2011, trainee teachers in geography have been directly affected and often experience major difficulties early in their career. Another serious concern is the reorganization of geography exams at baccalaureate level, with parents of students in science pathways putting pressure on teachers in the broader context of a radically reformed curriculum that teachers have not had time to fully assimilate.

These developments have led to a climate of fear and suspicion among teachers, but have also caused tensions between educational practitioners and the educational authorities. This has inevitably affected the reception of curriculum changes among the teaching community and has changed the perception of the territorial dimension and its inclusion within the curriculum. The prevailing view is that geography has been increasingly marginalized, while the growing popularity of the concept of territory has meant that it is in danger of becoming meaningless. To understand the relationship between the two ideas from a theoretical perspective, I trawled through three hundred mails and letters written during the period of reforms. Half the letters and emails were responses to recent policy developments (i.e. emails sent to the ministry via *rectorats* during the consultation period), while the other half were letters written by regional school inspectors (*inspecteurs d'académie* and *inspecteurs pédagogiques*) as part of consultation meetings held with teachers.

Based on the collected evidence, there appear to be three main objections to the new curriculum. The first is its lack of neutrality. While the concept of territory may not appear to have any political implications, the related concept of sustainability has been a major focus of political action in recent years. For example, the title of the *Seconde* program ("*L'humanité en quête de développement durable*") has been heavily criticized for its normative implications. Critics see the topic as either "demagogic and overly focused on Nicolas Hulot-style ecology" and as a mere "mantra" or as being too far removed from the discipline, exposing it to the risk of being instrumentalized in the service of a univocal approach: "Are we still within the specific field of geography? Is sustainable development the new paradigm of geography?". The discontent of teachers is a reflection of the challenges of teaching a topic as complex as the nature-society interface in geography, as shown by Hagnerelle (2011) and Vergnolle-Mainar (2008, 2009). The point is not simply to reconsider the failed attempt to introduce the concept of "geosystem" in schools, nor even to emphasize the difficulty of teaching a concept as vague as sustainable development. The geographical community and the geographical literature have created an ambiguous view of political ecology in France (see, for example,

the “*Géographie, écologie, politique : un climat de changements*” conference held in Orléans in 2012). Indeed, it is not unreasonable to suggest that these ambiguities have been a contributing factor to the general climate of fear and suspicion among teachers.

Insofar as the “territory” topic invariably involves an interpretation of the changing relationship between people and space and an analysis of planning operations, the question of territorial action has also been a target of criticism. Critics argue that “sustainable development can be a social project or a political slogan, but not a geographical concept”, or claim that “what we have here is almost a ‘political’ program, with phrases such as ‘supporting’ rural areas and ‘sustainable planning’ becoming commonplace, as if the geography curriculum had become an election campaign! Is that what the study of space really is?” Critics also argue that “the prospective approach is not compatible with the geographical approach. The European Union is no longer discussed; it has simply become a spatial planning agency”. In other words, there is considerable resistance to the introduction of an institutional approach to territory in schools. Various described as being too technical, too political or too dehumanized, the concept of territory is widely viewed as the framework or foundation for the planning decisions made by public and private institutions, thereby removing the question of territory from the real field of geographical inquiry. This is nothing new. In the previous curriculum reform in 2008, and even in the penultimate reform, the introduction of the notion of local planning was also met with resistance (Champigny and Durand, 2004; Baudelle, 2008). The description of the relationships, contracts and agreements between institutions to plan and develop public facilities and infrastructures has been a major cause for concern because of the complexity of the issue (i.e. secondary school teachers are not necessarily familiar with the mysteries of decentralization) and because it conveys an impression of “smooth governance” and removes or conceals the element of conflict or contention, but also because of the sometimes painful social implications of the studied phenomena. As noted by one teacher: “Is it not true to say that the territory is a new scientific norm serving an ideological function?”. Similar criticisms have been voiced by academics. For example, Dumont and Béchet (2011) highlighted the end of the “humanist” conception of geography and the increasing impoverishment of the curriculum. Another contentious issue has also emerged following the introduction of a new topic at *lycée* level: the study of planning (based on a real case of local planning close to school), a topic widely perceived as too politically correct and overly technocratic. The pressure to work on local case studies based on fieldwork conducted around the school has been criticized by many teachers unaccustomed to such practices. After all, what is a field in geography at *lycée* level? How might we engage with local officials? What form should fieldwork take in practice? And how might we assess students’ work and results? In short, the emphasis on engaging with the reality of territories is seen as a cause of disruption among teachers, but also forces the wider educational community (students, teachers and others) to shift their perspective. The implication is that field praxis, in the sense defined by Calbérac (2011), needs to go hand in hand with the appropriation of the concept of territory by teachers.

The third and final criticism stems from the previous criticism. Many observers have taken a stand against the renewed emphasis on the French territory in the curriculum, particularly

at baccalaureate level (a major novelty). The study of France has been part of the *Première* geography curriculum since 1920, and no major changes have been made since then (Lefort, 1996). Until thirty years ago, the study of France was still largely based on a quasi-Vidalian perspective combined with regional science. The idea of reintroducing France as an object of study based on a more territorial perspective and of combining it with a broader European and global perspective has been met with skepticism by the teaching community. In particular, the idea of refocusing on France and of moving away from the systematic study of the major “powers” (i.e. the United States, Russia and Japan) is seen by many as a triumph of self-centered territorialism and of the territory as *terroir* (the assumption being that France should be studied from the point of view of so-called local territories). In other words, the move is seen as a defeat of international openness and as a failure to recognize the multipolar reality of the world. There is also a feeling among teachers that the emphasis on France is at the expense of Europe and that the focus on Europe is at the expense of the world, and that, in some sense, focusing on local or immediate territories means overlooking or ignoring the world, thus diverting attention from current realities. Many of the letters and emails sent to the French Ministry of Education argue that the new approach “opens no new horizons for students” and that it reflects an “ethnocentric view of the world” and a form of “cultural isolationism”. There is also a feeling that the renewed emphasis on France-based topics, not least in the science baccalaureate, may serve to “promote an unattractive image of the discipline”, by contrast with the study of major powers, which was often seen as a form of openness or an “escape”. There is also some confusion over the place that should be given to the French territory in schools, and in particular over whether France should be taught instead of or alongside foreign territories. The academic Rémy Knafou is almost alone in expressing his indignation at seeing “France left out” of the curriculum. Is he aware that there is not a single teacher who would agree with him (Knafou, 2011)? The argument that learning about the geography of French territories is less interesting and less attractive to students than learning about the geography of other parts of the world also raises questions about the perception of the national territory (see Chanet and Jalta, 2004), suggesting new avenues for research on potential improvements to the proposed approaches, for example by emphasizing immersion and direct contact with places through their form and their colors and the production of images, representations and perspectives, both major trends among contemporary photographers (Depardon, 2010) and landscape artists (Bailly, 2011).

## CONCLUSION

The term “territory” crystallizes some of the most critical issues surrounding recent research and teaching practice in geography and related fields. It is the connecting link between the attempt to radically reform a discipline as part of the development of a science of territory and the drive to promote pedagogical change. The term has also been the focus of much debate in both research and teaching. In particular, the spatial and temporal variability of the term and the inter- or transdisciplinary adaptability of the concept (Audigier, 1995) are major foci of debate and research in this area – which is ultimately, perhaps, a good thing.

These considerations suggest that some of the objectives of the curriculum reform may not be achieved. The concept of territory, which seemed to provide depth, critical reflexivity and diversity to the geographical approach, is now widely seen as a sign of intellectual decline and impoverishment – a decline illustrated by “the excess of case studies, data, images and statistics, and the paucity of ideas”, as one teacher recently complained. The emphasis on the concepts of globalization, sustainability and territory and the sense of repetition and redundancy of the thematic topics related to it have created a sense of suffocation. The rapprochement between the territorial sciences and the school curriculum made at the beginning of this chapter now seems questionable. For many researchers, the concept of territory provides a basis for reinvigorating and renewing the field, for developing a broader perspective, and for informing and promoting interdisciplinary debate (this is perhaps one of the *raison d'être* of the CIST). By contrast, among teachers, the concept of territory is widely seen as implying a much narrower perspective. The idea of school geography as a beleaguered fortress resisting the rise of the concept of territory is also related to the difficult relationships with disciplines that may also involve the study of territory (on the difficulty of sharing the concept of territory, see Casili, 2011). Beyond the traditional conflicts of norms and legitimacy, beyond the conflicts between conservatives and reformists, it is our hope that, with the help of the territorial sciences, geography may also find the strength to rebuild its basic principles, both in school and at university.

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**3.3**

**Tools to contribute to public debate**

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## CHAPTER 16

# **HyperAtlas: a tool for promoting political debate The case of EU cohesion policy**

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### **INTRODUCTION**

“Science looks for its objects, [...] it does not find them readymade.”  
(translated from J. Ullmo, *La pensée scientifique moderne*, 1969)

Like any emerging science, the science of territory faces two challenges: to demonstrate its theoretical power and to prove its political and social value. The development of new cartographic tools for visualizing social, economic and environmental disparities and inequalities is an important part of this process. Cartographic tools can be used to meet the needs of policy-makers and society by making information more widely available. But they can also create doubt and confusion by showing that measures of territorial inequality are relative (i.e. context-dependent), thereby complicating the task of selecting the most effective strategy for reducing inequalities. The fear of a manipulation of public opinion will remain as long as the debate remains limited to a technical discussion of the properties of a given statistical measure or cartographic representation of inequalities. In other words, the responsibility of researchers for the political uses of cartographic tools requires critical reflection on the theoretical concepts underlying the various options and their political meaning and significance.

HyperAtlas is a multi-level tool used to measure and map territorial disparities developed by researchers in geography and information technology on behalf of the European Commission (specifically, the ESPON Programme, the European Parliament and the European

Environment Agency). We suggest that HyperAtlas provides a useful illustration of these issues and dilemmas in an unstable international political environment in which conflicting interests are increasingly made to compete without any assurance that the public interest will prevail. It is beyond the scope of this chapter to provide a comprehensive description of the general features of HyperAtlas (for further details, see Grasland et al., 2005; Plumejeaud et al., 2011; Le Rubrus, 2011). Our purpose here is to examine the potential uses of the tool in a specific political context: the negotiations surrounding the allocation of EU cohesion funds after 2013.

