Emanuela Casti

Reality as representation

The semiotics of cartography and the generation of meaning
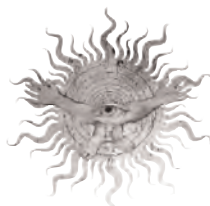
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This book takes maps to be a demonstration of how humankind's intellectual appropriation of reality aims to offer a linguistic construction of the world, with the body of names and signs within a map forming the world of sense experience into ordered knowledge. This innovative study looks at the semiotics of cartography in terms of semantics, syntax and pragmatics, and thus illustrates how a map communicates. The empirical studies that accompany the theoretical discussion range from Renaissance maps to Euclidean cartography, bringing out the specific nature of this means of communication and its special feature of "self-referentiality".

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Contents

Acknowledgements

It is difficult for someone working in the field of research to totally separate their professional and private life, and thus here I would like to mention those who, in one way or another, have been a part of my life for the last ten years: my students, who have helped me in giving form to the exposition of my work and whose curiosity has been a constant stimulus; my colleagues, who on numerous private and public occasions have shown their willingness to discuss and debate ideas; my friends, who have sustained me in moments of crisis; and my family, whose affection has made it possible for me to dedicate myself to this research. A special mention should go to Eugenia Bevilacqua, who first taught me that maps may conceal new worlds, quite apart from their most obvious appearance.

Two people have followed each step in my research, and to them I express my special gratitude: Luigi Gaffuri, who not only took on the task of reading through the entire manuscript, but was also a patient listener as I voiced my doubts and perplexities during long evenings in Africa, and Angelo Turco, without whom it is very unlikely this book would have been written. Finally, particular thanks go to Jeremy Scott, whose knowledge of semiotics has made it possible for this translation to improve and clarify numerous points in the original text.

Preface

CARTOGRAPHY: THE EMPIRE OF NAMES

The basic premise of this work is that the geographical map, viewed as a collection of signs, is a representational device that serves as an instrument in a process of denomination. Intellectual appropriation of territory requires that names be applied to places – and this application takes places through the construction of geographical maps. Of course, maps meet many other needs, but their basic purpose is the allocation of designators within a topological system that re-presents objects in the same relationship to each other as that which exists in the real world. The names in a map serve to order and regulate the message contained therein. The aim of this study is to describe the various mechanisms of communication employed in this process.

There is an ever-growing demand for a study of cartography as a process of communication. However, a purely structural approach would be merely reductive if it did not take into account a map's role in the process of territorialisation (for example, its role in providing "targeted messages", establishing tactics and determining behaviour). Hence, my aim is not simply to bring out the special structural characteristics of a map, but also to cast some light on the role cartography played in the appropriation of territory. We know that any representation may be considered as a topic figure that breaks down information then re-composes it, collocating it in a way that is consistent with other components of knowledge. In short, representation is a mechanism whose primary purpose seems to be to condition the recipient – who "uses" rather than simply "views" the message received.

However, the map has more wide-ranging effects. Once it has been drawn up, a map is an individual object in its own right and thus can exert independent influence on all those who use it. Whilst it may be a suitable instrument for conveying the cartographer's original intention (a particular interpretation of the physical world), it can also function independently of the intentions behind its production, exercising its own influence on the knowledge and action of the recipient. Hence, the message conveyed by a map is a self-defined message which assumes an independent status in the process of communication. Ultimately, it is this *self-referentiality* that determines the map's effectiveness: its ability to act as a substitute for direct experience of the physical reality portrayed means it can fulfil a specific role in orchestrating the various components – or individual acts – that play a part in the process of territorialisation.

Some studies have, in part, explained this by the fact that a map is an instrument of symbolic communication and thus draws on a number of rhetorical mechanisms. However, neither the studies which have focused on

maps as examples of visual communication, nor those which have emphasised questions of ideological power, have been able to give a full answer to the question I have just raised: why, in the process of communication, are maps able to convey interpretations that go beyond not only the original intentions of the cartographer but also beyond his actual knowledge?

Other geographical studies which have focused explicitly on symbolic systems of territorial representation have revealed how the role of maps can be analysed in a different way. I am referring, for example, to A. Turco's recent studies of the procedures adopted in the intellectual appropriation of physical space, and of how those very procedures can affect and decide social relations within the groups which apply them. Denomination is seen as a feature of human praxis which, by enumerating and classifying, organises the surface of the globe in an interplay of differences; it is a process that projects a basic order onto the land we tread, establishes its first "grammar". Alongside this primary function, there are others that relate to the practical needs of a society, which must be met if that society is to function and reproduce itself. These can be subsumed under the general, but fundamental, question of *the establishment of a position*, the definition of a frame of reference. And, of course, that establishment of reference stimulates interpersonal communication, organising it as part of a social order – within what Turco calls *discursive configurations of referentiality*[1]. In this context, the map can be seen as *one such configuration, capable of exerting an influence on further developments in the "semanticisation" of territory.*

Starting from this basis, I will try to show how the geographical map is a denominative projection – that is, a clear *manifestation* of the intellectual appropriation of territory – and, at the same time, also the *locus* in which the process of denomination is carried out. This approach, which puts great emphasis on the role of names within maps, also draws on important ideas in other disciplines. Roland Barthes, for example, having carefully studied the influence of the mass media on social behaviour, argued that it was a mistake to speak of contemporary society as a "culture of the image": nowadays, even more so than in the past, what we have is a "culture of the written word". Having investigated the historical development of the relation between text and image, he claimed that in recent times an important change had taken place. The image no longer serves to illustrate the word, but – from a structural point of view – it is the word that depends parasitically on the image. The result of this reversal is that if we want to discover the message connoted by the image we must turn to the verbal messages contained therein[2].

Thus it is clear that the analytical instruments one should use in explaining the communicative capacities of a map are those drawn from

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[1] A. Turco, "Dire la terra: la costituzione referenziale del territorio in Costa d'Avorio", in: *Terra d'Africa 1994*, Unicopli, Milan, 1994, pp. 15-58.

[2] R. Barthes, *L'obvie et l'obtus*, Ed. du Seuil, Paris, 1982. Reference is to the Italian edition: *L'ovvio e l'ottuso*, Einaudi, Turin, 1985, pp. 15-17.

semiology, and – in particular – from what is now known as "the semiology of territory"[3]. The study of the semiotics of maps should, therefore, reveal the mechanisms of representation those documents use and illustrate the possible contexts in which this generation of signs/meanings might be employed and for what purpose. Applying the technical and conceptual tools that have been perfected by the "semiology of territory"[4], this study brings out three types of relations which, taken together, define a veritable semiotics of cartography. The first relation is that to be found in the *semantic* domain proper and concerns the production and accumulation of meaning; the second concerns the *syntax* within a map – that is, the communicative system of interconnected symbols within which the meaning of those symbols necessarily evolves; the third is to be found in the sphere of *praxis*, in which the map is both the object of interpretation and a "stencil" outlining territorial behaviour[5].

It is at this third level that one can see most clearly how a map is not only an instrument with a role in the intellectual appropriation of territory but rather an integral part of that process itself. The map thus appears to be the product of a culture which then becomes an expression of culture in its own right. It draws on the cognitive patrimony of a specific society in order to enhance territorial knowledge; it establishes itself as an autonomous means of communication; it sets itself up as an innovative interpretation of the world operating within the mechanisms of control applied by the society that produced it.

Naturally, any semiotic analysis of maps must be accompanied by a consideration of context – of the motives and interests at work in the production of a map, and of the means used in creating it. Only in this way is it possible to understand the unitary logic which govern the creation of a map and influence the criteria adopted in its production (criteria that are intended to support one of various possible renditions of physical reality, and thence influence possible changes therein).

Far from being a linear univocal process, the interpretation of a map involves all three of the above-mentioned relations, which play off and echo each other, setting up an interplay that is often circular in nature. What is more, interpretation is not a purely cognitive – socially neutral – operation. It necessarily involves an interpreter, a social agent who turns to the map for information that will serve in the pursuance of objectives. In fact, from

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[3] A. Turco, "Semiotica del territorio: congetture, esplorazioni, progetti", in: *Rivista Geografica Italiana,* 101, 1994, pp. 365-383.

[4] A. Turco, "L'ordine infinito: simboli territoriali e dispositivi sociali presso i Senoufo della Costa d'Avorio", in: *Terra d'Africa 1993*, Unicopli, Milan, 1993, pp. 15-72.

[5] E. Casti Moreschi, "Cartografia e politica territoriale: i boschi a Venezia", in: *Storia Urbana*, F. Angeli, Milan, 69, 1994, pp. 105-132; *Id.*, "La 'mappa' del Baratieri, la sconfitta di Adua e la vittoria dell'autoreferenza cartografica", in: *Terra d'Africa 1996*, Unicopli, Milan, 1996, pp. 17-79; *Id.* "Rappresentazione e pratica denominativa: esempi dalla cartografia veneta cinquecentesca", in: G. Galliano (ed.), *Rappresentazioni e pratiche dello spazio in una prospettiva storico-geografica*, Centro Ital. per gli Studi Storico-Geografici, Rome, 1997, pp. 109-138.

the point of view of pragmatics, the interpretation of a map is already a territorial *act*: it heralds strategies of production and use, indicates the ways in which territory will be rendered within media.

The examples studied in this book come from two very distinct social, geographical and historical contexts, which have been the focus of my research for some years now: the first concerns the Venetian Republic and the territorialisation of its mainland dominions; the second, Italian colonisation in Africa. In both cases, maps were an instrument in political projects – as C. Raffestin might put it, they created the order necessary for the establishment of those power relations that could sustain a process of territorialisation[6]. But Europe and Africa are also brought together here to see how, through the mediation of cartography, those two worlds recognise – but also reject – each other. In effect, cartographical representation – with its connotations of modernity, its use as an instrument for establishing the place of the "Other" and the "Elsewhere" as part of a shared social awareness – in both cases became an intellectual and political tool in strategies of domination. However, while Europeans did view Africa as the very locus of the "Other", the forms of representation they used to depict it should be seen not only as their rendition of an "Elsewhere" but also as a revelation, a reflection of themselves.

A play of reflections, therefore, which functions thanks to the map – that "interface" which mediates as it reflects.

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[6] C. Raffestin, *Pour une géographie du pouvoir*, Les Librairies Technique, Paris, 1980. Reference is to the Italian edition: *Per una geografia del potere*, Unicopli, Milan, 1981, pp. 149 *et seq.*

Chapter One

COMPLEXITY, TERRITORY AND CARTOGRAPHY

Naming is always classifying,
and drawing a map is essentially
the same as giving a name
(G. Bateson)

Physical space becomes the territory of an agent as soon as it finds its place in a social relation of communication. This is C. Raffestin's succinct definition of the beginning of the process of "territorialisation" – that series of acts by means of which a society operates on its environment in order to survive. Mankind examines the world and interprets it, translating it into a system of linguistic signs that can be used in communication. Thenceforward the world becomes a *site of the possible*; given specific motivation and adequate technological know-how, it will be transformed and made to meet certain purposes and requirements. This marks the beginning of that transformation of nature which ultimately makes mankind into the master of the real world; by understanding and modifying what already exists, man breaks free of any sort of deterministic mechanism[1].

Nature at this point is replaced by Civilisation. This imposing project of "territorialisation" has been a necessity since the first appearance of primitive man, and the "geography of complexity" argues that it implies not dichotomy but interrelation[2]. The process has always been characterised by a dilemma: how can one operate on the intricate interweave of environmental restrictions and opportunities so that one overcomes the former without destroying the latter (indeed, the aim is to develop those very opportunities)? It is a daunting challenge. However, it is not, as Goethe argued, a clear indication of man's arrogance, of his desire to take the place of God and create a new world for himself. What we have here is an example of the complexity that the world itself imposes upon human existence. When Faust exploits his technological know-how in order to draw up a project of land reclamation – which is more an act of creation than of transformation – he is attempting to impose an order on what appears to him to be chaos. Overcoming the limits imposed by "anarchic" water resources means guaranteeing oneself two new opportunities: a material opportunity (the reclaimed land can be exploited) and an intellectual opportunity (the territorial knowledge acquired becomes part of a communicable cognitive heritage). In effect, it means guaranteeing one's independence from the conditions imposed by Nature. And it is through the management/organisation of such complexity that man achieves his independence, consciously working to establish a relation with the natural

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[1] C. Raffestin, *Pour une géographie du puovoir*, Les Librairies Techniques, Paris, 1980. Reference is to the Italian edition, *Per una geografia del potere*, Unicopli, Milan, 1981, p. 153.

[2] The general approach adopted in this book draws on that outlined in: A. Turco, *Verso una teoria geografica della complessità*, Unicopli, Milan, 1988.

world that will facilitate survival and freedom of action. The ultimate aim is to manage the natural world by reducing its complexity, without however destroying that complexity altogether (to do so would mean that one could never exploit it further at some later stage). Everything rests on creating a dialectic of autonomy that maintains a certain level of complexity: at a later stage, if he so desires, man can implement his choices and decisions by neutralising those features which, at that point, appear to him to be redundant. Hence human action works in two directions: on the one hand, it creates environments of reduced complexity (and thus fragments the world); on the other, it actually makes the world more complex (due to its end results).

Humankind was quick to learn that such a challenge could only be met by collective action, and so formed itself into groups in order to guarantee survival and reproduction. Hence the social body is a territorial agent, which consciously implements projects intended to achieve results that are important for the collectivity as a whole. Whilst strategies might vary according to each individual society's intellectual and technical resources, the basic aim remains the same: the creation of favourable conditions for the survival and reproduction of that society. Territory thus becomes a reflection of how a society functions and is organised; at the same time, it supplies the necessary intellectual and material resources for the implementation of collective projects.

The axiomatic principle – restrictions are to be overcome without opportunities being destroyed – can be found at all stages of human action on the environment, and is particularly clear in the early phases of territorialisation – that is, during the intellectual appropriation of territory. "The site of the possible" is managed through knowledge – and such knowledge is nothing other than an ordered representation of what was previously taken to be merely chaotic. This is something we all know very well, and is expressed by the initial meaning of the term "geography" to indicate "an ordered representation of the earth".

Such a representation is the basis for subsequent action – and, above all, for communicative action: geographical knowledge becomes part of the circuit of cultural production, and thus suffers all its inevitable effects, deformations and corrections. The first step towards the achievement of order is some kind of representation. From there, each social group actually moves forward at different rates and in different ways (though, in all cases, the end result always appears to come at the conclusion of a long and difficult process of conquest). The shifting path followed is one beset by doubts and uncertainties; however, it ultimately leads to the establishment of control and government over what had previously been totally unmanageable.

By taking representations as instruments for the governance of an original – inordinate – complexity[3], one can evaluate the ways in which

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[3] By "original complexity" I mean that range of opportunities that the environment offered to *homo geographicus* – that is, to those groups of human beings who undertook territorial action.

these representations are created, and thence reflect upon the purposes they were intended to serve. The primary aim of a representation is not so much to provide an objective (or subjective) description of the world as to modify that world through the very images supplied. As P. Bourdieu argues, one does not measure the effectiveness of a representation simply on the basis of the objectivity – or subjectivity – of its depiction of the real world. To take objective accuracy as our only parameter would be to forget that a representation can actually affect the reality it depicts, perhaps leading to the creation of the state of affairs it shows as already existing. Clearly, its effectiveness here does not depend simply upon how it was drawn up. Conversely, it is also true that if one takes a representation as ratifying what is true and what is false, one tends thence to consider that representation itself as establishing what exists and what does not exist[4]. One might avoid such alternative judgements of "subjectivity" and "objectivity" by considering the representation as an inherent part of the knowledge of the object itself – that is, by recognising that it serves a role of mediation and can thus play an active role in the "composition" of reality. Such a view takes a representation to be the "locus" of a permanent struggle for the definition of "reality"[5]. From this point of view, one can understand why objectivity is not an absolute guarantee of truthfulness, to be accepted without reservation; an ingenuously "scientific" vision of the world is, in effect, the result of man's abdicating from the full exercise of his critical powers. Along with E. Dardel, one might argue that the objectivity of modern thought necessarily derives from the full exercise of subjectivity; in the final instance, it is man's freedom of spirit that makes it possible to judge whether something be true or not. An abdication of sovereignty here would actually be an abdication of humanity[6].

Why do I insist on these points here, when all areas of research now accept the influence and power of representations? Perhaps as a timely reminder that everything which is *established* is the result of a struggle to bring about the existence (or non-existence) of what in principle *can* exist. Hence, I would suggest that representations work as enunciations which aspire to bring about what they enunciate; one would be taking a very limited view of representations (be they mental, visual or literary), if one

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[4] P. Bourdieu, *Ce que parler veut dire: l'économie des échanges linguistiques*, Fayard, Paris, 1982. Reference is to the Italian edition: *La parola e il potere. L'economia degli scambi linguistici*, Guida ed., Naples, 1988, p. 115.

[5] It should not be forgotten that this leads to an increase – rather than a decrease – in the importance of representation: in evaluating the pertinence of a map, this shift from criteria of objectivity to a recognition of the internal mechanisms within a map which can play a role in the modification of reality, means that representation is seen as capable of an active role (as a symbolic mediator within the process of communication). This is one of the reasons which leads us to study communicative systems, in order to understand how they function at a social level (and, hence, see what territorial processes are at work within them).

[6] E. Dardel, *L'Homme et la Terre. Nature de la réalité géographique,* Presses Universitaires de France, 1952. Reference is to the Italian edition: *L'uomo e la terra. Natura della realtà geografica*, Unicopli, Milan, 1986, p. 81.

were to argue they are just one of the many means available to mankind for the creation of an image of the world. Undoubtedly, this is one of their purposes; however, representation involves more than the simple discovery of a system of signs that can serve to communicate what initially appears complex. The point one has to stress – and here we get an important insight into why representations are so important in the relation humankind establishes with its world – is that representations serve as a means for the (human) creation of the world itself.

A mere list of all the various contemporary theories which accept that the world "comes into being" through representation would take me too far afield from the argument I want to develop here[7]; however, I should underline that when I use the term "intellectual appropriation" I am not simply referring to those practices which humanity establishes as the initial conditions for human action, but rather to the fact that such practices could be said to sanction the very existence of a world as such[8]. In effect, the cognitive act is already a selection of certain attributes in preference to others; it is an act of re-construction that finds expression in representation. Hence the dichotomy between Nature and Civilisation turns out to be superseded: human action does not simply modify the pre-existent, it actually creates it – through a process one might describe as retroactive (that process whereby civilisation leads to the recognition of the natural world as such).

Yet if each representation pre-supposes the use of a system of signs capable of transmitting information, it is not the case that all representations are equally effective, equally proficient in transmitting an ordered idea of the world. I have already mentioned how the very term "geography" implies the achievement of order through representation. In effect, geography's ability to "set in order" arises from the task it initially poses itself: the organisation of natural phenomena and features. Geographers provided a systematic account of objects in relation to other objects, and so the key to the recognition of things became the interrelations between them. A geographer's skill rested on the definition of difference through the application of discriminating criteria. Hence it is clear that, in this case, order and classification become closely-related concepts: the establishment of an order in things requires the use of parameters of evaluation that can bring out differences, and classification requires that specific features be put together in ordered hierarchies. An order can only be established when the individual nature of an object with respect to others has been recognised, and the particular characteristics of

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[7] B. Harley is recognised as having initiated this approach to the study of cartography (P. Gould and A. Bailly, *Le pouvoir des cartes. Brian Harley et la cartographia*, Anthropos, Paris, 1995) – along with his work, I would also mention another, more recent, study that adopts the same point of view: D. Wood, *The Power of Maps*, The Guilford Press, London, 1993.

[8] In the field of geography, this subject is raised in: G. Zanetto (ed.), *Les langages des représentations géographiques*, Università degli Studi, Dipartimento di Scienze Economiche, Venice, 1987.

that individual nature have been taken as distinguishing parameters. For its part, a class is only valid if it envisages a number of components that can generate sub-components, which in their turn can generate other such sub-components. These are the principles on which descriptive geography rests.

Such "geographical inventories" however do draw on a "theory" – in the sense that they necessarily involve the application of some type of programmatic perception (which becomes all the more important if the theory being drawn upon concerns the social world). Once again, one might cite P. Bourdieu here: "there are undoubtedly few cases in which the structural power of words, their ability to prescribe when apparently describing, to denounce when apparently enouncing, can be doubted. The effectiveness of representations is demonstrated above all in the constitution of societies: the theories which contribute to the creation of a social order impose principles of di-vision – above all through symbolic representations that echo the political scenario where order is guaranteed"[9].

For his part, C. Raffestin emphasises how the production of any representation of physical space already involves an exercise of intellectual appropriation (and therefore control) as there can be no representation without some pre-supposed project, some desired image of territory. Each representation – that is, each construction of the real – is an instrument of power which requires the use of codes of communication and semiotic systems that can serve to impose the "objectification" of space[10]. With regard to cartography itself, one only needs to look at C. Jacob's masterful studies of the matter to see that through the ages there has been a clear relation between the principles of social regulation applying at a particular time and the canons of representation a particular society employs[11].

Geography – initially functioning as an ample domain of knowledge and subsequently as a scientific discipline – has also served its turn in legitimating social hierarchies by applying them in its representation of the world[12]. This is linked to the fact that the passage from a phase of spontaneous grouping to the establishment of a socially-recognised group presupposes the creation of a principle of classification which organises the distinctive characteristics of the group as a whole and "negates" those properties that are shared by (either some or all) its individual members and might therefore serve as the basis for other hierarchies of classification (characteristics of nationality, age, sex, etc.). Whether one uses sex or age, wealth or level of education, each such classification serves to introduce divisions which have an influence on policy and action[13]. It should here be

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[9] P. Bourdieu, *La parola e il potere…*, p. 122.

[10] C. Raffestin, *Per una geografia del potere…*, pp. 150-155.

[11] C. Jacob, *L'empire des cartes. Approche théorique de la cartographie à travers l'histoire*, Albin Michel, Paris, 1992.

[12] F. Farinelli, "'Der Kampf ums dasein als ein Kampf um raum': teoria e misura dello spazio geografico dal Settecento ai giorni nostri", in: P. Pagnini (ed.), *Geografia per il principe, teoria e misura dello spazio geografico*, Unicopli, Milan, 1985, pp. 29-60.

[13] P. Bourdieu, *La parola e il potere…*, p. 124.

mentioned that, in part, social order owes its stability to the fact that it imposes schemes of classification which reflect some sort of recognisable objective property or characteristic and thus nurture some form of recognition of the established hierarchy (a recognition that necessarily implies a failure to see the true – arbitrary – nature of the foundations of social order). This correspondence between objective divisions and classificatory schema, between objective structures and mental structures, is at the basis of adherence to the established order[14]. Hence it is clear that a "theory" of representation that can order and classify the world whilst respecting the ideology behind that world (indeed, reinforcing that ideology by showing it to be a reflection of natural laws) is of great functional importance to any political project. It is this which sanctions the effectiveness and usefulness of cartographical – as of other – representations.

1.1 *The Map in the Modern Age*

In the Modern Age the material or intellectual conquest of physical space found concrete expression in the creation of geographical maps – which served both as the means for proposing territorial strategies and as instruments for implementing those strategies. The use of such maps became widespread during the period of gestation of scientific geography – that is, during the period of the great geographical discoveries. However, if in some senses geography and cartography develop alongside each other, their paths do diverge at some points. In discussing the emergence of this new concept of geography – and the drive to undertake "voyages of discovery" – E. Dardel indicates such divergence whilst nevertheless arguing the vital role of the geographical map: "political or mercantile concerns alone do not explain that frenzied activity of discovery, even if they often played a decisive role in making research and discovery possible. One might, therefore, talk of a *poetics* of geographical discovery, in the sense that discovery was the consummation of a vision of the world as a whole; it was an act of creation – the creation of space – an opening-up of the world to the expansion of humanity, a rapturous leap towards the future and the establishment of a new relation between humanity and the Earth. [...] For the new conception to become established, a taste for research and discovery – together with a new logical order based on invariable and universally valid laws – had to reign supreme. But for this scientific attitude to confirm itself in the face of the real world, the exercise of will and enthusiastic endeavour had to give way to a return of pondered experience, reflection and analysis. In a certain sense, scientific geography is the very opposite of geographical discovery, which necessarily requires the exercise of will-power, a taste for risk and adventure and a certain openness to the thrill and pleasure of discovering the new. Geography "with the wind in its sails" and geography "at the drawing-board"

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14 *Ibid.*, p. 121.

are, over all, two distinct phases; the latter requires one to rein in the impatient desire for new discoveries, to lead a life somewhat distinct from the project one is engaged in, and exercise greater detachment in the face of the "object" of geography[15]. The link between these two ways of understanding and investigating physical space was the geographical map. Thanks to cartography, the *globus mundi* became the *globus intellectualis*. And while this may have had the negative consequences underlined by F. Farinelli (with geographers serving to propose the idea of the world as embodying one specific order), it is also true that cartography served not only to stimulate experimental praxis but actually created the conditions necessary for it[16]. As N. Broc points out, if the map became a projection of geographical science – the locus in which such a science gained self-awareness – it was also the locus for the expression of developing ideas. A map was much more than the direct material result of geographical discoveries[17]. In fact, it served a fundamental role in spatial praxis – was, indeed, an essential instrument in the process of discovery itself. At the planning stage, for example, it already acted as a guide to the navigator. A voyage was only undertaken after having traced out a route on a map – which served both to convince the shipowners backing the whole project and to have some idea of the time-scale and conditions of the journey ahead of one. Maps played a role in projects of land conquest too – even when these involved entire continents. The great voyages of geographical discovery were undertaken using maps which, in their depiction of uncertain coastlines and unexplored straits, gave physical expression to a hypothesis which thence took on credibility through the very representation of those geographical features. Hence the map served as an instrument of persuasion to promote a journey of exploration; conjectures were represented as empirically confirmed and thus the project proposed was presented as –

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[15] E. Dardel, *L'uomo e la terra…*, pp. 72 and 75.

[16] F. Farinelli claims that bourgeois geography emerges when the dictates of cartography are abandoned. He argues that the cartographical theory of the modern world – that is, the representation of the world by means of geometrical rules (which during the course of the eighteenth century became solidly Euclidean rules) – not only served to legitimise a pre-established social order but also meant that the geographer returned to a praxis which, at its birth, bourgeois geography had opposed for an entire century: the praxis of geographical knowledge as the mere registration of the dictates of cartography. This process culminated at the end of the eighteenth/beginning of the nineteenth century, when Positivist geographers unquestioningly adopted a topographical spatial model of the world – thus decreeing the end of any critical theory of geographical space. The world became a complex of individual facts that were observable insofar as they could be registered by cartography; the cartographic image became the decisive proof of the concrete existence of an object because, by giving it a name and a symbol, such an image endowed the object with real substance. As a result, the cognitive act within geography became a simple act of representation rather than an act of conceptualisation. (F. Farinelli, "Alle origini della geografia politica 'borghese'", in: C. Raffestin (ed.), *Geografia politica: teorie per un progetto sociale*, Unicopli, Milan, 1983, pp. 21-38; *Id.*, *I segni del mondo, immagine cartografica e discorso geografico*, La nuova Italia, Florence, 1992, pp. 107 *et seq.*).

[17] N. Broc, *La géographie de la Renaissance 1420-1620*, C.T.H.S., Paris, 1986. Reference is to the Italian Edition: *La geografia del Rinascimento*, Panini, Modena, 1989, pp. 29-31.

became – feasible. Subsequently, maps would serve as registers of discoveries, because a discovery was only of value if the territory concerned could be found again with ease – that is, if there were the premises for action. One should never forget here that by registering discoveries, maps also embodied a particular sovereign's territorial claims. The heated and interminable discussions between the Spanish and Portuguese experts of the day are notorious: whilst trying to outdo each other in cunning and deviousness, they supported their territorial arguments with *ad hoc* documents while keeping the more accurate, truthful – and useful – charts safely out of view. It is clear that maps were a political, diplomatic and military instrument. And for all the efforts States made to prevent geographical espionage, corruption was rife and maps were copied or stolen. A map was the official guarantee which legitimated a conquest, and therefore it had to be preserved in secret and repeatedly updated. But it might also have a documentary or even decorative function; as an instrument of self-celebration it took on powerful symbolic connotations. This is why during the Renaissance maps served as illustrations, as decorated "images" – in the widest sense of the word.

The frenzy of discovery was followed by a period in which newly-acquired knowledge was consolidated. This brought with it a new approach to the representation of the globe: the middle of the sixteenth century saw the creation of not only the first collections of maps, which offered the educated men of the day an overview of contemporary geographical knowledge, but also of the first atlases, which very soon became specialised works with a specific focus (regional atlases, nautical atlases, etc.)[18].