Based on a Weberian perspective, the aim is to examine two possible uses of the HyperAtlas tool by European political actors.

*The use of HyperAtlas as a tool for policy simulation and benchmarking* is consistent with the first function of science defined by Max Weber: “first, of course, science contributes to the technology of controlling life by calculating external objects as well as man’s activities”. In the context of European regional policy, the implication is that political actors can use HyperAtlas to simulate the effect of redefining the rules governing the allocation of funds, whether it be a matter of changing indicators, using a different statistical threshold (e.g. 75% of the average) or redefining the territorial units used for the purposes of fund allocation. Political actors also need to assess the overall cost of policies and their implementation in accordance with the general framework underlying the European budget.

*The use of HyperAtlas as an indicator highlighting conflicts of values* reflects what Weber saw as the most ambitious but also the noblest goal of science: “Besides we can and we should state: In terms of its meaning, such and such a practical stand can be derived with inner consistency, and hence integrity, from this or that ultimate *weltanschauliche*<sup>1</sup> position. Perhaps it can only be derived from one such fundamental position, or maybe from several, but it cannot be derived from these or those other positions. Figuratively speaking, you serve this god and you offend the other god when you decide to adhere to this position”. HyperAtlas provides at least three measures of inequality for each region, thereby committing policy-makers to considering different perspectives on regional development. While the first use of HyperAtlas simply involves making the best of the existing framework, the second use focuses on the potential new rules highlighted by the tool (note that the purpose of HyperAtlas is not to determine the best course of action, nor indeed to articulate the values and beliefs underlying the various policy options).

After a brief examination of the origins of European regional policy and the underlying framework of rules, we will examine the use of HyperAtlas as a simulation tool and as an indicator of contradictions or conflicting values. The chapter concludes with a re-examination of the Weberian alternative and some suggestions for moving beyond it.

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<sup>1</sup> The German term “*weltanschauliche*” means “ideological” (in the sense of pertaining to a world view).

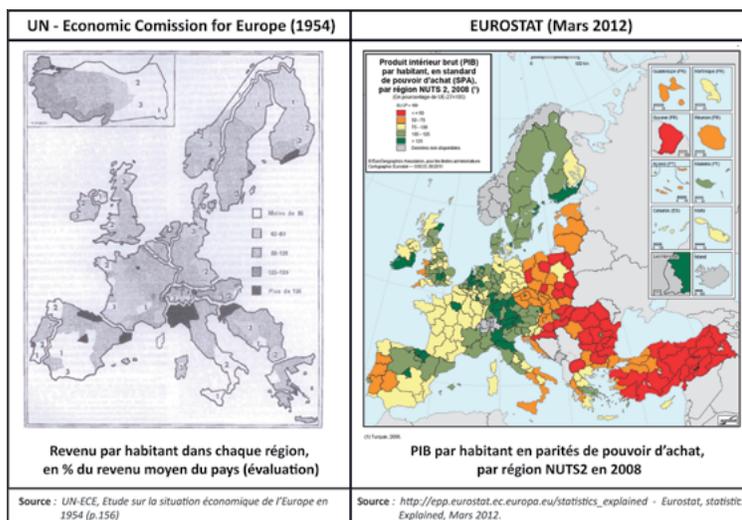
## 1. OFFICIAL MEASURES AND CARTOGRAPHIC REPRESENTATIONS OF REGIONAL DISPARITIES IN EUROPE (1954-2012)

While it is beyond the scope of this chapter to provide a comprehensive account of research and practice in this area, it is important to consider the strictly political uses of measuring and mapping regional disparities within the European Union. Two representative examples are described and shown in Figure 1.

### 1.1. A first comparative analysis of regional disparities (UN-ECE, 1954)

The first detailed study of regional disparities at a European level was conducted between the Schuman declaration of 9 May 1950, which marked the birth of the European Coal and Steel Community, and the Treaty of Rome signed on 25 March 1957 and marking the birth of the European Economic Community. In 1954, a study by the United Nations Economic Commission for Europe (UNECE) provided an assessment of economic inequality in several European countries (United Nations, 1954) in the Western bloc, in addition to countries defined by their independence from the Soviet Union (in the case of Yugoslavia). The report prefigured both the substance of future EU policies and subsequent regional studies conducted by the OECD by identifying lagging regions (see Figure 1, left) and by offering reasons for the challenges faced by countries within these regions. A number of success factors also were identified, including distance from population centers or production centers, the geographical location of the regions within Europe (central or peripheral location; favorable or unfavorable location), and economic productivity and modernity. Major territorial disparities, discrepancies and discontinuities were also highlighted, as were gaps between spatial units belonging to different territories.

Figure 1. Measures and official cartographic representations of regional inequalities in Europe in 1954 and in 2012



## **1.2. A regulatory view of European cohesion policy (EUROSTAT, 2012)**

The pioneering study by the United Nations provided a basis for understanding the causes of income inequality and strategies for reducing disparities from a Keynesian perspective of intra-national redistribution. By contrast, the Eurostat map of March 2012 (see Figure 1, right) is entirely based on the current framework of EU regional policy. The choice of territorial division or nomenclature (NUTS 2 level) is determined by the regulations governing the allocation of Structural Funds, while the list of represented countries includes the 27 member states or candidate countries (Turkey, Croatia and Macedonia) at the time of publication. The basic statistical criterion is not income (better suited to the analysis of social inequality) but GDP per capita in PPP terms (since this is the indicator used to determine eligibility for the Cohesion Fund). The choice of classes and categories is consistent with the statistical threshold (75% of the EU average) used by the European Union (excluding EU candidate countries), for the same regulatory reason (i.e. eligibility threshold). Close examination of the colors reveals a significant visual breakdown around this threshold (warm colors for eligible regions, i.e. yellow-red, and cool colors for non-eligible regions, i.e. green) to better highlight eligible regions for the 2013-2020 period. In short, nothing is left to chance in a document designed to serve a more political and normative function than an exploratory and academic purpose.

## **1.3. HyperAtlas as a hybrid tool for meeting academic and political demands**

The analysis of the two previous maps reveals different logics and shows that the same need (i.e. “the measurement of regional inequality”) can have different solutions in terms of statistical measures and cartographic representations. With the support of several European institutions (DG Regio, ESPON, European Environment Agency, European Parliament), the HYPERCARTE research group, which brings together several research teams in geography and computer science (LIG-STEAMER, LIG-MESCAL, Géographie-cités, RIATE), has developed several versions of HyperAtlas, a tool designed for the spatial analysis of territorial disparities. The key distinguishing feature of the HyperAtlas tool is not the choice of spatial analysis tools so much as the possibilities it offers for exploring alternatives interactively and in real time as part of an interactive policy-making process in the area of territorial planning.

A re-examination of the basic functionalities of HyperAtlas – and in particular the most recent functionalities of version 2 introduced in 2011 – in the light of the relevant political practices is needed to better understand the value and limitations of dynamic mapping tools for public debate and policy-making. Based on the Weberian analytical framework outlined in the introduction, the following sections provide a brief analysis<sup>2</sup> of the two political uses of HyperAtlas.

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<sup>2</sup> For reasons of space, we will only provide brief technical explanations of the functionalities of HyperAtlas in addition to a brief political account of the rules governing the Cohesion Fund. Interested readers are referred to the longer version available on the CIST website.

## 2. THE CHALLENGES SURROUNDING EU COHESION POLICY. HYPERATLAS: A SIMULATION TOOL

“What is decisive is, rather, the kind of resources that they have at their disposal.”  
(translated from M. Weber, *Le savant et le politique*<sup>3</sup>, 1963)

The European Council, which will have set out the rules for Cohesion Fund allocation by late 2012 or early 2013<sup>4</sup>, will have been carefully planned by the national statistical services of all member states. By the time the negotiation process begins, national representatives will have carefully examined and weighed up the various possible interpretations of the rules to ensure that the agreement is politically acceptable (if not to maximize their own interests). They will also have done their utmost to predict the proposals made by their partners and by the European Commission. However, it is impossible to anticipate all the twists and turns of a negotiation process involving 27 countries. In this sense, a simulation tool for evaluating and visualizing the effects and implications of a policy option in a matter seconds cannot fail to be of interest to informed negotiators.

Any policy-maker can use research findings to challenge the validity of the criteria used to define EU policy. Whether it be the chosen “territorial units” (the NUTS 2 regions and the broader Nomenclature of Territorial Units for Statistics), the geographical context of analysis (the EU-27 does not include EU candidate countries), the indicators (GDP in PPP terms, which conceals real inequalities) or the selected thresholds (why 75% of the EU average rather than 50% or 90%?), every element of the cohesion policy can be challenged on scientific or academic grounds.