However, the original *raison d'être* of these works – that is, the consolidation of a social order by the definition of a physical order in the world – seems to have made itself felt ever more insistently. The main focus of representation was topographical, with the creation of maps that made it possible to pick out geographical phenomena in some detail – works which proposed what one might call the "physiognomy of a region".

It has already be pointed out how the creation of a map can always be traced back to the political intent of territorial appropriation. Indeed, modern cartography emerged during the Renaissance, and its future development would be closely linked with the consolidation of the modern concept of "the State". For example, when the Nation-State saw the exercise of control over a well-defined geographical territory as one of the mainstays to its existence, then the map became an instrument of power – of centralised Power – and tended to adopt a Euclidean syntax (which in various ways was well-suited to the new ideologies). The core of Euclidean representation is a topographical system whose effectiveness rests on an extremely simple system of signs – a system which works by preserving not the substance of objects but the relations between them (offering an *analogy*

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[18] On the manufacture, distribution and use of Italian Renaissance maps, see: D. Woodward, *Maps as Prints in the Italian Renaissance. Makers, Distributors & Consumers,* The British Library, London, 1996.

of their respective distances from each other)[19]. Mathematical measurement and depiction of territory became the main parameters for deciding the exactitude and reliability of maps, because such numerical relations were seen as the most suitable way of giving a faithful rendering of the real. Hence, during the nineteenth century, the exact measurement and depiction of state territory served not only to facilitate the exercise of political and administrative power but also to stimulate the emergence of an awareness of nationhood. At the end of the Napoleonic wars, France was the only country with such a map of the State (drawn up using astronomical readings and a large series of measurements made using triangulation techniques); however, by the last decade of the nineteenth century, Greece and Turkey would be the only European states which had not undertaken the creation of topographical survey maps using the latest astronomical methods. Over this same period various governments hurried to set up state organisations responsible for the creation of a full national cartography[20]. The new methods for the cartographical survey and rendition of territory required highly sophisticated skills and the application of rigorously codified norms – the uniform adherence to which could only be guaranteed by a government body. One should, however, stress that this interest in the management of cartography was not solely technical; it also reflected an ideological concern. The State took upon itself the role of sole legislator and guarantor of the methods by and conditions in which the image of the territory under its sovereignty was to be created. In short, even at a technical level, systems of representation reveal a link between the designs and achievements of power. Technique and technology – understood as embodying exactitude of representation – promoted (revealed) an order in the world and at the same time translated that order into principles designed to promote a specific social order[21].

Seen in this light, another significant stage in cartography can be identified in the period when Europe set about colonising overseas territories. At this juncture, maps served to create a territory suited to the purposes and aims established by a rationality imposed from outside. By the time it dreamt of subjecting the entire world to the power of its science and industries, Europe had become a "developed" geographical entity of urban spaces in which geographical differences tended to be levelled out by a uniform material civilisation. In such a context, maps were a tried and trusted instrument which had already shown their worth at home (if they had been the tool by which the nation-state had imposed itself on its home territories, they would necessarily be invaluable in enabling that state to

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[19] F. Farinelli argues that maps are, in fact, incapable of *showing* such connections; the concepts of relation and connection involve a mental construct, and so the most that a map can do is hint at them. F. Farinelli, *I segni del mondo…*, pp. 134-135.

[20] F. Nadal and L. Urteaga, "Cartografia y estado: los mapas topograficos nacionales y la estadistica territorial en el siglo XIX", in: *Geocritica*, 88, Cattedra de Geografia Humana de la Universidad de Barcelona, 1990.

[21] F. Farinelli, *I segni del mondo…*, p. 60.

project itself beyond its borders). Topography became the means whereby one could legitimate the identification and denomination of geographical features in an unknown, alien context. As R. Battaglia notes with regard to the Italian colonisation of Africa, such a procedure was made all the more important by the fact that Europeans could not orient themselves within the African environment with the same skill as the Africans themselves; therefore, they had to resort to "abstract" reason, in such a way that abstraction in "the geographical definition of terrain became [a mark of] that which was fully and completely exact, scientific and incontrovertible"[22].

So, one must again underline how at each and every period of history, maps have been a tool designed to bear out a specific social project, in which the State is present as a territorial agent. This is why, historically, maps appear as the locus in which the chances for imposing a particular vision of the world are decided, with the products of cartography serving as a rhetorical presentation of the effectiveness of some specific project. Hence one sees that the aim of representing territory is always – inevitably - subordinated to the more basic aim of acting upon it. The production of a map is a step in the actuation of a more wide-ranging project, which aims to make physical space "human" – to implement what we call "the process of territorialisation".

1.2 *Maps and the Process of Territorialisation*

The theory of the "geography of complexity" sees the process of territorialisation in any one specific historic context as being both a product of a particular society and one of the necessary conditions for the reproduction of that society. Action upon territory comprises a whole range of acts which differ widely in logical and technological character yet can nevertheless be divided up to form three broad categories: i) symbolic control (operations aimed at the intellectual modelling of the territory – and thence its intellectual appropriation); ii) material control (operations aimed at directly modelling the territory and thus establishing the physical appropriation thereof); iii) dominion of meaning (the creation of structures – that is, operative contexts – suitable for the implement of projects of social relevance).

Denomination is the key device in the first of these categories of territorialisation. The naming of a location on the earth's surface necessarily means that the place takes on some human-centred characteristics: it becomes a place that can be formed, a place that can be investigated through human action. This is why denomination might be described as one of the fundamental forms of human action on the world. There is a wide variety of ways in which different social groups establish symbolic control of physical space and thus transform it into the cultural product of "territory".

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[22] R. Battaglia, *La prima guerra d'Africa*, Einaudi, Turin, 1958, p. 770.

However, this range of procedures can again be divided into three main categories, which respond to permanent and ineluctable social needs. The first of these procedures is the most intuitive and involves the establishment of a network of points of reference over the surface of the earth; the second involves using the earth's surface not only to reflect but also to model the values of a particular society; the third is concerned less with persuasion than with demonstration – that is, it embodies the empirically verifiable procedures which serve to produce territory as a codified but "open" body of knowledge. Thus when we speak of denomination we must be aware that we are referring to a complex process, whose meaning and significance varies according to the type of designator being used (different designators having different purposes and uses). *Referential* designators are intended to set up points of reference, and thus they are part of practices related to orientation and mobility; *symbolic* designators reflect meanings that are generated by socially-produced values (and thus they are closely linked with the "metaphysics" of a particular society); *performative* designators may well incorporate socially-produced concepts but, unlike symbolic designators, their meaning rests on empirically verifiable truth.

However, in each and every case, the use of a name draws on that name's recognised role within a social/cultural structure – a role that comprises both "an abbreviation of description" and, in some more or less sharply-focused manner, an "agglomeration of concepts". Seen in this way, it is clear that the designator comprises within itself the qualities of the object; meaning is so densely compacted, that the designator can only be fully understood through resort to different levels of reading. The first of these levels – the *denotative* – concerns the referential designator (given that the very codification of such designators is intended to set up a system of reference); the second – the *connotative* – concerns performative and symbolic designators, making it possible to "unwrap" all the cultural, technical and "historical" deposits within such terms (which are both social products and social mirrors). So it has to be emphasised that geography as it interests us here – as a territorial form of social action – is a process of denomination: it betokens the intellectual appropriation of territory, and functions as a linguistic construct of the world which serves to establish and organise social relations.

Seen thus, a geographical map becomes the *manifestation* of such appropriation, and the *site* in which the process of denomination unfolds. The presence of a map bears witness to the process of intellectual appropriation, which is effected by the identifying, naming, classifying and ordering of geographical phenomena. At the same time, the dynamics of communication employed within the cartographical artefact clarifies reference (i.d. physical location) whilst it can also lead to an increase – or decrease – in the cognitive import of the designators used. These aspects can be seen in all the various types of maps that have existed throughout history – and thus highlight the importance of the role of maps within the process of territorialisation.

Let us first look, therefore, at the multiple functions of the map; some of these can be identified at the very moment the map is drawn up, whilst others come later, arising simply because the map exists and is used. What follows is a – non-exhaustive – list of some of these functions; it will serve as a preliminary to the analysis that should give us a better understanding of the problematic nature of the map itself – that is, of its ability to play an active (and not merely passive) role in communication.

The map is … an instrument

Perhaps the most banal – but most convincing – role envisaged for a map is that of an instrument with a primarily practical function. Cartography – and, above all, modern cartography – could, with some accuracy, be defined as embodying the practical representation of physical space. It is very easy to demonstrate that maps serve as an instrument of territorial action. Orientation and mobility are primary needs that cartography plays an important role in satisfying. We know that referential denomination sets up references that enable an individual to establish his physical location and also undertake a journey in a specific direction (perhaps with the purpose of engaging in some form of interpersonal communication). However, whilst the designator renders the world semantic, the map renders it *figurative.* A variety of procedures carried out using the designator result in that designator being seen in as "an image of the world", with the consequence that the designator functions as spatial organisation – in effect, as territory itself[23]. The result is the creation of a base to which the individual can anchor himself if he wants to have an idea of his location in physical space; the "terms" necessary for communication, for the transmission of information and the comparison of routes now exist. A map indicates how to get from one place to another, by the shortest, least dangerous or most convenient route. Nowadays, we all know our location in space, and the best way of getting from one place to another. The signs that clutter up roadsides with information relating to directions and distances may well reveal our obsessive need to know exactly where we are (to enjoy the security and safety of being in a place familiar to us), but they also serve as a surrogate for the map, guaranteeing us intellectual control over a space that is too large to be dominated and organised by the naked eye alone.

And if we move from the intellectual control of space to the implementation of some material transformation, then the map reveals itself to be an even more serviceable instrument. There is no project of territorial modification which does not envisage the use of a map, which can be presented without one. The planning and construction of a dam or road, the implementation of a land reclamation project – all require the use of a

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[23] Greimas sees figuration as discursive configuration in which referentiality relies on "spatialisation" (one of the three procedures – "agentification", "temporalisation", "spatialisation" – which, he argues, play a constituent role in the establishment of discourse). On the importance on this consideration in the field of geography, see: A. Turco, "Dire la terra…", pp. 19-20.

map; and it is a map which serves to confirm the completion of the project. This is true whether the territory we are talking about is local or far-flung. In the former case, the cartographical document outlines a modification to be carried out in territory that is subject to empirical verification; in the latter, the project is a drawing-board product that is transferred onto the map – which thus becomes not only the representation of an otherwise unknown territory but also the test ground on which the feasibility of the project is evaluated.

Political and administrative maps reveal the role cartography can play in the structuring of territory. One should not forget that fiscal needs were at the origin of the emergence of modern Euclidean cartography in France, where the full organisation of centralised power required that control be extended to the remotest and most inaccessible corners of territory. The map created the conditions for the blanket exaction of fiscal dues, which were decided using the incontrovertible criterion of measurement as a parameter guaranteeing equitable evaluations.

The map is ... a symbol

The possession of a map, its very physical existence, necessarily implies that there has been intellectual appropriation of what is represented. Territorial conquest is followed by a cartographical product that testifies to the new acquisition. One need only think of the cartographical works produced during the age of the great voyages of geographical discovery – for example, the maps of Battista Agnese and the atlases of Giorgio Sideri. Maps confirm an extension of physical space which runs parallel to the increase in geographical knowledge: for example, in the maps of the fourteenth century, the Mediterranean occupied a central position, whilst the cartography of latter centuries depicted it as simply a part of a vaster system of oceans[24]. Similarly, representation served to establish a hierarchy of roles for the different European States by, in effect, creating and ordering the new geography of the world. And if we shift our focus slightly to look at the symbolic function of maps in domestic politics, we can see their role even more clearly. For example, when, in a phase of political and economic expansion, the Republic of Venice set about organising the *terra firma* as a subject territory, it had maps drawn up of all its domains therein. These works would then be kept in the chancellery of the Serenissima – the so-called *Sala delle Mappe* – and formed a topographical representation of all Venetian-controlled lands (drawn to such a scale that each could be used for the planning of detailed projects of territorial transformation). The importance attached to maps is clear from the fact that this *Sala della Mappe* was a secret council chamber open only to a few people.

The map is ... a metaphor

The outlining of borders makes a map not only the depiction of a

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[24] E. Casti Moreschi, L. Gaffuri, "Le *carte da navigar* e la territorializzazione mercantile in Africa: rappresentazioni, viaggi della memoria, itinerari di geografia", in: *Terra d'Africa 1992*, Unicopli, Milan, 1992, pp. 283-301.

territory but also a metaphor for it, in the sense that cartographical representation assumes the ability to establish modes of recognition and identification that will only subsequently be applicable "on the ground". In effect, the first phase in the definition of borders comes in their delineation on a map. The concrete demarcation of the territory itself only comes later, and the map remains tangible proof of a national or political right that implies obligations of sovereignty and control. A map can also be a metaphor for a political project. One example of this is the *Gallerie delle Carte Geografiche* in the Vatican: the maps there give a representation of Italy as a whole, organised according to latitude in vertical extension within a gallery – a clear reference to the unity of Italy so strongly desired by the Pontiff himself, who is placed at the summit of this construction. The representation of the individual regions suggests the existence of a natural order, within which, however, each unit would be able to maintain its own individual qualities and identity[25].

The map is ... mediation

As a heavily symbolic creation, the map can be a means whereby the recipient can gain knowledge of distant lands of which he has no direct experience. Hence, in certain circumstances, the map can serve as a mediation, a "link" between agent and territory. Let us take as an example the territorial policies implemented during the period of colonialism. The map was the means whereby a number of "outside" rationalities could make themselves felt in newly-conquered territories via the implementation of projects, actions, etc. This is the simplest form of the map's function as mediation. A much more complex form comes about when the map exercises its ability to focus projects, to establish a *status quo* or intervene directly therein – thus going far beyond the initial intentions of the cartographer.

The map is ...

What I have brought out so far is the general use of maps as a "practical" representation of physical space. It would, indeed, be fairly easy to show that the history of humanity is full of cartographical representations, expressions of a mental architecture that gradually matured as humanity's understanding, its ability to grasp and order analogies, developed. However, such aspects might well be classed as the marginal phenomena of a more all-embracing symbolism, whose crucial function was the conference of meaning on things – a vital step in establishing the patterns of behaviour that would guarantee a human group's ability to survive and reproduce.