### 2.1. Defining the rules of the game and the reference hypothesis

With over 308 billion euros paid out over the 2007-2013 period (the second most important part of the EU budget), the EU regional policy appears to be solidly entrenched in the European political landscape. For neophytes, the power and long-standing use of this key financial instrument<sup>5</sup> may suggest that territorial disparities and inequalities have been successfully addressed by the European authorities. Despite the reforms of EU regional policy and the challenges to the fundamental objectives of Structural Funds, the main components of the policy have remained largely unchanged, i.e.:

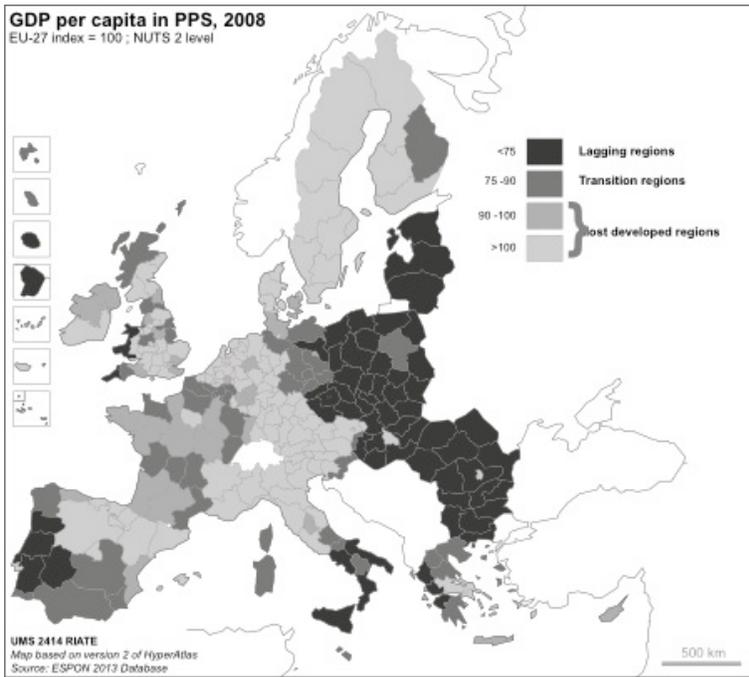
- *GDP per capita in purchasing power standard* as the key indicator,
- The official *NUTS 2* level as a framework for defining eligibility,
- The level of reference of the *European average* as a basis for measuring disparities and inequalities,
- The choice of *statistical threshold* at 75% of the average value as the eligibility threshold.

3 *Le savant et le politique* is the French translation of two lectures given by Weber at the University of Munich in 1917 and 1919: *Wissenschaft als Beruf* and *Politik als Beruf*.

4 This text was written in September 2012.

5 The first programming period goes back to 1989-1993.

Figure 2. Cohesion regions in the reference scenario



The European Commission recently announced that it is planning to change the current system by introducing an intermediate threshold corresponding to 90% of the EU average. The new threshold will be used to define not one but two categories of eligible regions. The result will be that Cohesion Funds will be reallocated to the wealthiest countries, with most of the regions having risen above the 75% threshold, notably at the time of the expansion of the EU from 25 to 27 members. Under the new system, the regions between 75% and 90% will receive fewer funds than those below the 75% threshold. This amounts to diluting the available funds by targeting a greater number of territories while reducing the amount of funds allocated to the poorest regions. Taking this scenario as a reference, and assuming that GDP per capita for 2008<sup>6</sup> will be used to define the funding criteria, users of HyperAtlas can define the reference map given to negotiators at the European Council, all in a matter of seconds (see Figure 2).

## 2.2. Changing the territorial units

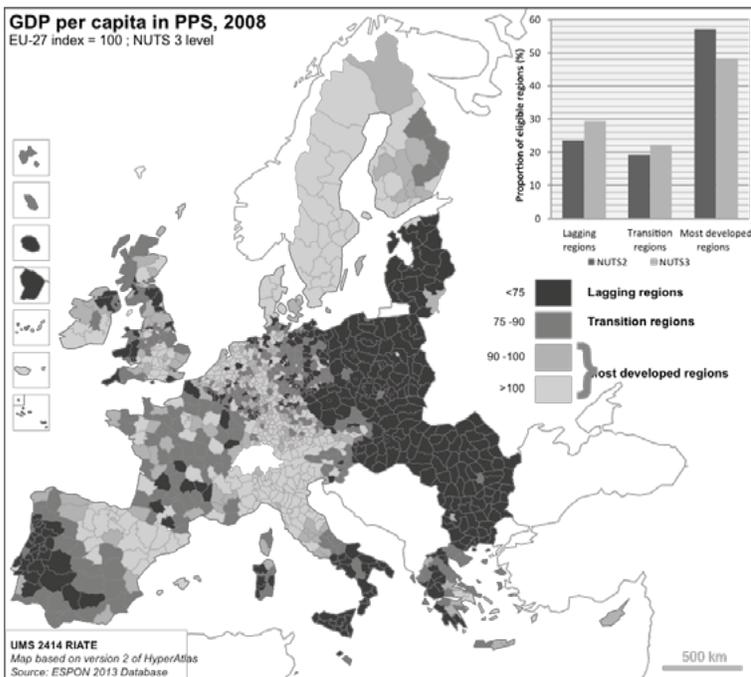
HyperAtlas provides a way of moving from one level of territorial division to another and of visualizing the effects of this shift on the geography of regions receiving Structural Funds while keeping the other parameters constant. What researchers describe as a filtering problem known as the “modifiable areal unit problem” is either a threat or an opportunity for political

<sup>6</sup> This choice has significant ramifications and is likely to be contested by the countries worst affected by the global economic crisis and with an interest in requesting an updated list of regions requiring aid based on the most recent statistics.

actors. Without going as far as changing the map of regional territories to secure more structural funds (a common practice in the past but now governed by regulations), negotiators can, in theory, move from one official level to another – typically, from NUTS 2 level to a more aggregate level (for example, a national level, following the example of the Sapir report<sup>7</sup>) or a more refined level (for example, NUTS 3 level). This last hypothesis involves radical changes (see Figure 3).

NUTS 3 level provides a basis for refining the analysis of territorial disparities<sup>8</sup>. For example, in the case of Estonia, which is defined as a *lagging region* at NUTS 2 level (since Estonia is viewed as a single entity at the NUTS 2 level), Tallinn is ranked among the *most developed regions* at NUTS 3 level. Conversely, the Nord-Pas-de-Calais region of France, a *transition region* at NUTS 2 level, includes one *département* (Pas-de-Calais) that meets the criteria of *lagging regions*. The system generates statistical illusions in countries where NUTS 3 level separates urban centers from peri-urban and rural territories, since the place where GDP is formally allocated is not an indication of real wealth<sup>9</sup>. It remains that from a purely political point of view, these changes are likely to benefit some countries while disadvantaging others.

Figure 3. Cohesion regions under the hypothesis of the NUTS 3 level



7 See Sapir (ed.), 2003.

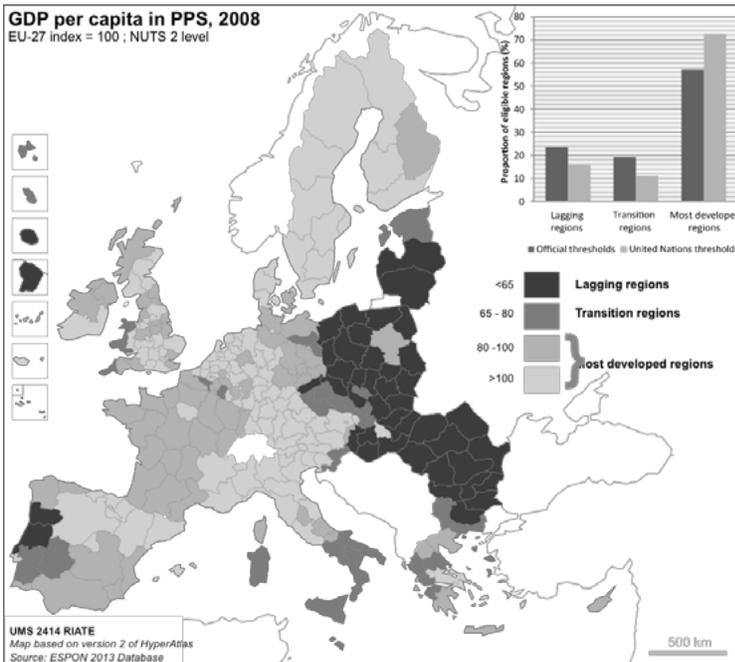
8 This does not mean that it is more relevant or useful. A *reductio ad absurdum* shows that at the smallest territorial level every unit would contain just one person or household, implying a shift from a spatial analysis to a social analysis of inequalities and making any talk of “regional” policy pointless.

9 Among other things, it does not take into account commuters travelling from peri-urban territories and creating added value in urban centers.

### 2.3. Statistical thresholds

At NUTS 2 level, there are 271 values of GDP per capita (corresponding to the total number of regions). The process of transforming a continuous distribution (here, GDP per capita) into a limited number of classes (a process known as discretization) is not without consequences. While the generated information may be more accessible to a broad audience, differences between the values are no longer perceptible within each class (Béguin and Pumain, 2012). It seems reasonable to question the wisdom of choosing 75% and 90% thresholds to divide the NUTS 2 into “lagging regions”, “transition regions” and “more developed regions” since these thresholds do not reflect any objective discontinuity in the statistical distribution. This is not a problem from a political point of view, and we will only simulate a change of threshold based on UNECE criteria to test their effects on the allocation of funds to the two types of cohesion regions. Figure 4 shows that using the 65% and 80% thresholds proposed in the 1954 United Nations report should help to improve the funding system by directing more resources toward the *least developed regions* than the current framework based on the 75% and 90% thresholds.

Figure 4. Cohesion regions under the hypothesis of lower thresholds (65% and 80% compared to 75% and 90%)



In this scenario, most of the regions of Slovakia and the Czech Republic would be reclassified as *transition regions*, as would the regions of eastern Germany and south-west Britain. Ultimately, using discretization should help to direct more funds toward lagging regions,

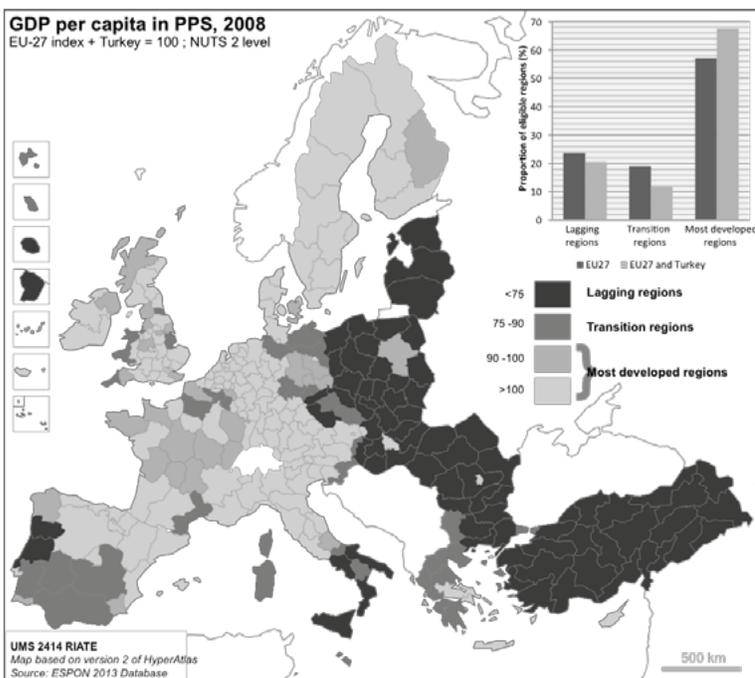
with evidence indicating that 16% of NUTS 2 regions are eligible to be classified as *lagging regions* (compared to 24% previously).

#### 2.4. Expanding the reference territory: the case of the accession of Turkey

The expansion of the European Union has been the subject of a long-standing debate among EU authorities and member states. The aim here is not to re-examine the long and complex relationship between Turkey and the European Union but to assess the potential impact of the accession of Turkey – a large country with a below-average level of wealth – on EU cohesion policy. If Turkey were to join the EU, the average per capita GDP (in PPP) would fall from 25,110 euros to 23,450 euros per capita.

Using HyperAtlas to simulate the effect of the accession of Turkey, we find that the resulting upheavals are not as significant as the effect of major EU enlargement, although the map of lagging regions and cohesion regions would be significantly redrawn (see Figure 5).

Figure 5. Convergence regions under the hypothesis of Turkish accession

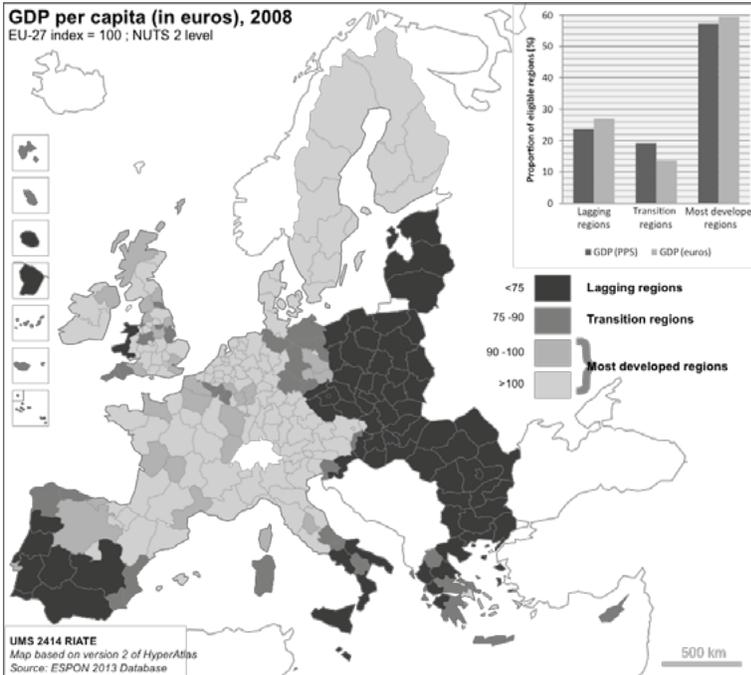


Our findings indicate that the accession of Turkey would have a radical impact since some of the regions in the “lagging regions” category would rise above the “75%” threshold and would therefore be reclassified as *transition regions* (e.g. Cornwall and West Wales). Another effect would be that some territories would be evicted from the “transition regions” category

(e.g. Aquitaine and Midi-Pyrénées regions). However, the main problem is that all the Turkish regions at NUTS 2 level except Istanbul would be classified as *lagging regions*, thereby reducing the amount of funds allocated to eligible regions.

### 2.5. Changing the statistical indicator

Figure 6. The cohesion regions under the hypothesis of GDP in euros (using current market prices)



Finally, we might consider altering the most important rule: the choice of reference indicator (GDP per capita in PPP terms). Without going into the vast literature devoted to research on composite indicators and the search for an indicator of territorial cohesion (Grasland and Hamez, 2005), we will illustrate the effect of this rule by replacing GDP in PPS by GDP in euros (using current market prices), which is still consistent with the dominant economic paradigm but which is also a more accurate reflection of the functional reality experienced, for example, by workers or firms in cross-border spaces (Grasland, 2004). As in the previous cases, a simple click of the mouse is enough to have a profound impact, highlighting a significant shift in favor of the poorest member states (see Figure 6).

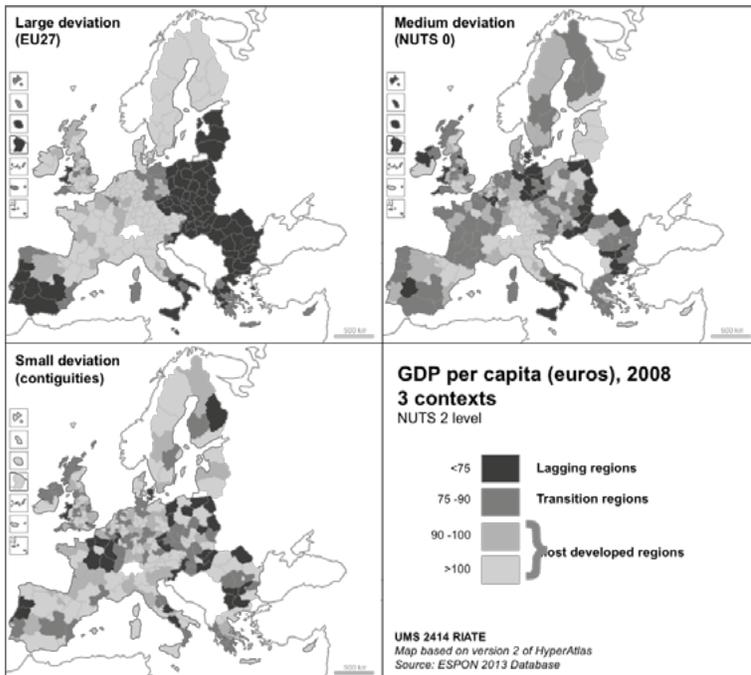
If the cohesion policy were based on GDP in euros, more NUTS 2 regions would be classified as lagging regions, including the capital regions of Central and Eastern European Countries. By contrast, there would be significant losses for the richest countries in the “transition regions” category, for example in metropolitan France.

### 3. HYPERATLAS AS AN INDICATOR OF CONTRADICTIONS

“Figuratively speaking, you serve this god and you offend the other god  
when you decide to adhere to this position.”  
(translated from M. Weber, *Le savant et le politique*, 1963)

Whatever we may think of it, the use of HyperAtlas as a “cheating tool” has the potential to yield significant political benefits. It is clearly contrary to the spirit of the Europeanization of European policies (Bafoil, 2006) and the development of multi-level governance. Far from being limited to GDP, HyperAtlas is also designed to highlight the conflicts, tensions and contradictions between European, national and local policies in areas as diverse as economic competitiveness, social cohesion, sustainable development and population growth (Baron et al., 2010). The originality of HyperAtlas lies in its use as a tool for comparing different measures of inequality based on a multilevel approach (see Figure 7).

Figure 7. Multilevel analysis of regional disparities in GDP per capita of EU NUTS 2 regions in 2008



HyperAtlas highlights the range of measures of regional inequality by providing three measures of regional situations based on different conceptual and political frameworks. The various measures also imply different visions of European construction – specifically, three conflicting theories of convergence. In addition, HyperAtlas now provides a basis for

evaluating the cost of potential redistribution policies or of the impact of not implementing any policies<sup>10</sup>. Whether they like it or not, policy-makers face conflicts between different levels of governance that can only be resolved by reflecting on the assumptions underlying their decisions. To illustrate these points, let us return to the example of GDP per capita of European regions in 2008.

### 3.1. The redistribution of wealth and labor under the hypothesis of a federal Europe

HyperAtlas provides a tool for simulating how a Europe of regions without national states might actually work. Taking the case of Europe as a general framework, the large deviation (index 100, European average) provides a basis for identifying those regions that would need to be supported by the European Union to achieve a balance between lagging, transition and developed regions. To achieve this balance, we may change either the numerator (investment of GDP from rich to poor regions) or the denominator (migration from poor to rich regions) of the indicator used to measure the level of development (wealth or population). In short, HyperAtlas provides a tool for visualizing deviations from territorial equality in the form of estimations of the volume of potential redistribution (or transfers)<sup>11</sup>.

Figure 8. Potential redistribution of wealth and population under the hypothesis of a federal Europe (HyperAtlas screenshot)



In the case of GDP per capita in the NUTS 2 regions of the 27 EU member states in 2008, the econometric disparity index is 17.4%, meaning that a long-term objective of a perfectly equal distribution of population and wealth would only be possible by transferring 17.4% of the GDP of rich regions to poor regions or 17.4% of the population of poor regions to rich regions<sup>12</sup>. The redistribution map accurately quantifies the volumes in question (see Figure 8). Under the hypothesis of regulation by investment, the transfer of wealth

<sup>10</sup> Since the development of version 2 as part of the ESPON 2013 programme.

<sup>11</sup> In HyperAtlas, open the “tools” window and select the “expert” option to view three redistribution maps (relative to the three reference scenarios).

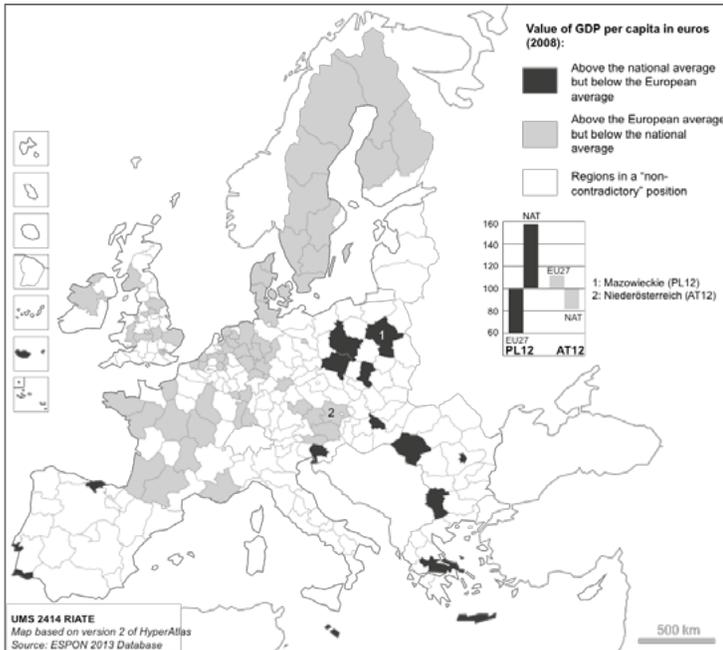
<sup>12</sup> A mixed solution may also be envisaged by transferring, for example, 10% of the population of poor regions and 7.4% of the wealth of rich regions.