Summarising what I have said so far one might say that the map is the expression of two fundamental needs implicit in the intellectual appropriation of the world: description and conceptualisation. That is to say, a map *describe*s the world, attempting to render those aspects that can be seized by direct observation of reality; or else, it *recounts* the world, applying the basic

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[25] This theory has recently been reiterated in a monumental works on the Vatican collections: L. Gambi, A. Pinelli (eds.), *La Galleria delle Carte geografiche*, F. C. Panini, Modena, 1994. See, especially, the essay by P. Sereno, "La fortuna del ciclo delle carte geografiche", pp. 155-167.

categories of representation/interpretation to indicate how the world functions. Hence, we might distinguish between those maps which focus on description and those which present a more iconic view of the world (one only partially bound by the rules intended to guarantee an analogy with empirical reality). The former would include topographical maps, nautical charts and other maps dedicated to a specific theme, whilst the latter would include planispheres, celebratory city maps, and maps and charts outlining some territorial project or modification.

However, it is important to see this in relation to the map's role in the "semanticisation" of the world – that is, its role as a element in the "discourse of territory". In fact, the communicative procedures used within the map to *show* the enunciation that renders the world semantic all involve figurative depiction: the designator produced by the "semanticisation" of territory is taken over and transformed into a figurative depiction. As we have already seen with regard to the referential domain of maps, figurative depiction necessarily involves spatialisation, and the final stage of such depiction is an iconic image (one which takes the already-formed images and endows them with a special meaning, which is not only referential but also transmits a particular conceptualisation of the world). By shifting the level of communication from simple description to a deeper level – at which the message conveyed also carries a social meaning – the map reveals its abilities as narrative (be its purpose either to describe or conceptualise). What is more, by considering the map as a narrative system one brings out another important semiotic possibility inherent in its nature: the innate ability to generate discourse. In fact, the multi-level communication adopted by maps means that they cannot only bestows meanings on things but also create meaning *ex novo.*

Our understanding of maps as an instrument capable of creating new discourse is not much helped by the semiotic studies of visual representation carried out in other fields. For example, the attempts by art historians to distinguish between narrative and descriptive painting produces only apparent – and, all in all, misleading – parallels when applied to cartography[26]. It is worth reiterating here that what distinguishes cartography from all other textual and visual means of communication is the fact that the map is a denominative projection; it is a highly sophisticated expression of the process

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[26] This is the case, for example, with S. Alpers' study of Flemish painting, which puts forward the argument that, in contrast to the Italian painting of the same period, seventeenth-century Flemish paintings were descriptive rather than narrative. This thesis rests on the claim that, since Flemish artists depicted the world with the same precision and meticulousness that is to be found in geographical maps, their description of the world falls within the same parameters of evaluation. However, without going into the pertinence of this argument to the study of art, one must underline here that the analysis of cartography is rather vague: there seems to be no appreciation of even the most basic technical capacities required, nor any recognition of maps as semiotic constructs (S. Alpers, *The Art of Describing: Dutch art in the seventeenth century*, University of Chicago Press, Chicago, 1983. Reference is to the Italian edition: *Arte del descrivere. Scienza e pittura nel Seicento olandese*, Boringhieri, Turin, 1984, pp. 250 *et seq.*).

of territorialisation, and therefore is ill-understood when considered without reference to that process.

One should not forget that all the above-mentioned functions would be null and void without that first basic step in the cognitive appropriation of the world: the attribution of a name. In other words, the roles taken on by a map are unthinkable without denomination. If humanity had not discriminated between different components of the real, establishing names for defined *nuclei* of knowledge, it would have been impossible for humankind to effect an intellectual grasp of the world[27].

The historical examples that I have given of the importance of maps are also significant indications of the importance of denomination. Each and every process of territorialisation rests on the "semanticisation" of a natural space, or on the "re-semanticisation" of a space that had previously been codified in a different way. Let's take Italy as an example. With the political unification of the peninsula, the new State set about legitimising and consolidating its position by undertaking the measurement, mapping and semanticisation of its territory. Whilst the first two procedures obviously involved the completion of fragmentary or non-existent data, the third might seem a rather redundant affair. In fact, the territory of Italy had already been subjected to denomination, and so it should simply have been a case of adapting the existing semantic system to the new "logic" of territorial distribution. However, the denomination itself was revised, and great importance was attributed to those zones in which the process of signification could proceed "from scratch". And this is, of course, understandable when one remembers that denomination is never a banal operation; it implies a cognitive act aimed at legitimating the territorial possessions of the agent performing that act. Hence geographers, amongst others, were part of a long-term project of intellectual investment in studies of place-names and toponymy, the ultimate aim of which was to "re-appropriate" the connotative meaning of designators. Particular attention was focused on the alpine area because it was a region of incomplete denomination, where the application of new names would furnish an opportunity for the affirmation of national sovereignty[28].

A further example can be drawn from the attitude to denomination taken by the colonialist States. The conquest of "virgin" (and therefore nameless) territory was a task that stimulated the intellectual energies and resources of various European nations, who set about establishing rules and norms which would make the enterprise as efficient as possible. A fundamental role here was played by the various Geographical Societies, which organised symposia and conferences to work out the best criteria to be applied in the process of denomination. Their meetings and discussions revealed the clear perception

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[27] On the role of names in maps, see the stimulating points raised by J. L. Rivière in his "La carte, le corps, la mèmoire", in: *Cartes et figures de la Terre*, Centre Pompidou, Paris, 1980, pp. 83-93; *Id.* "Il profeta dell'arca di carta", in: G. Macchi (ed.), *Il disegno del mondo*, Electa, Milan, 1980, p. 254.

[28] On cartography during this period, see: Att. Mori, *La cartografia ufficiale in Italia e l'Istituto Geografico Militare*, Stab. Poligr. per l'Amm. della Guerra, Rome, 1922.

of the importance of names; the denominative procedure adopted might be one of translation or trans-codification, but the various points of view put forward in the lively debate on the issue reflect a number of different ideological positions. In effect, as one traces the history of the debate one can see a change in the approach to the problem: initially, the question of names was viewed from the point of view of spoken language (with transcription being required to respect certain phonetic rules), subsequently the interest was focused on the establishment of an internationally-accepted written form of names (with the *a priori* acceptance that such a form was most clearly manifest in geographical maps). Hence, while still being a linguistic component, the name took on the character of a territorial indicator of strictly geographical importance (a recognition of the essential importance of denomination within geographical maps)[29]. However, when one considers the symbiosis between denomination and cartography, this change is revealed to be inevitable. A theoretical analysis of the role of maps in the process of denomination shows that they reinforce the meaning of a name by the use of a symbol – a clear, compact, effective sign that is, as a matter of convention, taken to indicate an important but hidden reality. In effect, the map has "the enormous advantage of, more of less extensively, rendering explicit that which, as we all know, words can only 'stand for' as abbreviations. The map, therefore, should be seen as an extension of the condensed properties of the designator: outlines of coastlines or mountain ranges, delimitations of extension, dots, lines and images are, from a logical point of view, no different to denomination. However, they provide supplementary information that makes the name more intelligible; or, when there is no name at all, they take over its ability to 'stand for' something"[30]. If this is the case, one might say that, through the process of territorialisation, European man intellectually appropriated the world by assigning names to things – and that he constructed geographical maps in order to be able to do so. All the graphic signs used in a map indicate some specific quality of the object represented and serve to give a more focused character to that which the name merely identifies as a whole. So, in constructing a geographical map one not only uses names, arranging them so that they reflect the actual distribution of real objects, one also accompanies those names with other signs that indicate shape, quality or quantity. However, this use of other linguistic (non-lexical) codes to indicate the same object, should not only be taken as a way of endowing a name with greater specificity; it is actually a necessary condition for the name to be able to function within cartographical communication. And thus we come to the semiotic analysis of the map itself.

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[29] E. Casti Moreschi, "Nomi e segni per l'Africa italiana: la carta geografica nel progetto coloniale", in: *Terra d'Africa 1992*, Unicopli, Milan, 1992, pp. 13-60.

[30] A. Turco, *Geografie della complessità in Africa. Interpretando il Senegal*, Unicopli, Milan, 1986, pp. 211 *et seq.*

Chapter Two

Cartography as metalanguage

The Geography of Classical Antiquity treated the Columns of Hercules with reticent modesty.
Once they had been violated, there was the Ultima Thule – and then the two Poles.
Finally there was nothing left.
Man set out in search of a limit
that had become indeterminable.
All that remained were "voyages autour de sa chambre"
from which, however, one rarely returns.
(E. Flaiano)

Certain theoretical tools will be useful in trying to understand the workings of the processes of symbolisation of which cartography is just one example. One should maintain a constant focus on the analytic aspects of denomination – taking designators as linguistics signs, and thus treating territory itself as a semiotic field[1].

When the language of geography takes on form within a social body it initiates and sustains a system for the generation of signs, within which one can identify a number of smaller semiotic domains relating to single designators or groups of designators. A focus on this generation of signs – that is, the process whereby something takes on the function of a sign which can be interpreted by a recipient – will enable us to highlight the communicative role of denomination and thus understand how things acquire meaning within the process of communication (and – in the area that more precisely concerns us here – make out the results of the role played in communication by the means of transmission themselves).

An analysis of the *sign-as-vehicle* – that is, of designators which incorporate information and transmit it – reveals that such a vehicle implies three different types of relation: i) that involving the formation of the sign; ii) that existing between one particular "vehicle" and others; iii) that relating to the interpretation performed by the recipient of the information conveyed by the sign. These different relations will – in turn – involve us in a discussion of the semantic, syntactic and pragmatic aspects of the generation of signs. Seen from this point of view, territory emerges as a semiotic field in which the generation of signification implicit in the act of denomination primarily concerns the association of a particular *signifié* and *signifiant*: "an area of ground becomes a "place" – that is, an artefact – when there is a *signifiant* that incorporates a *signifié*. The first aim of denomination, therefore, is the semanticisation of the world. One might say that this act is one of the most decisive ways in which mankind emulates God, given that it involves a real act of creation – the creation of places"[2].

The procedures of semanticisation depend upon the category of designators employed therein, and imply *denotative* and *connotative*

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[1] I follow the analytical scheme laid out in: A. Turco, "L'ordine infinito: simboli territoriali e dispositivi sociali presso i Senoufo della Costa d'Avorio", in: *Terra d'Africa 1993*, Unicopli, Milan, 1993, pp. 15-72.

[2] A. Turco, "Semiotica del territorio: congetture, esplorazioni, progetti", in: *Rivista Geografica Italiana*, 101, 1994, pp. 365-383, see pp. 371-372.

codification. The former is more immediate and tends to be more stable because it is linked to direct physical evidence (that is, to explanations suggested by sense data). Nevertheless, even this is a convention, which is justified by its place within the culture that produces territorial knowledge and embodies it in the designator. The second process of codification is denser in meaning. Grafted onto the initial denotation and evolving over time, it involves mechanisms that somehow parallel rhetorical figures: starting from the base-meaning established by the primary code, other meanings may be developed through shifts or derivations of meanings arising from processes of metaphor and metonymy respectively. At a geographical level, these processes give rise to a *topomorphosis* – that is, a symbolic process which results in abstract (social, ideological, metaphysical) values being transferred to – or, better, transformed into – a place. In effect, semantic relations are organised in a process that results in a group of social values taking on the appearance of a "place", which then plays a role in regulating the behaviour of the society that inhabits it[3].

Syntactic analysis is based on the identification of the relations between designators – whether they be referential, symbolic or performative. The aim is not to establish presumed objectivity (how accurately the designators reflect the various aspects of the earth's surface) but rather to bring out the links that are created between *signifiés*, which indicate natural or man-made features and thence become part of a whole system of symbols. It is easy to see that each of these symbols exists at the centre of a network of relations with others; so the "syntax" of territory is essentially that coherence which exists between the symbols composing the world into a compound entity of names. The different natures of the codes that govern semanticisation help us to appreciate the way such coherence functions[4].

Finally, the dynamics of sign-as-vehicle also involve a consideration of pragmatic relations – those between sign and interpreter. The importance of this sign/interpreter relations rests on the fact that it is through the sign that the agent acquires indications and information as to how he can satisfy his needs or carry out his plans and projects. One should point out that the degree of awareness in the interpretation varies according to the role the agent plays in the society of which he is a part. If that agent has an "authoritative" social role – that is, if his authority/competence means he can affect projects that are of importance to the collectivity as a whole – then the conscious cognitive act of interpretation can be said to constitute an authoritative act of communication.

Here one should recall that the fundamental procedures of territorial action comprise: i) action *qua* production of territory; ii) action *qua* use of territory; iii) action *qua* initiation, development or interruption of the social relations that are mediated by territory. Hence, the interpreter can be seen as *homo geographicus*, endowed with a specific communicative competence, when he can decide his

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[3] *Id.*, "L'ordine infinito…", p. 32.
[4] *Id.*, "Semiotica del territorio…", p. 373.

own action on the basis of indications arising from the territory in which he acts; these indications can then be ordered semantically (thus ensuring that *topomorphosis* is comprehensible and stable) and syntactically (thus endowing the symbols he himself has created with communicative coherence).

2.1 *The Map as a Semiotic Field*

Now let's look at a map in the same ways as we have looked at territory – that is, as a semiotic field. This interpretation is borne out by various considerations. First of all, there is the fact that a map functions as symbolic mediation and can have an effect on territorial praxis. This means that it does not merely register what has already happened, but can function as a key instrument in the process of territorialisation itself. Secondly, there is the related fact that the symbiosis between denomination and cartography reveals that a map is a means of communication that can play an active role in the appropriation of territory, establishing the focuses of meaning around which communication is centred.

Finally, one should also consider the fact that a map is a complex system of symbols, within which signs can generate new meanings – hence it can play a part in the furtherance of semanticisation.

At this point I should underline the special nature of the map as a semiotic field. In effect, a map is a communicative system that contains and transmits what has already been in some way instituted "on the ground". This means that a map should be considered as registering the "semiotic generation" of territory which occurs thanks to denomination: a map is a product of denomination, subject to the same semiotic dynamics as those at work in other linguistic codes. However, the map is also a semiotic field itself, within which the use of codes of different types initiates a further generation of signs. The bases of a map are geographical designators, but the communicative mechanisms within a map function by using these designators along with other signs.