(capital) should be from the regions containing a grey disk to those containing a black disk. For example, Lower Austria (*Niederösterreich*) would need to pay 4.7 billion euros to the European Union, while the Warsaw region (*Mazowieckie*) should receive 21.5 billion. By contrast, under the hypothesis of regulation by population mobility, the population of Lower Austria would need to increase by 187,000 inhabitants, while the population of the Warsaw region would need to decrease by 858,000 inhabitants. However improbable this may seem, the illustration by population transfers gives an insight into the power relations between different regions.

### 3.2. The hypothesis of a return to state regulation in a Europe of nations

By contrast, the confederal (or unionist) approach is based on the primacy of interstate cooperation over European institutions. This is the “Europe of nations”. This previously marginal conception of the European construction process<sup>13</sup> is becoming increasingly popular throughout Europe, a fact related to current economic and demographic trends. In any case, it is a reminder that many countries see the rebalancing of regional economies at a national rather than a European level as a political priority. HyperAtlas also provides a tool for visualizing national conceptions of redistribution based on the same principles of redistribution (volume of wealth or population to be transferred between regions of the same country to ensure equal distribution at a national level).

Figure 9. Contradictions between regional, national and European disparities



13 Recall the famous quip by Margaret Thatcher at the Dublin summit on 30 November 1979: “I want my money back”. Thatcher was referring to the fact that the UK was paying out more than it was getting.

### 3.3. The cartography of conflicts between national and European regulations

The reason why Europe has struggled to decide between the two models is that there are two conflicting types of legitimacy at its core: state legitimacy and union legitimacy. With the Maastricht Treaty and, more recently, the Lisbon Treaty, European governance is currently based on a hybrid system midway between confederation and federation. While in reality these two visions may be said to coexist, they imply a number of contradictions in terms of the strategy of regional development to be implemented throughout Europe. HyperAtlas provides a tool for combining both criteria in order to visualize regions where the conflict between the two forms of inequality is most obvious. In Figure 9, the regions shown in black have a GDP per capita above the national average but below the European average. In other words, these regions may be said to be “wealthy” from a national perspective but “poor” from an EU perspective. Conversely, the regions shown in grey are generally “wealthy” at an EU level but relatively “poor” from a national perspective.

Of the 271 NUTS 2 regions, 66 have a GDP per capita above the European average but below the national average (24%). Conversely, 20 regions have a GDP per capita above the European average but below the national average (7%). The map – which provides an illustration of the intrinsic contradiction of the European construction process – thus concerns one in three regions (31%).

### 3.4. The hypothesis of cross-border interregional dynamics

To go beyond this long-standing and well-documented debate (Davezies, 1997), HyperAtlas proposes a third approach to regional disparities based on the opportunities for local inter-regional cooperation, a form of cooperation not governed (at least in theory) by the same rules of national or supranational policies of vertical redistribution (Grasland, 2004). This approach is based on the notion of growth poles, the foundations of which were laid by Perroux in the 1950s and which posits a form of regional development based on a conception of development organized by the polarization of major nodes of wealth accumulation and a process of diffusion (or redistribution) toward surrounding areas. This conception has affinities with more recent theories of the new regional economics, which make no presuppositions about the potential positive or negative impact of local regional disparities on the process of economic convergence (Dall’erba and Le Gallo, 2006). HyperAtlas simply examines the hypothesis of potential cooperation between neighboring regions (regardless of whether they belong to the same country) and provides a map of differences in GDP per capita between each of the regions and those sharing a common border. The consequences of a region being richer or poorer than its neighbors are left to the appreciation of academic and political experts and observers. There are at least two conflicting theories here: either it is assumed that the richest region will derive a greater benefit, for example by attracting qualified labor from poor neighboring regions; or it is assumed that firms in the rich region will be tempted to relocate to cheaper labor markets in neighboring regions. Some studies developed as part of the ESPON programme (ESPO, 2006) have

suggested that both phenomena can occur and that poles initially begin to develop at the expense of neighboring territories before leading to redistribution in the long term (see Figure 10).

This implies a complete open border policy, meaning that the hypothesis is politically similar to the hypothesis of a federal Europe, the only difference being that regulations operate on a decentralized basis, with maximum freedom of action given to local actors, whether they be institutions, firms or households.

Figure 10. Potential redistribution of population and wealth under the hypothesis of local cross-border dynamics



## CONCLUSION

In the context of the ESPON programme – a key contributing factor to the development of the HyperAtlas tool – policy-makers and senior officials have often criticized researchers for using overly sophisticated methods and tools that are incompatible with their practices and expectations. Conversely, researchers involved in the applied research programme developed as part of the political objectives of the ESPON programme often suspect policymakers of being resistant to innovation. These divergences have the advantage of producing “creative” effects (Grasland, 2005) once a dynamic balance is achieved. In particular, politicians may find that new tools and indicators provide an opportunity to investigate unexplored political avenues, while researchers may realize that the political and social value of the methods used is not always proportional to their level of theoretical sophistication.

However, as the example of HyperAtlas shows, a compromise can be reached. On the one hand, researchers can be useful to policymakers by showing that the consequences of policy and budgetary decisions vary depending on the chosen scales and thresholds. Above all, researchers can provide policymakers with the means to simulate and illustrate the policy decisions they make. However, the value of HyperAtlas is not simply that it makes “objective facts” or “evidence” available. What it also does is to force policymakers to confront the issues raised by the use of a specific criterion for measuring inequalities, and thus to focus the

debate on the values implied by any given position. In this sense, HyperAtlas may serve to promote a reciprocal learning process that will help to overcome the conflict between science and politics highlighted by Max Weber.

From the point of view of the policy applications of HyperAtlas, it seems reasonable to suggest that the next stages in the development of the tool and its contribution to public debate will involve research in political science (to determine the validity of the proposed methods) and cognitive science (to assess the use of the tool by users, their understanding of the functionalities of the tool, the support provided in terms of the construction of knowledge, etc.).

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## CHAPTER 17

# **(Re)Building the territorial sciences: toward a science of social harmony. The “Founding Territorial Sciences” conference: Some concluding remarks**

Michel BUSSI

The goal of the most committed participants of the original “Founding Territorial Sciences” conference is no less than to build a new science. This is an ambitious undertaking, but one that has much in its favor. Advocates of the new field argue, for example, that the time has come to transcend disciplinary boundaries and to promote non-traditional interdisciplinary research; that innovations occur at the margins of established paradigms and frameworks; and that major research institutions and most of the major international research networks are also keen to develop interdisciplinary research along these lines. The main non-academic partners of research centers are equally reluctant to operate within or even to recognize traditional disciplinary boundaries, as shown by the wide range of non-academic institutions present at the CIST conference (e.g. DATAR, INSEE and ADEME). In short, the territorial sciences are assumed to have three major benefits: disciplinary decompartmentalization, their applicability beyond the academic sphere, and conceptual innovation at the margins of traditional disciplines – a noble goal indeed.

### **1. THE NEW FRAMEWORK OF THE TERRITORIAL SCIENCES**

It is difficult, if not impossible, to build a new science of territory without considering the relationship between the territorial sciences and geography. The problem can be summarized as follows: can the territorial sciences be subsumed within geography? And can geography be subsumed within the territorial sciences?

The answer to the first question is clearly “no”. Geographers do not have, or no longer have, a monopoly on territorial research. Based on differing definitions of “territory”, researchers in a range of disciplines (including sociology, economics, political science and environmental science) have already begun to explore and interrogate the concept or even to claim it as their own, sometimes with a view to redefining themselves. The territorial contextualization of research questions is often a way of promoting a new form of complexity in disciplines largely focused on individual (i.e. individual-centered) studies (consider, for example, the emphasis on non-context-specific individual studies), or on largely theoretical research (see for example, the interest in utilitarian or strategic macro-theories in a globalized, multipolar world). Even more significantly, the concept of territory has opened new perspectives, enabling, for example, spatial planning actors to engage in dialogue among local (and territorial) authorities, governments and associations.

The answer to the second question is more ambiguous. By extending the concept of territory to reflect what other disciplines refer to as the ecological approach (i.e. the study of collective behaviors and interactions in specific geographic areas), we might easily include within it all academic research in geography, from geomorphology to field research in social geography and from cultural approaches to modeling and geosimulation<sup>1</sup>.

In short, while geography and the territorial sciences may be said to overlap significantly, geographical research does not have a monopoly on territorial research. The question that arises is this: Is the shift from traditional geography – an academic discipline based on encyclopedic knowledge – to territorial geography merely a facelift, a change of name and logo designed to give the field a more modern appearance conducive to promoting collaboration? In other words, rather than a process of demolition and reconstruction, is the seemingly radical rebuilding of geography simply a rebranding for external (as opposed to internal) purposes?

In reality, the new field has two ambitions. Geography is both a clearly defined discipline endowed with institutional legitimacy and authority and a form of “open knowledge” accessible to anyone. While the “territorial turn” may be seen as providing a basis for better understanding the “open knowledge” produced by geography, it may not necessarily undermine, and indeed may even reinforce, the status of geography as an institutionalized discipline. In French primary and secondary education, geography is not only taught from a narrow disciplinary perspective, but is also designed, via the territorial approach, to compensate for the fact that political science, economics, sociology and demography (among other disciplines) are not taught in schools (at least not before *lycée*, i.e. high school).