Hence it would be better here to speak of cartography-as-metalanguage, in that a map is a "second-level" semiotic operation (the first "level" being the recognition of territory as such). What is more, this "second level" does not simply rest upon the primary signs initially established but develops some of the implications latent within them[5]: the first level in this process concerns the procedures of territorial codification, whilst the second-level presupposes that the results of that first codification have already been achieved (codes from the first codification will be selected – together with other aspects – and the implications inherent within them will be developed). This means that in taking up what was established in the

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[5] It is, therefore, clear that henceforward cartographical language is to be understood as a metalanguage – that is, as "a semiotics of a semiotics" (R. Barthes, *Eléments de sémiologie*, Ed. du Seuil, Paris. Reference is to the Italian edition: *Elementi di semiologia*, Einaudi, Turin, 1966 (1992), pp. 80 *et seq.*).

semanticisation of territory, the cartographical metalanguage functions thanks to *discursive configurations* – that is, thanks to the mechanisms by which interpersonal communication/identification of territory is possible (and these same mechanisms – for "showing" what is simply "enunciated" in the semanticisation of territory – are those which are at work in the denominative projection performed by the map).

Here one can start to look at the various phases of figuration that are to be found in maps – that is, the procedures that serve to carry out such denominative projection. *Spatialisation* serves to indicate the referential aspects of the designator; *figuration* involves the partial replacement of the meaning of the designator by surrogates therefor; and *iconisation*, as I have already pointed out, refers to the deeper values embodied in the map[6]. An analysis of cartography-as-metalanguage, therefore, aims to reveal the way a society uses designators, and links this use to the discursive or material praxis arising from – and substantiating – representation.

In order to fully grasp such a dynamic complex, I will take the map to be a semiotic field within which designators, along with other signs, offer themselves in the form of *signs-as-vehicle* to the interpreter. Thanks to the above-mentioned relations (*semantic, syntactic* and *pragmatic*), these designators define a complex whole which is the product/expression of *cartography-as-metalanguage*. The end result – the map – is, at this point, both an object of interpretation and a model and stencil for territorial behaviour.

The first domain – that of semantics – seems to centre on a relation between designator and graphics, thus highlighting the special linguistic structure of the map. As a system of signs, a map is in fact the result of the super-imposition of two structures: an organisational structure on a flat surface (which embodies some geometric code – that may or may not be Euclidean), and the symbolic structure as such. This latter is contained within the flat surface, and within itself contains a number of codes – for example, numerical, figurative, lexical and chromatic[7] (Figure 1).

So the map can be defined as a polystructural text, which acts upon the information contained to reinforce both cognitive and communicative meaning. At a cognitive level, it is clear that the use of several codes to render information that was originally expressed in a single code enhances the information conveyed. What is more, the information produced is not static; it varies according to the use of codes – that is, according to the capacity for manipulation shown by the very instruments of communication.

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[6] I am here applying to cartographical analysis an argument that is developed by A. Turco, "Dire la terra: la costituzione referenziale del territorio in Costa d'Avorio", in: *Terra d'Africa 1994*, Unicopli, Milan, 1994, pp. 15-58.

[7] The term "code" is here being used in its simplest sense to refer to a constructed artifical language; together with the signs mentioned here, one might also classify the alphabet (and its spelling rules) as "codes". In the discussions in later chapters, which will follow a more complex semiotic approach, I will abandon the term. On the communicative structure of maps, see my "Nomi e segni per l'Africa italiana: la carta geografica nel progetto coloniale", in: *Terra d'Africa 1992*, Unicopli, Milan, 1992, pp. 13-60.
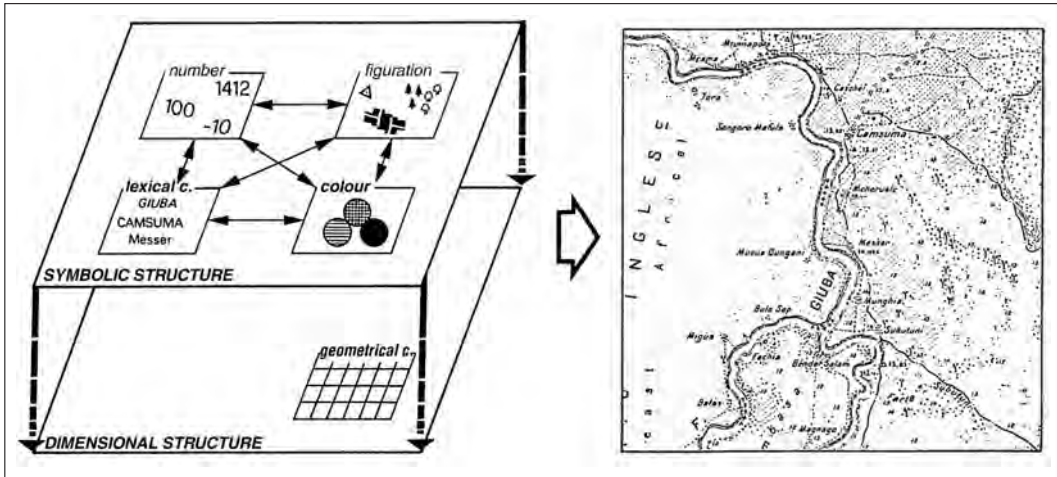
Figure 1 - *The map as a system of signs.*

And at the communicative level, the map produces a qualitative change; the use of a polystructural language may exploit the connotations a particular designator has accumulated within a particular society[8].

But our semiotic approach to maps – which focuses on their communicative aspects in preference to their linguistic aspects – means that we see them as instruments of a special kind, whose technical features reveal their function to be the construction of a unified area – a semiotic field – designed to create the conditions for the communicative function of denomination. The names and codes used in a map – the latter henceforward referred to as *denominative surrogates* (for example, colours, numbers, figuration, or even the relative positioning on the page) – serve to organise the world of experience into ordered knowledge. My argument is that the ordering of signs is the basic principle in the syntactical-semantic organisation of territory which is at the basis of cartographical communication. What is more, we also know that any ordered system is based on the search for regularity within a group of non-defined phenomena. If this regularity is then recognised as legitimate, it can serve as the starting-point for a logical-semantic interpretation of the phenomena as a whole. However, for a regularity in the discursive chain to be identified, the recurrent phenomenon must appear, in some way, as discontinuous with respect to other phenomena; this means there must be a classificatory sub-

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[8] On the consequences for communication of a shift from a single-structure language system to a polystructural language, see: E. Cassirer, *Philosophie der symbolischen Formen*, Cassirer, Berlin, 1931. Reference is to the Italian edition: *Filosofia delle forme simboliche*, La Nuova Italia, Florence, 1961, pp. 9 *et seq.*

division that can identify geographical phenomena and arrange them in the same sequence as that in which they are perceived in reality. Such a classificatory procedure is obviously of key importance, because it serves to create the conditions which make the world intelligible[9].

In fact, once organised into groups and sub-groups, such distinctions offer a representation of reality (or a part thereof), and thence the complexity and disorder of reality itself diminishes. I have already indicated how the reduction of complexity consists in finding models that can limit complications, redundancy and waste, and whose elegance or simplicity of representation guarantees increased levels of knowledge and pragmatic utility. Here, we can turn to maps, recognising them as models in which this process is at work. And by "model" I mean an artificial object – the map – which is intended to imitate certain aspects of a "natural" object (in our case, territory)[10]. The model "is an artefact, a contraption, a sort of real or imaginary machine that simulates a fragment of reality. It is not only science that thinks in terms of models, but also engineering and politics – not to mention, magic and religion"[11].

Hence, the construction of a map is similar to the construction of a model. In both cases, one can see an initial rupture of continuity, and thence the adoption of a discontinuity – the result of selection and the delimitation of a continuum by the establishment of arbitrary limits (arbitrary but coherent with all that the system performing this operation considers as knowledge). The result is a sort of presumed isomorphism between map and territory. However, territory belongs to a logical order that is superior to the logical order of the map because it reveals itself in a continuum of information that is capable of generating that dis-continuum of cartographical information. In effect, the selection that is inevitable in the creation of the map turns reality into a model which, if it is to be communicated, must be anchored to a general system of reference[12]. But that is not all: no map can give an exhaustive representation of territory – a goal that would not even be achieved by a series of maps of particular features that might be superimposed on one another (rather like a number of slides that depict certain parts of a single object). The relation between map-as-model and territory is such that the former serves to decide which information should be focused on, which relegated to the background, and which ignored altogether[13]. This operation of "modelling" involves a

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[9] A. J. Greimas and J. Courtés, *Sémiotique, dictionnaire raisonné de la théorie de langage*, Hachette, Paris, 1993, pp. 101-102 and pp. 263-264.

[10] One can, of course, use the term to refer to a painter's model, to a dressmaker's model or to a model to be followed by students in their written work, etc.. In effect, here the term *model* is applied not to what is copied but to the result of the exercise of copying – that is, to what is produced as a representation of something.

[11] G. Giorello, "Teorie e modelli nella scienza", in: *Il sapere come rete di modelli*, Panini, Modena, 1981, p. 14 and pp. 13-24.

[12] Here we are discussing in geographical terms what is a general problem in the theory of communication – on which, see: F. Filesi, *Analogico e digitale. La cultura e la comunicazione*, Gangeni, Rome, 1984.

[13] *Ibidem*, pp. 57-70.

double system of communication, which might be described as employing both analogical and digital procedures.

2.2 *Analogical and Digital Systems*

The methods of production employed in the creation of various models necessarily create differences between them. I have argued that the creation of a model involves the organisation of a certain amount of knowledge through the classification of objects (which are abstracted from their real context). These procedures follow the rules for the codification of signs that are inherent in the communicative systems adopted – systems which can be divided into the analogical and the digital. These two are present in all processes of communication: the analogical system can be found in any process that works by *analogies* (that is, employs some sort of *continuity* – or parallel – between real quantities and how they are rendered), whilst the digital system is to be found in those processes that employ *discontinuity* (that is, in which the relation between elements and what they represent is purely arbitrary and conventional). As one can see, the distinction between analogical and the digital is reflected in that between the continuous and the discrete. Indeed, it has been argued "an analogical system functions on the basis of a continuum of information made up of real physical variables; and the very processes by which information is rendered respects that continuum. In digital calculation, on the other hand, information is represented in a discrete manner and the elaboration thereof takes place in successive moves" using formal symbols for real finite features and elements[14].

It is important to establish which of these communicative systems are employed in maps because these documents offer a "deformed" account of the properties of the objects they represent: the identity of what is depicted is established – more or less – thanks to the parameters of difference and distinction. In his discussion of analogical and digital systems, G. Bateson argues "a map is not territory and thus we see a map as a sort of end result that summarises differences, which organises the information regarding the differences that exist in the 'territory'"[15]. *Difference* therefore creates information and is to be found within a continuum, within a series of continuous processes and real qualities. However, differences become veritable *distinctions* only when they are made "pertinent" – that is, circumscribed and located within the system that organises them. For example, in a map the continuum of colour is made pertinent by the names given to the coloured areas – names which thus serve to identify an area as specific[16]. In short, analogical communication

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[14] *Ibidem*, p. 6.

[15] G. Bateson, *Mind and Nature: a Necessary Unity*, E.P. Dutton, New York, 1979. Reference is to the Italian edition: *Mente e natura*, Adelphi, Milan, 1984, p. 149.

[16] "In effect, the very basis of communication is difference. One perceives an infinity of differences, some of which – as the result of nerve and retinal processes, together with training, habits and conscious or unconscious decisions – are selected as distinction." (A. Wilden, "Communication", in: *Enciclopedia*, Einaudi, Turin, 1979, p. 652).

functions thanks to the adoption of a series within a continuity of differences: differences of size, frequency, distribution and organisation[17].

The digital, however, is the field of distinctions: it can be codified as consisting of oppositions, identities, contradictions and paradoxes. Digital distinctions require – or produce – elements that are separated from each other by intervals. Hence, unlike analogical systems, digital systems are based on classifications, on logical characterisation of types, on communication that is in some way its own subject-matter. What is more, the digital system envisages the interposition of a code which establishes the "style" of the representation[18]. For example, if we take a photograph as the result of light falling on a light-sensitive film – totally ignoring all the consequences of the interpretation made by the photographer in taking the picture – then photography becomes an analogical system: the message conveyed is "continuous" because there is no need for an interpretative key to establish the link between object and its representation. But, when we look at a map, we see that it is the result of a process of selection carried out according to specific rules which constitute the "style" of the representation, and if we are to interpret the end results we need an interpretative key.

So, whilst recognising that the communicative structure of a map responds to the parameters of the analogical system, it is clear that within that map a digital system is at work. In other words, cartographical communication rests on a double system: a map is both digital and analogical (Figure 2).

More precisely, one might say that a map is *a reconstruction of the real that is based on differences – a reconstruction that uses an analogical language which is, in its turn, subject to codification*. This definition is all the more pertinent when one bears in mind the point made by A. Turco that the analogical and the digital are not mutually exclusive by definition (even if they may sometimes be so in fact)[19]. For example, in a map the analogical system serves as the "context" for the digital. Though that map fits the definition of a analogical system, one cannot ignore the operation within it of a digital system. Hence, one could claim that the differential and distinctive procedures – which might be respectively defined as resting on the identification of comparative and unique features – are used to achieve the same goal: a picture of the world that is as realistic as possible.

In cartographical communication one can also see the analogical system

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[17] A. Wilden, "La scrittura e il rumore nella morfogenesi del sistema aperto", in: E. Morin *et al.*, *Teorie dell'evento*, Bompiani, Milan, 1974, pp. 77-111.

[18] This leads to a message of denotation becoming one of connotation. So, the digital system can be seen as the means whereby a society communicates and reveals its values (R. Barthes, *L'obvie er l'obtus*, Ed. du Seuil, Paris, 1982. Reference is to the Italian edition: *L'ovvio e l'ottuso*, Einaudi, Turin, 1985, pp. 6-11). Given that a map *displays* the codification at work within it, then the relation between object and cartographical sign can be defined as one of *transformation* rather than *registration* (*Ibidem*, p. 33).