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<sup>1</sup> In my role as Vice-President and later President of section 23 (geography) of the CNU (Conseil national des universités), I found that even without lengthy attempts at conceptual clarification, a diverse community of geographers (36 elected and appointed members representing almost the entire spectrum of research areas in geography) had little difficulty defining the remit of geography. There are implicit disciplinary boundaries, with similar dividing lines between geology and geomorphology, anthropology and social geography, and political science and political geography. In my view, and contrary to a widely held belief, these boundaries should not be seen as a sign of a Malthusian discipline that sees itself as threatened by centripetal forces. The award of a doctorate or HDR in geography is primarily determined by the consideration or non-consideration of socio-spatial interactions, and not only by a use of the notion of territory for the purposes of geographical localization, contextualization or multi-level (or multi-scale) research, which are now all common practices in disciplines other than geography.

The CIST will therefore need to answer an important question, if only to reassure its partners about the historical legacy of geography: can the concepts, epistemology and paradigms of geography serve as the foundation of the new field? If they can, and if the territorial sciences are ultimately nothing but new clothes for an old discipline – more fashionable clothes bought in the sales following the liquidation of the major nation-states bankrupted by the reign of the local and the global – there will be no need to discourse at length on the matter. However, if the aim is to lay the foundations of a new science or discipline (or “metascience”, as suggested at the CIST conference), a process of emancipation will be necessary.

## **2. FROM THE INDIVIDUAL TO SOCIAL HARMONY**

One promising avenue for emancipation is to define the territorial sciences from both a research and a conceptual perspective as the science of social harmony. From this point of view, the social purpose of the territorial sciences would be to promote individual and collective flourishing in a constrained natural, economic and cultural environment. The purpose of the new field would also be to serve as a socially conscious science designed to promote citizenship. Admittedly, this is not a new idea, and many humanistic geographers have long thought that their job is precisely to perform such a role (or at least have never sought to deny that this is their role).

This proposal should not be seen as an attempt to reduce the territorial sciences to a utopian form of geography (i.e. the geography of cooperation, democracy and peace) at the opposite extreme of realist or radical “Lacostian” geography. Rather, the point is that we need to examine and interrogate tensions, power relations and conflicting ideologies from the point of view of possible future scenarios, potential agreements and acceptable compromises.

This is a common mistake and, without further efforts to define the nature of the field, there is danger that the territorial sciences will simply become a “science of platitudes” (Kueg, 2011) designed to promote a fairer and more equitable system from the global to the local, with the job of laying the foundations of justice remaining to be done. Worse still, a science ostensibly designed to uphold certain values (i.e. development, progress, democracy, fair distribution of resources, and so forth) might emerge, whether as a secular Western-centered republican science incapable of integrating other cultural models or as a neo-colonial science prescribing or recommending good practices – or even, in the case of the branch of the science that models collective solutions based on the postulate of the strategic attitudes of actors, as a science designed to validate neoliberal solutions aimed at promoting competition between territories on the basis of their assumed potential and limitations. In short, any attempt to define the territorial sciences as a science of social harmony would require an in-depth analysis of the political meaning given to territories, whether from the point of view of their natural or anthropized (i.e. man-made) reality.

Another issue raised by the idea of a science of territory centered around the question of social harmony is the temptation to operate on the basis of a minimal definition of “territory” as a matrix promoting exchange between individuals or man-nature interactions. Based

on convenient portmanteau terms (development, governance, mobilities, etc.), the territorial sciences would simply become an empty shell, a giant “container”<sup>2</sup> or melting-pot designed to promote links with and between the other social sciences but contributing little or nothing to the recipe. In this conception, the term “space” applies to the inheritors of the new geography and is generally restricted to the study or identification of “macro” effects (at the level of regions, states, Europe, etc.), the issues and challenges faced by spatial planners primarily concerned with the technical issue of metric distances (movement, accessibility, etc.), or the modeling of natural phenomena (risks, contagion, diffusion, etc.).

To overcome these difficulties, we might argue that a science of social harmony should not be based solely on a social model (i.e. progressive humanism). I suggest that the territorial sciences should also involve a scientific approach and conceptual emphasis focusing on the shift from the individual to the collective, or in other words, on research into issues that can only be examined by going beyond the individual. My proposed definition has the advantage of distinguishing the new field from other disciplines and approaches. In my view, the object of the territorial sciences should be: 1/ the study of the collective consequences of individual actions; 2/ the analysis of the invisible effects of the structure and organization of basic entities (whether human or natural); 3/ the determination of the relevant levels of observation and analysis (to avoid an over-reliance on individual case studies and isolated perspectives); 4/ the understanding of their interactions; and 5/ suggestions for a “fairer” and/or more efficient organization. The study of socio-spatial justice is at the heart of the proposed project. In other words, where once it was an implicit dimension (i.e. a humanistic science), socio-spatial justice has emerged as an explicit focus of debate (i.e. what are the possible forms of social harmony?). In my view, these should be the main reference points, both academic and social, of the new science of territory.

### **3. THE TERRITORIAL SCIENCES: EXPERTISE OR ACTIVISM?**

However attractive it may be, the proposed project faces a number of challenges. First, it is easy to imagine that the new field might be left in the hands of experts, many of whom are not part of the academic world. For example, the search for pragmatic solutions to improve social harmony is the task of DATAR, ADEME and the INSEE – organizations which, unlike university researchers, are untroubled by discipline-specific epistemological issues or concerns. Think tanks devoted to territorial issues – an idea proposed by a number of participants at the CIST workshops – have a similar purpose. The question that arises is the role of local activists, group interests and lobbies.

The question of social harmony also raises the issue of communication. Better and more effective communication increases the risk of promoting the development of a field owned by experts advocating suggestions and recommendations based on a top-down approach (i.e. the model of the prince’s council, infused, in its more modern form, with a democratic spirit).

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<sup>2</sup> It so happens that the debates were conducted in the “Chaudron” lecture hall at the Paris 1 Panthéon-Sorbonne University.

To restrict the field in this way would be to overlook a key component of social harmony – its educational and participatory purpose. In this sense, the territorial sciences also require bottom-up approaches involving activists and vernacular knowledge and based on the principle of alterity, or even community empowerment strategies and NIMBYism.

A good way of addressing this issue is to promote public debate, to clarify the distinction between the territorial sciences and other disciplines and to make research findings available to the widest possible audience. Herein lies the potential value and power of the new field – a role that academic geography has been unable to perform (a fact related to the legacy of geography as a descriptive science taught in schools, but also to the fact that geography has fewer academic practitioners than other disciplines, to its lack of recognition beyond the primarily local academic sphere of its most prominent figures, and to the ambivalent relationship between geography and the sphere of politics and ideologies).

The resounding success of the *Festival international de géographie de Saint-Dié* proves that this is a legitimate goal. In other words, we need to promote interest in geography among a wide audience by expanding the field to include broad territorial questions. The challenge remains to balance the interest of the general public with the innovative capacity of a true science. The success of the FIG, though undeniable, is perhaps largely down to the risk-averse approach taken in selecting largely uncontroversial topics and questions involving categories that are likely to be perceived as “natural” by the general public, such as forests, seas and landscapes (to name but three of the topics addressed at the festival over the past four years).

In short, there is a delicate balance between the idea of an innovative science based on highly specialized methods (new technologies, access to data at a micro level, the flexibility and adaptability of political territories, geosimulation, etc.) and the attempt to include the widest possible audience – the only avenue for a science of social harmony unconstrained by the rule of disembodied expertise. This balance can be viewed as a legitimate avenue for the territorial sciences – an avenue that researchers in the field have already begun to explore (see, for example, the Geomedia project).

### **CONCLUSION<sup>3</sup>**

It only remains for me to consider the future of the CIST. Following the heated debate that took place at the conference, my findings suggest a number of avenues for future research and development.

### **In-CIST-ence?**

This is a shared objective, though it requires much effort and perseverance. New institutions, new networks and new partnerships need to be created. In short, we also need to re-CIST.

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<sup>3</sup> Originally presented at the closing session of the CIST conference following several hours of intense debate, this conclusion was merely intended to provide comic relief.

### **With whom might we build the territorial sciences?**

With the participants of the CIST conference, or at least those who attended the three days of the event and the heated theoretical debates, which the CIST is keen to promote. Future developments in this area should also include activists and progressives from a perspective that might be described, based on the idea of a science of territory designed to interrogate the notion of social harmony, as a socially conscious approach.

### **What is a CIST-izen?**

A CIST-izen is an individual involved in a global system. We need to promote a critical and self-reflective approach to persuade the undecided, the racist, and the sexist (among others). Paradoxically, the CIST will only win if we persist. But as they say, if ifs and ands were pots and pans, there'd be no need for tinkers...

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<sup>1</sup> As at the end of 2013.

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Nicolas Lambert holds a Masters in Remote Sensing from the Paris 6 University and has been a CNRS engineer (UMS RIATE) since 2004. His research interests are in cartography, focusing in particular on Web mapping and geomatics. He is a member of two research groups: the HyperCarte research group, which specializes in the development of mapping tools for territorial analysis, and the Cartomouv research group, which aims to share and exchange knowledge on the design and production of animated maps. He was awarded the CNRS Cristal medal in 2011.

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Pierre-Antoine Landel has been an agricultural engineer since 1980. Until 2000, he worked in various local authorities in France and contributed to the decentralization process, focusing on agriculture, the environment, development, culture and heritage. In 2000, he joined Joseph Fourier University (Grenoble, France). His research focuses on the development of territorial resources and the associated modes of governance. As a local elected representative,

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### **Denise PUMAIN**

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### **Christian SCHULZ**

Christian Schulz was born in 1967 and studied geography at the universities of Saarland, Laval (Quebec) and Metz. In 1997, he received a PhD from Saarland University for a thesis on intercommunal cross-border cooperation in the Saar-Lor-Lux region. He completed his habilitation thesis on "Environmental Producer Services" at the University of Cologne in 2004. Professor Schulz has taught at the universities of Saarland, Metz, Cologne, Frankfurt and Duisburg-Essen. Since April 2006, he has been Professor of "European Sustainable Spatial Development and Analysis" at the University of Luxembourg, where he is also in charge of the IPSE interdisciplinary research unit (Identities, Politics, Societies, Spaces). His research focuses on spatial planning in Europe and border areas, economic restructuring and sustainable development issues.