[19] A. Turco, "Analogique et digital en géographie", in: G. Zanetto (ed.), *Les langages des représentations géographiques*, Università degli Studi, Dipartimento di Scienze Economiche, Venice, 1987, pp. 123-133, see pp. 128-130.
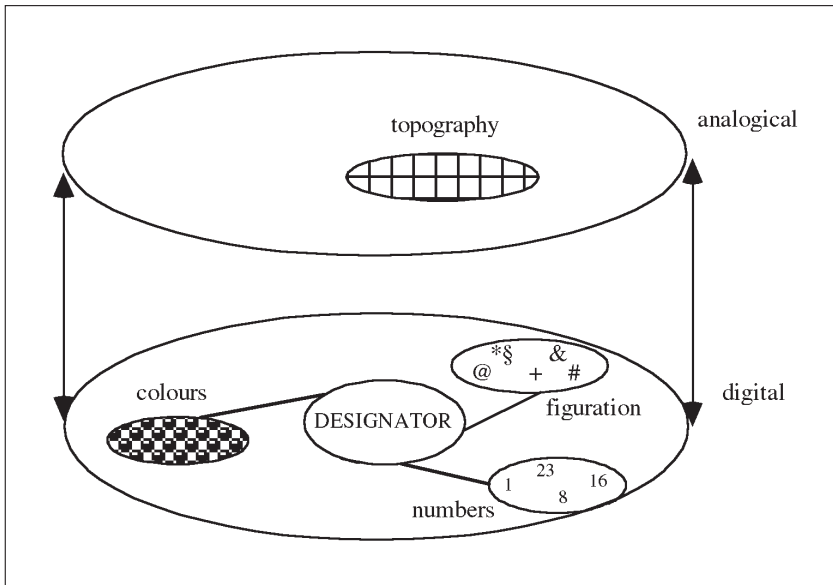
Figure 2 - *The communicative systems within a map.*

at work in *topography* (that is, that body of rules which establish how the information is to be located on the sheet). The distribution of objects, the relation between them and the size of the sheet as a whole, may well draw on the rules of proportion and perspective but does not constitute a veritable transformation (in the mathematical sense of the term); there is no need for an access key if we are to understand them. The map aims to present objects as they are in reality – understanding that reality as a *continuum* that answers to physical laws which can be understood by resort to *differentiations* (an object is differentiated from another because it is located in a specific point, because it has different characteristics to other objects, etc.). In its turn, the presence of the digital system can be seen from the fact that to transmit the information regarding a geographical object, the map uses various surrogates (colour, number, figuration) that aim to isolate/highlight certain aspects that are already contained within the meaning of the designator: in other words, the digital system serves to create *distinctions*, to underline those features that are characteristic identifying features of the object.

Let's look at some examples relating to the map's referential function, which is the most banal of all those it performs (though here we will consider the designator as an empty token totally void of implicit meaning)[20].

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[20] This point must be underlined because we know that once a point of the earth's surface has been named it acquires a consistency and individuality that distinguish it from all others.

The designators within a map are arranged in a continuum that reflects the unity of the territory itself. Hence, one might decide to distinguish designators by identifying the precise point at which they are located (given that a map is a system of orthogonal reference within which designators are distributed). This operation of precise location might be carried out using a grid of geographical co-ordinates – that is, a body of readings that relate to every single point on the earth's surface[21]. But when one wants to indicate some specific features of the object referred to by these designators, one must resort to denominative surrogates in order to distinguish them: thus a city will be depicted by a symbol that is different from that for a hill or a river. In the first case one uses difference within a continuum, in the second one makes reference to what distinguishes one name from another. This means that, following current cartographical conventions, Paris becomes a French place when its designator is located a 48° 50' N and 2° 20' E – that is, when the designator is located within a grid of reference which is the product of a differential process that uses geodetic readings to identify the territory that constitutes "France". This is the procedure which serves to differentiate one point on the map from the space around it. However, to distinguish Paris from other geographical phenomena one must have resort to a surrogate that can identify it as a city – and, what is more, distinguish it as the French capital from other French cities.

So, the analogical and the digital are two components of the same semiotic process, within which one might recognise the predominant role of one or the other. In the studies of actual maps which occupy the following chapters we will see how the two systems of analogical and digital tend to be confined to particular segments of the semiotic process as a whole. The analogical is more easily found in the processes of semanticisation, in the production of meaning, whilst the digital makes itself felt more forcefully in the syntax governing the process of communication. So, if the analogical is semantically rich and syntactically poor, the digital is syntactically rich and semantically poor. Hence, the rationale of the analogical is the rationale of semantics (of meaning, metaphor and intuition), whilst the rationale of the digital is the rationale of syntax (of metonymy and logic).

At this point we should look at the semantic process in action, and – more precisely – at the mechanisms of denominative projection. The following discussion takes various aspects of the question and looks at them in order.

This is one of the key questions concerning the role of denomination in the meta-generation of signs within cartography.

[21] In effect, the representation of the globe of the earth only starts when the coordinates that were previously used to represent the heavens are applied to the earth itself.

Chapter Three

THE SEMANTIC DOMAIN

The world is full of signs,
but not all of them have the simplicity of the alphabet
(R. Barthes)

3.1 *The Elementary Structure of Maps*

If one is to talk about cartographic structure then perhaps one should first define precisely what one means by the term "structure". Here, one should bear in mind that our main interests are concerned with questions of semiotics, and hence *structure is defined as a relational context* – in which relations constitute the very properties of the object and make it recognisable. There are two aspects to these so-called "elementary" relations: on the one hand, they are the basis for differences between values; on the other, it is the relations between these values which make them recognisable as such[1]. The elementary structure may be considered as the model for the organisation of signs and also as a model for the production of meaning. Here, therefore, I will take the elementary structure to embrace that body of presuppositions, rules and graphic codes that form the framework within which one organises and produces denominative projection[2]. So, at this stage, though I recognise that the elementary structure of a map may serve to suggest a coherent sensorial perception of territory, what I will focus on are the technical means whereby the relations within such a structure are created. Thus a map will be taken as a representational device within which the elementary structure organises and produces the "terrain" where the denominative projection can develop. Subsequently, when looking at the pragmatic aspects of maps and their use, I will look at the function of structure as an organic entity that can be checked against contexts of partial meaning and thus play a role in the implementation of one or more programmes or projects.

So, let's look at the communicative system at work in the elementary structure of a map. It is a analogical system that aims to show objects as

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[1] Considered by itself, structure is not a property peculiar to semiotics or to the human sciences as a whole. As an epistemological/methodological tool, the notion of structure corresponds to a "scientific approach" that in some way defines the area in which the researcher operates. As is known, in considering territorialisation, geographers see structure as an operative field, an objective physical place (the complexity of which has been to some measure reduced). A structure is at the disposal of the agents that within it – and by means of it – achieve certain determined objectives.

[2] Elementary structure can be compared to what Anceschi has called the "tropological space" within every visual representation – that is, the general layout within which all the other signs are arranged. According to Anceschi, such a tropological space functions in cartography as a locational device within which the communicational content of the designator is contained. See: G. Anceschi, *L'oggetto della raffigurazione*, Etaslibri, Milan, 1992, pp. 107-112.

they appear in reality. In ordering the world of experience, analogical organisation and arrangement aim to represent the actual arrangement, interconnection and size of geographical objects. One should also add that, given the map is both a referential instrument and a means of mediation which reflects the relations men have established with the world, it obviously takes into consideration such visual properties as form and mass of objects (and the relations between them), as well as considering spatial distribution and the distance between objects (and how these relate to human interests). All of this is part of what has been defined as *cognitive spatialisation* – that is, the procedure whereby objects are endowed with spatial properties in relation to an agent who, in his turn, is "spatialised" in relation to those objects themselves[3]. The position of the agent in relation to the map is dictated by his role as an observer whose gaze must embrace a vast region of territory. He aims to observe the world from above, from a point of view that puts him in a position where he is "abstracted out" and, at the selfsame time, re-included as an observer. We know that one of the main prerogatives of a map is to offer an overall view of a whole that is usually not available to the naked eye alone.

I am claiming that the position of the agent helps to establish rules of *vectorialisation* – that is, the process whereby space is structured along certain "lines of force" that are a human – rather than natural – artefact. In effect, the fundamental semanticisation connected with cartographical reference involves the human body: the world is to be understood as an extension of man – that is, of his body. Hence, semanticisation draws on vectorialisation. This means that the orientation of the map depends on the position of the observer and, consequently, on the very nature of the human body itself (on how it moves, on the form and characteristics of the human body as seen in relation to this natural terrestrial habitat, etc.). The fact that man is now situated at an ideal point external to the real world does not mean that these natural properties of egocentrical perceptive space are not taken up and contained within a language which, we should not forget, hinges on the referential use of designators. The designator is placed on the map in such a way that, when read, it reveals the position of the interpreter. And even if that position is external to the real world, it echoes the spatial orientation of the human body seen in relation to the heavenly bodies (and to the Sun in particular)[4].

So the vectors taken into consideration are those relating to the path of the Sun and to the position the observer assumes in relation to that path. It is clear that one very potent schema of vectorialisation will rest on the two axes east/west and north/south – which indicate the points where the sun rises and sets, and those associated with its total absence or culmination.

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[3] A. J. Greimas and J. Courtés, *Sémiotique, dictionnaire raisonné de la théorie de langage*, Hachette, Paris, 1993, pp. 358-359.

[4] A. Turco, "Dire la terra: la costituzione referenziale del territorio in Costa d'Avorio", in: *Terra d'Africa 1994*, Unicopli, Milan, 1994, pp. 15-58.

When we say that a map is oriented with north at the top, we mean that the observer turns towards the north when reading it; similarly, a map that has the east at the top is read by an observer who aligns himself opposite the point where the sun rises. I point this out because a map normally envisages one alignment for reading, which corresponds to the orientation established by the person who constructed it – an orientation that must be respected if one is to be able to read the document properly. But there are cases where this is not true. Mediaeval nautical charts, for example, were read by rotating the document; the position of the observer was not static but dynamic, with the cartographer taking the specific needs of the interpreter into account: given a course had to be plotted using the scant information gleaned from the joint use of compass and map, the navigator's task was facilitated by having a document that could be rotated[5]. In this case, there is multiple radial vectorialisation, given that there are many different alignments for the reading of the map.

Even the location of objects on the map depends on rules of vectorialisation – that is, on the products of human action. It should here be emphasised that spatial localisation is one of the procedures of spatialisation and may be defined as the construction of a system of reference that makes it possible to situate objects on the basis of certain parameters (for example, the horizontal and the vertical, together with perspective appearance – that is, whether one object is in front of or behind another). So, in the semanticisation of the world the role of the map is to propose an organisational structure based on topological categories that establish the location of objects. A map is *a device representing the use of the surface of the globe, in which objects are arranged according to a topological plan resting on a system of cardinal points*. It is worth underlining that this fact is at the basis of such characteristics of maps as the use of a scale in the depiction of objects in their relation to each other. The geometrical structure of maps envisages that objects are arranged in such a way that real dimensions and distances are always respected, and that there are vectors of orientation indicating the point of view from which they are seen.

Though present in other forms of representation – think, for example, of painting and Alberti's rules of perspective – the *scale relation* as used in maps has some very special characteristics. In perceptive painting, the vanishing point serves to establish a linear relation based on the distance between object and observer; depth of space is rendered by progressively reducing the linear relation between actual object and object as represented, hence things get smaller and smaller the further they are from the observer. However, in maps a geometric scale is established, with

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[5] Amongst the latest works on nautical cartography and its development, see: G. Ferro, *Carte nautiche dal Medioevo all'Età Moderna*, Ed. Colombo, Genova, 1992. An interesting example relating to the role of denomination in such maps is given in: A. Terrosu Asole, *Il portolano di Grazia Pauli, opera italiana del secolo XIV trascritta a cura di Bacchisio R. Motzo*, C.N.R., Istituto sui Rapporti Italo-Iberici, Cagliari, 1987.

objects being reduced in size uniformly with respect to the real world. Even where perspective is used – as was sometimes the case in the maps of the past – the ideal point of observation chosen was a vertically raised one, and such vertical observation meant there were no perspective shifts within the thing represented. The end result is that the scale relation makes it possible to recover the real distance between geographical features.

This characteristic lies at the basis of the emergence of cartography as a genre independent of pictorial representation. However, things were not always this clear-cut. There are cases – such as sixteenth-century city maps – where the specific characteristics of cartography are less evident. However, though these were, in fact, documents that were not entirely independent of the canons of pictorial representation, it is worth taking a look at the technical developments within them. The centres of political/religious power were highlighted by depictions that were essentially perspective in nature, whilst at a later period, symbolism was used to indicate the centres of power, and thus the urban fabric was depicted in a uniform manner – as seen from an abstract, vertically-elevated point of view.

Here, I should just briefly raise the point that the principle of comparison between map and territory (even if based on a scaled-down representation) has a number of implications with regard to the communicative role of maps. Though a full development of the point would take me too far from the argument I am following here, it is worth recalling an essential part of Euclid's geometry – that the observation of equality or similarity between certain parts of an object means that one can deduce the equality or similarity of all the others. Here, I will, however, concentrate on the relational implications of the analogical system, given that such relations play a crucial role in cartography: the very *raison d'être* of the map is undermined if one considers only the features which help to identify and distinguish single individual objects. The analysis of a symbol in isolation from other symbols serves no real purpose; it does not give us an overall view of territorial information. For example, a hill is defined as such in relation to circumambient territory – that is, in the presence of other symbols or their (significant) absence. As N. Luhmann points out, the very exclusion of data in the communication of information is a process of selection that itself serves to create further information[6].

Mediation and transition between the real world and the world-as-represented is achieved through the observation and interpretation of what has been excluded in the passage from one to the other. This is where cartographical analogy reveals its communicative capacities: it constitutes a framework in which information can be included or excluded. Indeed, such

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[6] "Something can have an effect on behaviour even if – indeed, precisely because – it is absent". N. Luhmann, *Liebe als Passion: zur Codierung von Intimität*, Suhrkamp, Frankfurt am Main, 1982. Reference is to the Italian edition: *Amore come passione*, Laterza, Roma-Bari, 1987, p. 105. How this play of absence/presence makes itself felt in the art of Delacroix – and, particularly, in his representation of the geography of "the Other" – is discussed in: A. Turco, "Delacroix in Marocco: indagine sull'altrove", in: *Terra d'Africa 1995*, Unicopli, Milan, 1995, pp. 315-353.

inclusion/exclusion is the necessary condition for the geographical to function as an efficient communicative system. Think, for example, of a representation in which the distribution of geographical objects did not respect topological rules: the communication of the information contained would only occur if there was a preliminary statement of the criteria adopted in fixing the location of the various geographical objects. Cartographical representation is all the more convincing because it takes an analogical relation to reality as one of its basic tenets. This means that certain pre-suppositions can be accepted a-critically by the user of the document, who is also pre-disposed to accept any other information offered in the same way.

So, whilst *analogical distribution* is the main characteristic of cartography, one should also recognise that the process of selection is carried out according to very precise rules. If the means of communication is to be efficient and effective, then the map must base its selection of features for inclusion on parameters relating to certain specific goals – the first of which is comprehensibility. The density of information depicted has to be kept under control: if the map is to be easily understood then it must contain neither too much nor too little information. In effect, one can link this point to that made earlier with regard to the dialectic of autonomy: on the one hand, selection must create a framework of reduced complexity that makes it possible for action to be carried out (the first such action being communication itself), and at the same time this reduction must respect certain limits (excessive selectivity would deny the agent any range of choice and so inhibit the exercise of his autonomy)[7].

However, one should not consider the effects of selection without looking at the outcomes of the procedures through which such selection is made. In effect, selection can be carried out by the destruction of what is excluded or by setting it aside for future use; and this dichotomy of procedures is of fundamental importance in the management of information. In fact, one should not forget that if the map claims, through reduction, to give a representation of the complexity of the world, it does this through the temporary "neutralisation" of what is excluded. It is only this *non-destructive selection* which serves to combat the risk involved, which makes it psychologically and concretely acceptable for the agent to "compromise" himself in choices that may be incorrect[8]. Selection can neutralise or destroy complexity – the former occurs when selection is based on non-arbitrary parameters, the latter when it is subject not to rules but to whim. For example, a map may well decide to exclude political boundaries (which could be re-instated in a latter document); however, if borders and boundaries are considered a category of information that is to be represented, then they must be included – all of them. The border that is not represented would, in effect, become non-existent – that is, would be destroyed within the communication itself.

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[7] A. Turco, *Verso una teoria geografica della complessità*, Unicopli, Milan, 1988, p. 46.
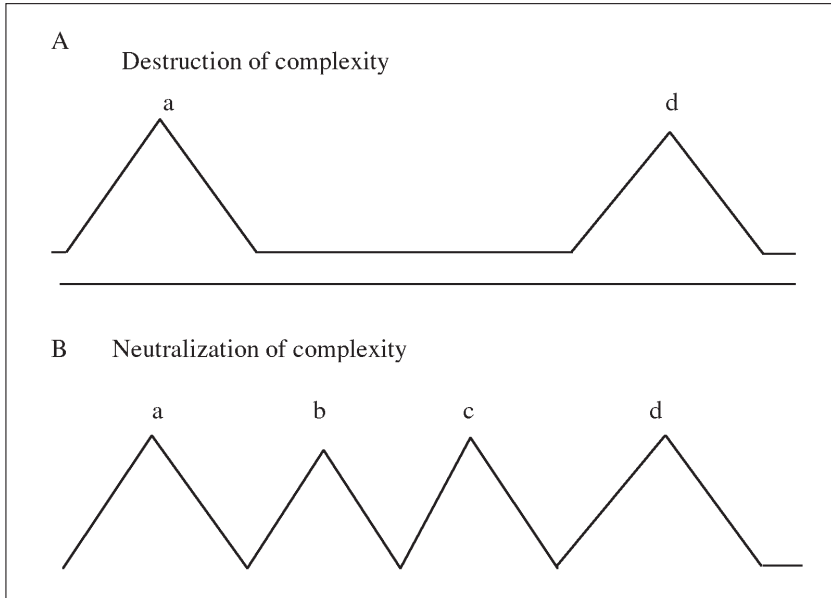[8] *Ibid*, p. 48.

Figure 3 - *The process of selection.*

It is this "neutralisation" rather than "destruction" of complexity which makes cartographical selection an adequate means for the transmission of a verifiable vision of reality: arbitrary exclusions would produce fallacious information (given that they would undermine the organisational principle of analogy with the real world). Figure 3 gives a schematic account of two examples of representation that illustrate this problem.

Map A depicts mountainous territory by showing some mountains but not all, and hence gives a picture of a plane enclosed by mountains (which does not correspond to reality). On the contrary, Map B gives a quantitatively exact rendition of the "raised" areas and so offers a account of the true morphology of the territory. Such discrepancies can also be found in map orientation: if the first document gives the illusion of a commanding view of the territory (characterised by a few clear features), the simplification is in fact too restrictive, because it only offers "those" features of reference without any possible alternatives. In the second document, however, the representation of the raised lands means one can make autonomous choice of points of reference, hence orientation is possible. In the first map, the simplification of information restricts orientation and creates false information; in the second, the parameters of selection have been respected and thus correct orientation is possible and one can gain an approximate view of the real form of the territory depicted.

Selection occurs both in deciding what is to be represented and in

establishing the aspects or qualities of it which are to be depicted. The intrinsic quality of the object represented will be determined by the purpose of the map itself: the particular features which the creator of the map takes as significant and relevant are those which will be included. Quantity too can become a discriminating parameter: one might lay down that a certain phenomenon is to be depicted only when it is present to a certain degree. However, in all these cases, one should never forget that these decisions are a question of convention: the practical and/or ideological establishment of criteria of selection has a number of purposes, and one of these is the efficient communication of information with an eye to specific courses of action. However, quite apart from the criteria applied in drawing up the map, once a convention has been adopted it must be respected (arbitrary flouting of the rules would make the information ambiguous). For example, if an object is considered important, then it must be represented using the same means of qualitative emphasis and depicted with quantitative accuracy.

It is, however, true that for a long time selection was the result of arbitrary or contingent interests; nevertheless, even in those cases, it did follow a logic resulting from the need to achieve a particular goal. The development that took place in the eighteenth century – when maps became one of the instruments of state power – led to a general codification of the whole language of cartography (including the processes of selection). The end result was the emergence of "Euclidean" cartography, the precision of which is based on the identification of physical position on the earth's surface by means of geodetic calculations and the measurement of exact size by means of trigonometry. Hence, this will be our starting-point in tracing out the presuppositions embodied in cartography.

3.1.1 *The Pre-suppositions of Cartography and their Codification*

A discussion of the structure of maps necessarily involves reference to the conventions and codes employed within them. As C. Jacob points out, these conventions and codes are an important aspect of any study of cartographical communication because when looking at a map we not only recognise what is being shown there but we also recall and recognise the other maps we have seen. What is more, reference to some sort of official codification in a map strengthens the likelihood of the cartographical message being accepted automatically (due to the fact that it appears to draw on some recognised authority)[9]. So, let us look at the codification of the pre-suppositions within a map.

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[9] Geographers have adopted different positions with regard to this point. F. Dainville, for example, argues that originally codification served only to facilitate representation and was the result of the development in topography to be seen in the work of French military engineers (linked, in turn, to the mathematical advances that were having their effect on all the physical sciences). Others, such as C. Raffestin, see codification as being an instrument whereby Established Power aims to impose its own axioms with regard to the use and exploitation of

I will take up a current definition of maps which is implicitly based on modern cartography – and, therefore, on a method of representation that respects certain geometrical principles (used throughout the Modern period, these were precisely defined and then encoded within Euclidean cartography). This definition says that a map is a miniature representation of the world produced on a flat surface using a symbolic language of conventional signs. This means that the map must meet criteria of *size-reduction*, *approximation* and *symbolism*. The definition covers not only the subject-matter of the representation, but also the way it is presented and the techniques used in constructing it. There is no explicit reference to the communicative function of a map, but this should come as no surprise given that the definition dates from the beginning of the twentieth century (when there was no extensive analysis of symbolic systems and it was believed possible to objectively re-constitute the world on the basis of the practices of classification and enumeration that were seen as general features of all means of communication). I will use this definition simply in order to trace the process of codification that results in a map being a *representational device* based of *pre-suppositions*, a device which employs a *multiplicity of codes* and develops through the use of a *number of structures*. In tracing this process, I will make reference to two characteristics of maps – that is, their structural and communicative aspects – and thus re-introduce the semiotic aspect that is omitted by the above definition. This means that the map can be seen as a node of certain problematics rather than just a product of certain techniques. A map, thence, becomes one of those communicative structures that can generate "interference" (a property that is now recognised as being possessed – to varying degrees – by all representational devices).

Codification establishes which territorial data are to be recorded and lays down precise criteria for their depiction. Hence, it has a precise practical objective: the outlining of a topography based on rules that are derived from referential principles (regarding such features as the measurement of geographical features and the distance between them)[10]. One should not forget that "the concern with precise measurement stems from that primordial concern of man to organise his environment so that things are within reach. The first perception of distance is not quantitative but qualitative: things are divided into the distant and the nearby"[11]. These

territory. In this case, one could already see power being exercised in the very classification and denomination of territorial features. This means that the codification within a map is intended to make the map into an instrument of power, designed to bring about certain situations that serve the purposes of those already in power. See: F. De Dainville, *Le langage des géographes*, Picard, Paris, 1964; C. Raffestin, *Por une géographie du pouvoir*, Les Librairies Techniques, Paris, 1980. Reference is to the Italian edition: *Per una geografia del potere*, Unicopli, Milan, 1981, pp. 106 *et seq.*

[10] One should not underestimate the ideological consequences of this procedure, given that it strengthens a map's ability to be persuasive.

[11] E. Dardel, *L'Homme et la Terre. Nature de la réalité géographique*, Presses Universitaires de France, 1952. Reference is to the Italian edition: *L'uomo e la terra, natura della realtà geografica*, Unicopli, Milan, 1986, p. 17.

two categories are not only rational perceptions, they are part of a fundamental awareness, necessary if man recognises the – difficult or easy – path that lies ahead of him. In effect, distance is not simply a question of metres, it is also a question of the obstacles that may hinder travel from one point to another. By identifying, measuring and depicting these obstacles, mankind makes an important statement of its own freedom from external constrictions. The fact that one can refer to a reliably exact document means that one does not have to engage in personal experimentation to discover which is the best path to follow from one point to another.

The Process of Size Reduction

As I have already pointed out, the processes of size reduction and data selection run parallel in the construction of the map; at both a structural and communicative level, they are concerned with in some way filtering the complexity of the world being depicted. The technical procedure for this is the adoption of a *scale of reduction*, establishing a relation between distances measurable in the real world and those represented in the map (hence a practice based on an analogical relation between territory and map). In effect, the first thing to do when setting out to represent an area is to establish a connection between real and cartographical distances.

In Euclidean cartography this scale is given precise mathematical and graphic expression; however, it is also to be found – with varying degrees of precision – in the cartography of the entire period under discussion in this book. One should perhaps at this point underline that present-day cartography is the direct descendant of the ideology of the Modern Age, which held that the world could be represented on the basis of certain clear relations[12]. From the fifteenth century onwards – thanks to the introduction of the rules of perspective (Alberti's "vanishing point") and the rules for the construction of representations (Ptolomey's "point of distance") – some sort of scale was always more or less explicitly present; indeed, very often one might find many different scales being used together. This multiplicity was due to the use of different types of projection (geometrical, orthogonal, perspective) within the same document: scale was applied (and to be interpreted) according to the method of cartographical construction being employed[13]. But is it correct here to speak of "scale"?

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[12] F. Farinelli, *I segni del mondo, immagine cartografica e discorso geografico*, La Nuova Italia, Florence, 1992, pp. 55-70.

[13] In the parchment map of the Verona region named after Almagià – a document we will look at in more detail later – there are a variety of scales: 1:7,500 in the depiction of the city of Verona; 1:10,000 for the city of Mantua and from 1:40,000 to 1:60,000 in the surrounding areas. In this case, the lack of scale uniformity is due to the purpose the map was intended to serve (and the need to highlight certain areas rather than others). The same lack of uniformity can be seen in the 1596 city plan of Mantua drawn up by Gabriele Bertazzolo; this contains a ground-plan of the city itself and a perspective rendition of the surrounding countryside (with obvious shifts in scale). This original document was drawn up for descriptive purposes, but

One might answer that while from a technical point of view these maps do not respect the rigorous criteria that were subsequently introduced into the practice of cartography, they can nevertheless be viewed as geographical maps precisely because they do make use of scale in some way (even if this is rendered to different degrees of faithfulness).

One should also point out that taking scale as a criterion of exactitude would be a mistake because, due to the alterations that result when depicting the curved surface of the globe on a flat surface, the relation between real and cartographical distances is never exact – not even in a Euclidean map. Scale does remain exact in topographical representations of small areas of territory because there is substantial coincidence between the actual surface of the globe and a flat sheet. However, when maps aim to represent larger areas there can be sizeable differences between actual distances and those indicated in the scale rendition. Think, for example, of the maps drawn up by Mercatore, which were centred on a loxodromic line (at an unchanging angle to the meridians and parallels) and thus give inaccurate measurements of ground areas[14]. This confirms that the initial claim of a correspondence between real and cartographical distance does not hold even when the relation is geometrical, which leads one to argue that the adoption of geometrical-mathematical canons is not enough to guarantee the rigorous accuracy of the end-result.

However, having said that, one must underline the important main function of scale – that of determining the degree of information contained in a map. The richness of detail depends on the scale used: selection covers not only the number of objects to be included in the representation, but also their level of detail (size and attributes). Hence scale plays a part in determining not only the degree of miniaturisation but also the very form and number of symbols included. What is more, it also affects the way in which the relation between the objects is represented – that is, it plays a role in determining the model intended to re-constitute reality. In effect, the choice of scale will depend on the actual aims behind the map. It may well not be determined by the size of the territory covered – which can, for instance, be depicted by various maps to different scales – but rather by the use that a specific map is to serve. Of particular significance here is the project that A. Penk outlined at the IV International Geography Conference held in Berne in 1891: the creation of a 1,920-sheet map to the scale 1:1,000,000 that would cover the entire surface of the globe. The aim of the project was to standardise the world in a single map drawn up according to uniform criteria (including scale) – a representation that was to be both technically and ideologically

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was redone a few years later (1628) as a celebratory document – and on that occasion, perspective was replaced by vertical projection in the rendition of the surrounding countryside (E. Casti Moreschi, "La pianta della città di Mantova del 1596 di Gabriele Bertazzolo", in: *Atti e memorie dell'Accademia Nazionale Virgiliana di SS. LL. ed AA.*, new series, L, Mantua, 1992, pp. 131-141).

[14] On the technical and ideological implications of the loxodromic line, see: R. d'Hollander, "Historique de la loxodromie", in: M. Pelletier (ed.), *Géographie du Monde au Moyen Age et à la Renaissance*, Ed. du CTHS, Paris, 1989, pp. 133-148.

homogeneous. Only in part carried out, the project took on such importance within the international community of geographers that a special committee was set up for the purpose of studying the project. This met for the first time in London in 1909, and though it subsequently altered some of the procedures involved in the actual drawing-up of the map, it still upheld the basic principle (uniformity of scale) as valid. The desire for a standardised uniform scale was predicated on the felt need for there to be a single feature by means of which the various sheets of the map could be compared with each other (otherwise, it was thought, the representation of the earth's surface would, to a large extent, cease to be compellingly "self-evident"). The whole affair leads one to reflect upon the role of conventions in cartography and the ideological content that may well be concealed within them.