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### **Ronan YSEBAERT**

Ronan Ysebaert has been a *chargé de mission* at the UMS RIATE since 2007 and is an expert in statistics, cartography, spatial analysis and databases. He has contributed to the development of the new version of HyperAtlas as part of the ESPON programme (HyperAtlas v2). Since 2009, he has been managing the ESPON Database project, which aims to develop standardized territorial databases on the European Union and surrounding areas.

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# Abstracts

## PART 1

### THE INTERNATIONAL SCIENTIFIC DEBATE ON TERRITORY

#### 1.1 PLACE VS. SPACE

##### CHAPTER 1

##### **Territoriality: a tension at the heart of territorial contradictions**

Guy DI MÉO

This chapter argues that territories have three main dimensions: a political dimension (as a political space), an experiential dimension (as an experienced space) and a practical dimension (as the basis or substance of action). As an expression of the tensions between the three dimensions of territory, the concept of territoriality refers to how people construct their relationship to geographical space both collectively and individually, somewhere between rootedness and mobility. In order to understand what a territory really is, we need to recognize that it cannot be dissociated from the territorialities that connect it to social agents.

##### CHAPTER 2

##### **Space and territory: toward integrated concepts**

Denise PUMAIN

Space and territory are complementary concepts in the observation, analysis and interpretation of places, environments and geographical spaces. However, it is argued that the two concepts must be distinguished and further developed to ensure that geography continues to build cumulative knowledge – i.e. both theoretical and practical knowledge. This requires an understanding of the historical conditions of the emergence of space and territory as concepts. Further research is also needed to refine our understanding of space and territory by building on the concepts and insights of a range of disciplines in the humanities and social sciences.

CHAPTER 3

**The Territory is not the Map: steps towards a new (meta)science**

Helen COUCLELIS

This paper argues that an integrative science of territory that is built on the notion of territory itself, rather than around any collection of disciplines that use that notion, is desirable and possible. The paper first examines certain prerequisites for the establishment of a new science and notes that these could be met by a science of territory. Next, it examines Robert Sack's contribution on the subject, possibly the most authoritative in the Anglophone literature, and briefly reviews geographic information science research on boundaries. The paper then sketches out a possible theoretical framework for a (meta)science of territory, based on the notion of "object of discourse". The idea is that the richness of concepts underlying the notion of territory, ranging from parts of space to human intentionality, and the breadth of its applications, may be captured on four different levels of meaning that work together but may be approached by methods appropriate to each. The paper closes with some suggestions about possible organizational forms to help establish a science of territory.

CHAPTER 4

**Formalizing Space and Place**

Michael F. GOODCHILD, Linna LI

The space/place dichotomy has long been recognized in geography, and more broadly in the social sciences. The geographic information technologies that have emerged in the past few decades are almost exclusively spatial, however. The concepts, principles, and tools of the spatial perspective are reviewed, along with their importance in facilitating multidisciplinary social science. Human discourse tends to focus on places and their characteristics, and to pay little attention to the coordinates, distances, and directions of the spatial approach. Recently the engagement of citizens in the production and use of geographic information has placed new emphasis on place and its concepts. Arguments for a platial perspective, and its implementation in platially oriented technologies comparable to geographic information systems, are presented and discussed.

CHAPTER 5

**Imagining space and the problem of territory**

Kevin COX

This text responds to the 1st session of the conference, namely to articles from Denise Pumain, Helen Couclelis, Michael Goodchild and Linna Li. It replaces the debate within these last decades transformations of English-American geography, as part of the growing influence of the notion of territory, in opposition to the quantitative revolution of its spatial approach born in the 1950s. The author's position states that territorial analysis cannot be compared to spatial analysis, although both should take into account interactions between space and social relations. Understanding "relative space" necessarily goes along with taking into account power and, generally, the mechanisms leading to the production of space.

## 1.2 FOREIGN EXPERIENCES

### CHAPTER 6

#### **A scientific trajectory in territorial sciences: the recent Italian experience**

Roberto CAMAGNI

It is interesting to compare the initiative of the GIS CIST to a similar one launched late in 2011 in Italy, by the Italian association “*Società dei Territorialisti*”, and the recent history of territorial sciences in Italy. A 1st phase (1980-1995), insisting on pluridisciplinarity, got replaced by a decline (1995-2010) when disciplines tried to digest the proliferation of the preceding phase at a time when the notion of territorial capital was flourishing. Perspectives show a new pluridisciplinary approach encompassing life sciences in order to meet the societal challenges of sustainable development.

### CHAPTER 7

#### **Territorial sciences in Quebec? The case of the Groupe de recherche interdisciplinaire sur le développement régional, de l'Est du Québec (GRIDEQ)**

Yann FOURNIS, Marie-José FORTIN

Over the last thirty years, the Groupe de recherche interdisciplinaire sur le développement régional, de l'Est du Québec (GRIDEQ) has worked tirelessly to promote the development of the territorial sciences in Quebec. The originality of the work produced by GRIDEQ researchers lies in the importance given to places and the dynamics of actors over structures and their spaces, for many years a marginal issue in research on center-periphery relations. It was only in the 1990s and 2000s that the role of places and actors began to attract attention, with scholars using a range of dynamic concepts to describe the territorial arrangements between actors and structures (e.g. empowerment, self-development and community development, social movement, territorial development). In more recent years, another challenge has been to ensure the renewal of the group's membership. The aim of the new team is to conduct research on the internal density of territories and the complexity of the social relations defining spaces, which will involve reaffirming a range of research questions in the territorial sciences.

### CHAPTER 8

#### **Territorial Sciences in Germany**

Christian SCHULZ

This chapter provides a review of recent debates in spatial research and the territorial sciences in Germany. The chapter begins with some definitions before illustrating two conceptual approaches in social and economic geography, arguing that both have the potential required for interdisciplinary integration in the territorial sciences. It is argued that they offer new conceptual and methodological options involving a range of related disciplines (including economics, sociology, anthropology and planning). The chapter also examines the institutional profile of key faculties, public research institutions and major national funding bodies. The analysis shows that with the exception of extra-university research institutions, the visibility and formal institutionalization of the *Raumwissenschaften* remain limited compared to traditional disciplines.

## PART 2

# TERRITORIAL INFORMATION, INTERDISCIPLINARY AND INTER-SCALE STAKES

### CHAPTER 9

#### **A geomedia sensor of international events**

Claude GRASLAND, Timothée GIRAUD, Marta SEVERO

This chapter argues that combining geographic and media data, though problematic, may help to understand the contemporary system of international relations and recent changes in the system brought about by globalization if viewed from a spatio-temporal perspective involving sensors emanating from statistical or media measurement tools. Bringing together experts in geography, media studies and computer science, the “Geomedia” research component of the CIST is currently exploring two approaches to the study of international news flows and peaks indicative of the presence of events in these flows. The chapter examines the value of “heavy” sensors that involve aggregating articles from a large number of newspapers to provide an overall view of the relative importance of a country producing articles or attracting media attention. The study also examines “light” sensors that involve capturing RSS feed data from a selection of newspapers chosen on the basis of sampling and non-redundancy criteria. “Light” sensors and RSS feeds seem to be the most promising approach, although their application requires new IT tools and infrastructures for capturing, storing and visualizing media data in real time.

### CHAPTER 10

#### **The territorial dimensions of climate and cultural changes in the Bronze Age in the Eastern Mediterranean and the Near East**

Catherine KUZUCUOGLU

The history of Bronze Age societies in the Eastern Mediterranean and the Near East is marked by periods of cultural instability (or cultural crises) variously described as “transition periods”, “dark ages”, “intermediate ages” or “collapses” seen as governing the periodization of the Bronze Age. The dates of these periods vary in different regions and territories. Broadly speaking, the Early Bronze Age began around 3200-2900 BC and ended between 2300 and 1900 BC, while the Middle Bronze Age ended around 1550-1450 BC and the Late Bronze Age between 1200 and 900 BC. The history of regional economic and political systems during these periods is marked by profound and radical changes and by instability and destruction coinciding with periods of severe drought between 3250-3000 BC, 2300-1900 BC and 1250-900 BC. Climatic instability led to water shortages and changes in water availability (precipitation, humidity) accompanied by changes in the socio-economic structure of sensitive territories. Two examples of territories affected by significant environmental changes at the end of the third millennium BC are discussed: the Kingdom of Ebla in central Syria and the Akkadian Empire in the Khabur River Basin. Both cases illustrate the impact and territorial variability of these changes. The two examples also contribute to our understanding of the role of the variability of geographical, climatic and cultural conditions in the history of the transitional periods of the Bronze Age in these territories.

## CHAPTER 11

**Exploring global population dynamics on the Web**

Gilles PISON, H el ene MATHIAN, Christine PLUMEJEAUD, J er ome GENSEL

Global population growth is a major challenge for the future of humanity. Differences in fertility rates and increasing population mobility have had a significant impact on population growth and distribution. As part of its contribution to public debate, the French National Institute for Demographic Studies (INED) recently developed a dynamic and interactive mapping tool freely available at [www.ined.fr](http://www.ined.fr). The tool provides a range of demographic indicators using measurements and estimates (1950-2100) in different countries based on a new approach incorporating territorial and spatial dimensions. The data are drawn from the United Nations Population Division. The aim is to provide a tool for visualizing and understanding global demographic trends. The tool was designed as a pedagogical tool for teachers and students, but is also aimed at the general population. The complementary perspectives it offers are intended to stimulate reflection and to promote interactivity while enabling users to explore the various aspects of spatial dynamics. The tool has significant potential for informing policy decisions.

## CHAPTER 12

**Spatio-temporal analysis of territorial data with metadata**

Christine PLUMEJEAUD

Territorial information is very heterogeneous because of the wide range of data producers, measurement scales and data collection intervals. Understanding territorial information implies having intuitive methods of representation and visualization (maps, curves, etc.) and effective methods for comparing data in all their dimensions (i.e. spatial, territorial, and thematic). To address this issue, a geovisualization tool was developed to provide a method for the detection of outliers. This chapter discusses the benefits of the tool, which requires using geostatistical methods and ensuring user access to metadata in a spatio-temporal interface. The issues raised by the tool are also examined as an avenue for future research.

## PART 3

**TERRITORIAL SCIENCES AND SOCIAL DEMAND****3.1 GRENOBLE EXPERIENCE**

## CHAPTER 13

**Matching the territorial sciences with territories: conditions and determinantes**

Gr egoire FEYT, Pierre-Antoine LANDEL,  Elise TURQUIN

Collaboration between researchers and territorial bodies began with the emergence of the concept of territory in the 1980s. Since then, territory has come to be viewed as a basic framework and resource for development. However, despite recent developments and a number of isolated initiatives, an academic and institutional interface recognized by both researchers and territorial bodies has yet to emerge. Because of the increasing complexity of public action, territories are increasingly seeking to collaborate with research actors. This

chapter argues that collaboration must be based on experience and knowledge as part of an effort to take into account the expertise and expectations of local actors. The process of building the territorial sciences requires reflection on the theoretical and practical foundations of an effective, sustainable and balanced partnership between research and territorial actors.

#### CHAPTER 14

### **Lessons learned from 14 years of the GEOIDE Network**

Nicholas CHRISMAN

Over fourteen years, the GEOIDE Network has set a standard for excellence in delivering results of research to user communities across disciplinary boundaries in the field of geomatics. This experience provides lessons for the creation of a new interdisciplinary collaboration such as CIST. In particular, the interaction between the more technical field of geomatics and the concentration of 'territorial' (or landscape) sciences is apparent.

### **3.2 TERRITORIAL SCIENCES AND ACTORS**

#### CHAPTER 15

### **The impact of advances in the territorial sciences on school geography**

Nacima BARON

Over the past twenty years, the concept of "territory" has come to play an increasingly important role in the French geography curriculum at both primary and secondary levels. The recent curriculum reform signals a new phase in the rise of territory and has changed the way the topic of territory is taught in schools. How should we interpret these developments? As a mere realignment or as a sign of the emergence of a new "pedagogical field" associated with a new science of territory? Drawing on personal experience (and, in particular, on my involvement in the ministerial committee responsible for school curricula) and recent research (specifically, an exhaustive analysis of confidential academic responses), this chapter examines the concept of territory from the point of view of curriculum development and considers the difficulties and obstacles encountered by teachers in seeking to integrate the concept into their teaching.

### **3.3 TOOLS TO CONTRIBUTE TO PUBLIC DEBATE**

#### CHAPTER 16

### **HyperAtlas: a tool for promoting political debate. The case of EU cohesion policy**

Ronan YSEBAERT, Nicolas LAMBERT, Claude GRASLAND, Benoît LE RUBRUS,  
Marlène VILLANOVA-OLIVER, Jérôme GENSEL, Christine PLUMEJEAUD

This chapter examines HyperAtlas, a tool for measuring and mapping territorial disparities. Because of the analytical methods it uses and its potential applications, HyperAtlas is situated at the crossroads of science and politics. Drawing on the Weberian paradigm as a conceptual framework, the chapter considers the political utility of HyperAtlas using the example of the negotiations surrounding EU cohesion policy after 2013. We show that HyperAtlas can be used to simulate different policy scenarios, thus enabling actors to maximize their interests

in a zero-sum game. HyperAtlas may also provide a basis for developing policies operating at different territorial levels and for promoting more effective multi-level governance in a non-zero-sum game.

#### CHAPTER 17

### **(Re)Building the territorial sciences: toward a science of social harmony. The “Founding Territorial Sciences” conference: Some concluding remarks**

Michel BUSSI

Though not claiming to draw any definitive conclusions or to summarize the rich discussions that took place during the inaugural conference of the CIST, this chapter aims to build on the findings of the conference by offering a new approach to the practice and epistemology of the territorial sciences. A case is made for a definition of the territorial sciences as a “science of social harmony”. The new field or discipline will need to address a number of challenges, such as emancipating itself from geography both academically and institutionally, rethinking the transition from the individual to the collective, re-examining the political role and meaning of territories, ensuring that the territorial sciences are not left in the hands of experts and using new communication tools to contribute to public debate.



# CONTENTS

## INTRODUCTION

**Territorial sciences: Why a book on territories, and why a collection of essays? . . . . 1**

## *DEBATE PAPER*

**Territory as the legible, tangible product of complex processes and as a resource for action. . . . . 5**

Pierre BECKOUCHE, Claude GRASLAND, France GUÉRIN-PACE, Jean-Yves MOISSERON

## PART 1

**The international scientific debate on territory . . . . . 25**

**1.1 SPACE VS. PLACE . . . . . 27**

### CHAPTER 1

**Territoriality: a tension at the heart of territorial contradictions . . . . . 29**

Guy DI MÉO

### CHAPTER 2

**Space and territory: toward integrated concepts . . . . . 39**

Denise PUMAIN

### CHAPTER 3

**The Territory is not the Map: steps towards a new (meta)science . . . . . 55**

Helen COUCLELIS

### CHAPTER 4

**Formalizing Space and Place . . . . . 67**

Michael F. GOODCHILD, Linna LI

CHAPTER 5  
**Imagining Space and the Problem of Territory** . . . . . 77  
Kevin COX

**1.2 FOREIGN EXPERIENCES** . . . . . 83

CHAPTER 6  
**A scientific trajectory in territorial sciences: the recent Italian experience** . . . . . 85  
Roberto CAMAGNI

CHAPTER 7  
**Territorial sciences in Germany** . . . . . 93  
Christian SCHULZ

CHAPTER 8  
**Territorial sciences in Quebec. The case of the *Groupe de recherche interdisciplinaire sur le développement régional, de l'Est du Québec (GRIDEQ)*** . . . . . 101  
Yann FOURNIS, Marie-José FORTIN

**PART 2**  
**Territorial information, interdisciplinary and inter-scale stakes** . . . . . 113

CHAPTER 9  
**A geomedial sensor of international events** . . . . . 115  
Claude GRASLAND, Timothée GIRAUD, Marta SEVERO

CHAPTER 10  
**The territorial dimensions of climate and cultural changes in the Bronze Age in the Eastern Mediterranean and the Near East** . . . . . 131  
Catherine KUZUCUOGLU

CHAPTER 11  
**Exploring population dynamics on the Web** . . . . . 141  
Gilles PISON, H el ene MATHIAN,  
Christine PLUMEJEAUD, J er ome GENSEL

CHAPTER 12  
**Spatio-temporal analysis of territorial data with metadata** . . . . . 155  
Christine PLUMEJEAUD

<b>PART 3</b>	
<b>Territorial sciences and social demand</b> .....	165
<b>3.1 GRENOBLE EXPERIENCE</b> .....	167
CHAPTER 13	
<b>Matching the territorial sciences with territories: conditions and determinants</b> . . .	169
Grégoire FEYT, Pierre-Antoine LANDEL, Elise TURQUIN	
<b>3.2 TERRITORIAL SCIENCES AND ACTORS</b> .....	181
CHAPTER 14	
<b>Lessons learned from 14 years of the GEOIDE Network</b> .....	183
Nicholas CHRISMAN	
CHAPTER 15	
<b>The impact of advances in the territorial sciences on school geography</b> .....	193
Nacima BARON	
<b>3.3 TOOLS TO CONTRIBUTE TO PUBLIC DEBATE</b> .....	203
CHAPTER 16	
<b>HyperAtlas: a tool for promoting political debate. The case of EU cohesion policy</b>	205
Ronan YSEBAERT, Nicolas LAMBERT, Claude GRASLAND, Benoît LE RUBRUS, Marlène VILLANOVA-OLIVER, Jérôme GENSEL, Christine PLUMEJEAUD	
CHAPTER 17	
<b>(Re)Building the territorial sciences: toward a science of social harmony.</b>	
<b>The “Founding Territorial Sciences” conference: Some concluding remarks.</b> . . . .	223
Michel BUSSI	
<b>The authors</b> .....	229
<b>Abstracts</b> .....	237

The “Founding Territorial Sciences” conference marked the birth of the International College of Territorial Sciences (CIST), a new research body devoted to the study of space and territory. The purpose of the conference was to answer the following question: Although the concept of territory is central to recent social changes, are we justified in seeking to establish the “territorial sciences” as a new academic field or discipline?

To answer this question, we need to address a number of other issues. These include:

- the issues raised by interdisciplinary research in other countries; if we want to develop an international network, we will need to ensure that similar initiatives are underway in other countries and that they are compatible with the research projects of the CIST;
- the issues surrounding the questions addressed by researchers in the territorial sciences; though it has defined an initial set of research questions, the GIS may need to explore other avenues;
- the issues surrounding the nature of the “territorial sciences”: should the territorial sciences be defined as an interdisciplinary field, i.e. as a set of disciplines brought together to understand the territorial dimension of their objects of study? Or should they be defined as an emerging discipline, the key concepts, principles and methods of which will need to be defined?

The new field covers a wide range of disciplines extending well beyond the humanities and social sciences. The main theoretical and methodological challenges are to foster links between the humanities and social sciences and the life and earth sciences, the health sciences and the engineering sciences (modeling, complex systems, etc.). For example, the lack of collaboration between physicists and mathematicians working on climate change models and humanities and social science researchers concerned with the territorial impact of climate change has created a gap between global and local approaches.

Finally, beyond the confines of academia, what is the proper relationship between the territorial sciences and territorial development strategies and practices?

This book has been published in French in 2012 in “La collection du CIST” series in Karthala, edited by Pierre Beckouche, Claude Grasland, France Guérin-Pace and Jean-Yves Moisseron. It reflects the works of the Collège international des sciences du territoire (CIST – International College of Territorial Sciences), namely some contributions to the 2011 founding conference in Paris.