Mankind's dream of territorial appropriation involves the construction of a map that covers all the features of the natural world with all their characteristics, in such a way that the map will make it possible to see "everything". In theory, there are two ways of achieving this. One might adopt a 1:1 scale to create an impractical representation that would have no use in the real world, or one might use a model that develops a particular conceptual rendition of actual size. As Borges showed, the first approach produces a paradox that is rich in political – and other – implications, whilst the second (the use of a scale) produces a reduction in size which, insofar as it is considered inevitable, reinforces the idea that a representation may well be "smaller" but nevertheless contains "everything".

But let us set aside for the moment these ideological aspects and focus on the analysis of those maps that I define as "descriptive". As we have already seen, the final purpose of a map is to facilitate use of territory and thus the scale chosen depends on the type of territorial use one is intending to further[15]. Different-scale maps occur at different phases in the process of territorialisation. In the initial phase, when the desire and intention of appropriation first finds expression, maps are large-scale and mainly concerned with showing the territory as a single unit. In effect, the particular features of objects – which distract attention away from the main project – are of no interest here, where the main concern is an overall view of the whole. But as soon as intellectual appropriation has got underway, then smaller-scale maps are drawn up showing things in greater detail and therefore strengthening practical control over the real world. The desire to embark upon voyages of discovery, the need to establish mastery over certain coasts and routes, has in the past stimulated the emergence of schools of cartography which produced maps whose scale varied according to the different purposes they were intended to serve[16]. This confirms the fact that

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[15] In section 1.2 we distinguished between maps that describe – that is, those intended to render physical features that can be identified by direct observation of the real world – and maps that conceptualise – that is, which consciously propose an idea of the world on the basis of representational categories that are derived from a specific interpretation (pp. 24-31).

[16] A wealth of examples of the co-existence of different types of cartography in the Modern period – together with comments thereon – is to be found in: L. Lago, *Imago Mundi*

where territorial appropriation is possible, where some form of power is establishing dominion over a certain territory, modern man has created different-scale maps of that one specific region[17]. As Raffestin points out, "he who follows reality too slavishly remains blinded by it"; if one is to manage territory then one must "see" it within a simplified form, within a representational schema that makes it possible to have a view of the whole and, at the same time, offers one the chance to "zoom in" where necessary[18].

Geometric Approximation: Projection

Approximation is another ambiguous premise because, whilst attempting to respect real measurements, it produces inevitable shift and error. All the same, the presentation of approximation as a *geometric* premise supports the idea that such approximation is a system of cartographical construction that guarantees exactitude. Much has been written on the ideological import of this ambiguity[19], but here I want to focus on the technical aspects – in order to bring out how systems of projection are used to limit the error introduced by approximation.

Projection is a geometrical/mathematical system that aims to reproduce the whole – or part – of the spherical surface of the globe on a flat sheet by means of a grid of lines corresponding to longitude and latitude (geographical co-ordinates which serve to determine the exact position of the individual points on the surface depicted). The impossibility of fully representing a spherical on a flat surface means that some system of transposition has to be used. It is clear that none of these can totally avoid some sort of distortion, and it is equally clear that the smaller the area covered by the map and the larger the scale it uses, then the less telling these distortions will be. Only a globe can be mathematically faithful with regard to distance, isogony and equivalence – that is, offer a true representation of the areas, angles and lengths that pertain in the real world. Where geographical maps are concerned, it is only possible to meet one of the latter two requirements (isogony and equivalence), whilst equality of distance is restricted within certain limits and only applies in certain specific directions. The result is that the distortions within one single map vary (generally tending to increase as one moves from the centre

et Italiae. La versione del mondo e la scoperta dell'Italia nella cartografia antica (secoli X-XVI), Ed. La Mongolfiera, Trieste, 1992.

[17] B. Harley argues that all maps serve to codify, legitimate and promote the vision of the world prevailing in a certain society or at a certain period of history (J.B. Harley, "Deconstructing the map", in: *Cartographica*, 26-2, 1989, pp. 1-20, see p. 6).

[18] C. Raffestin, "Carta e potere o dalla duplicazione alla sostituzione", in: M. Quaini (ed.), *Cartografia ed Istituzioni in Età Moderna*, "Atti della Società ligure di storia patria", Genoa, 1987, pp. 21-31, espec. 30.

[19] Various writers have argued the same on this point. Amongst the most recent, see: C. Jacob, *L'empire des cartes, approche théorique de la cartographie à travers l'histoire*, Albin Michel, Paris, 1992, pp. 153-161.

outwards); hence, in some maps there is a shifting scale – and these shifts are sometimes so sizeable that – as I pointed out with regard to the maps of Mercatore – it is best to indicate the different scales for different areas of longitude and latitude.

From a technical point of view, the type of projection chosen depends not only on the contents and/or purpose of the map, but – first and foremost – on the size of the area to be depicted and its position with regard to geographical co-ordinates. The depiction of temperate or polar regions is more distorted than that of regions situated along the equator. Projection is chosen to meet the needs of each particular case, taking into account such factors as size and shape of region, latitudinal position and extension, the purpose of the map and the phenomena that one aims to focus on. Hence, various methods of projection have been devised – some based on geometrical projection, others on mathematical relations[20].

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[20] The use of projection became widespread during the fifteenth century when, following the rediscovery of Ptolemy, maps began to bear indications of latitude and – some time later – of longitude. The wind rose with its grid of wind directions was a characteristic feature of nautical charts, whilst with the advent of land maps it began to lose any real meaning – even if the two procedures (wind rose plus longitude and latitude) in map construction would co-exist for some time to come (M. Milanesi, *Tolomeo sostituito. Studi di storia delle conoscenze geografiche nel XVI secolo*, Unicopli, Milan, 1984). The change also made itself felt in nautical cartography, but it was a long and uneven process of transformation. The true revolution came with the adoption Mercatore's isogonic cylindrical projection from 1569 onwards. A fundamental work on the map-making of this period is Pietro Appiano's *Cosmographie de Pietrus Appianus par Gemma Frisius Anvers, C. Plantium*, 1574. Among the innovative uses of projection one should mention the maps of Giacomo Gastaldi – whose mappemondes were so famous they were simply known as a "Gastaldo map". He developed Mercatore's oval projection of equidistant lines to create mappemondes in which the parallels were not actually equidistant. Important progress was also being made in land cartography. At the beginning of the sixteenth century the first attempts were made in the use of the compass in land-surveying, and these experiments would be continued throughout the sixteenth and seventeenth century by the likes of S. Münster, P. Appiano and C. Sorte. As for the eighteenth century, one should underline the efforts being made to introduce more precise methods of representation – particularly of the elevated features of terrain. Surveying in many parts of Italy and Central Europe would lead to the production of a whole series of special maps that would completely renew the cartographical account of Europe. More than in the atlases of this and the following century, one can see this transformation in a number of the first large-scale topographical maps produced – for example, that of Baveria (1:440,000) in 24 sheets and published in Ingolstadt by Filippo Appiano. As far as Italy is concerned, there is, for example, the collection of topographical maps edited by G. A. Magini, which brings together all the groundwork done over the previous century. This period of discovery not only laid the bases for the theory of cartographical projection, but also examined the fundamental problems it raised. Further development would be impossible without adequate steps forward in all the observational sciences (and the sciences of astronomy and geodesy in particular). Already at the beginning of the seventeenth century, the Dutchman W. Snellius (1591-1626) proposed a system of triangulation for the measurement of degrees of latitude (a question that would be the object of much precise research during the forthcoming century). Introduced by the German W. Wurttemberg, triangulation would be considered the radical innovation that marked the birth of modern cartography. In the eighteenth century, the renewed studies of projection were concerned mainly with the representation of territories occupying the middle bands of latitude – that is, Central Europe, where there was the greatest interest in full cartographical cover. The

However, for all that projection is intended to eliminate certain arbitrary factors in the transposition of a curved onto a flat surface, there are inevitable distortions that effect the depiction of geographical co-ordinates. We know that such co-ordinates serve to give a precise indication of the exact location of the area represented: and we also know that the definition of the location of a point on the earth's surface is essential because position is an essential component in the network of relations established by mankind. However, no location can be defined exactly unless one makes reference to a point outside the earth – that is, to a star or heavenly body[21]. Hence, the grid of geographical co-ordinates is a projection of the schema of the cosmos onto our own microcosm. This is clear to the cartographer in Spielberg's *Close Encounters of the Third Kind*, who establishes contact with extraterrestrial beings by understanding that the information they are transmitting is to be decodified as referring to possible geographical co-ordinates. In effect, this is a most logical deduction, given that celestial parameters (polar axis, equator, lines of longitude and latitude) all come together within the sphere of the earth – that is, the conventional centre of mankind's universe. In this way, the inhabitants of earth discover the location of the extra-terrestrial landing-site precisely because the space travellers were in a privileged position when it came to obtaining certain data that could establish location with precision. However, normally, humankind has to use maps – or mathematical calculations based on the information they contain – in order to establish co-ordinates: in each and every case, one trusts to the adjustments that the cartographer makes to distortions that are envisaged right from the very start.

Another important factor in orientation is the precise location of a centre; indeed, it is only once that point has been established that the process of orientation proper starts. The question of "the centre" is part of an overall view of the world that in some way reflects an essential human anxiety – the result of which is our emotional and intellectual struggle against the "dark depths" of the natural world around us. E. Dardel has observed that at each era in history humankind's conception of the world has been based on geographical knowledge which – however extensive – necessarily illustrates the relation that humanity has striven to establish with the surface of its planet. And basic to the manifestation of this relation is the choice of a centre

middle of the eighteenth century is taken as marking the beginning of contemporary cartography because it was the period of the first large-scale (1:86,400) French topographical maps based on triangulations and on-site measurements. This was the beginning of a general use of the "Euclidean" map. On this widely-discussed theme, one can find interesting comments and questions in the collection of essays *Cartes et figures de la terre*, Centre Pompidou, Paris, 1980; H. Capel, *Geografia y Matemàticas en la España del siglo XVIII*, Oikos-Tau ed., Barcelona, 1982; the collection: G. Macchi (ed.), *Il disegno del mondo*, Electa, Milan, 1983; C. Bousquet-Bressolier (ed.), *L'œil du cartographe et la représentation géographique du Moyen Age à nos jours*, C.T.H.S., Paris, 1995.

[21] On the role of geodesy, the development of its technical systems and the importance it has on the G.I.S., see: J.J. Levallois, *Mesurer la Terre. 300 ans de Géodésie française*, AFT-ENPC, Paris, 1992.

for geographical representations. For example, planispheres change according to the country for which they are intended – one produced in New Zealand, for instance, would centre on the Pacific Ocean and relegate Europe to the periphery. The centre will be occupied by the zone which it is most useful to know about – because in the centre representation is less distorted and information can be more richly detailed (towards the edges, as we have seen, distortion becomes more sizeable and information less precise). But if it is true that projection serves to give a clearer representation of the area that most interests us, it is also clear that it can work the other way around: clear, accurate and detailed representation of an area can serve to convince the map's user that this is the region most worthy of note. The choice of one centre rather than another, with the concomitant inclusion of certain information and areas in preference to others, can serve to support the belief that the value attributed to certain phenomena is not only objective but actually unquestionable. Hence, for example, one might use the map to support the belief that certain boundaries are natural (and therefore unchangeable) or that one particular power is in fact a universal authority (precisely because it occupies what is "the centre of the world")[22].

Finally, the use of even refined systems of cartographical construction such as projection may increase the objectivity of representation in some ways but in others it diminishes it (enhancement and reduction of objectivity depending on the criteria applied – a decision which always rests with the cartographer alone). The result is that, in all cases, a map is actually pleading the case for the relevance, value and substantiality of the objects it chooses to depict. In aiming to evaluate the conceptual implications of technique as symbolic form one need only remember that, here, technique is a "mode of revelation" generally understood as "exactitude in representation". This mode of revelation turns out to be an act of promotion in two senses of the term: it promotes in the sense of makes available, but also in the sense of "pushing something forward, to maximum use at minimum cost"[23].

Miniaturisation and Symbolism

With regard to equivocations over the symbolic nature of the Euclidean map, F. Farinelli has argued that "thanks to the extraordinary reticence of geographers over the last century in actually posing questions with regard to the real meaning of the words they use, geography nowadays in under the "dominion of a usurper" who ascended to power in the Age of

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[22] With regard to this subject Harley speaks of "subliminal geometry", which strengthens the position of certain sites in the social awareness of physical space, thus putting them forward as the centre of the world (J. B. Harley, "Maps. Knowledge and power", in: D. Cosgrove and S. Daniels (eds.), *The Iconography of Landscape. Essays on the symbolic representation, design and use of past environments*, C.U.P., Cambridge, 1988, pp. 277-312).

[23] E. Panofsky, *Die Perspective als symbolischen Form*, Leipzig-Berlin, 1927. Reference is to the Italian edition: *La prospettiva come "forma simbolica" e altri scritti*, Feltrinelli, Milan, 1975.

Enlightenment: a concept of symbolism which may use the word "symbol" but says nothing about their true nature"[24]. Various writers on the history of cartography are now looking into the problematic nature of symbolisation and the repercussions it has on communication, focusing on how the use of analogical systems highlights the relation between objects and thence develops a communicative system in which mode of representation is of key importance. In fact, the process of *miniaturisation* – which involves condensation of meaning not only through a reduction in size but also through the actual definition of the object miniaturised – necessarily leads to the transmission of specific messages[25]. An illuminating example here is provided by the sixteenth-century nautical charts that show the city of Venice, in which the aim of describing the urban fabric of the city is overlaid by a system of allegorical correspondences. The end result of this complex cultural system that brings together technical abilities and factual knowledge, medieval "hangovers" and documentary requirements, is an iconic view that shows Venice, at one and the same time, as closed city within a walled precinct and an open "city of water"[26]. But symbolisation also has important social repercussions, with various authors arguing that symbols cannot guarantee mutual comprehension between different societies. The transformation of sign into symbol occurs at a level higher than that of conscious use: hence symbolic communication must make reference to a framework for understanding the world – thanks to which each person is able to understand different images of that whole[27].

These few points are sufficient to make it clear that here I must give a precise definition of my own view on the matter; and I would argue that signs and symbols within a map form a technical apparatus that is to be interpreted semiologically. This does not mean that I undervalue the importance of the ideological or social aspects of the symbol, nor that I consider sign and symbol as interchangeable. The position I take here follows on from my premise, which is that the name – the designator – is the key to the cartographical organization of the entire body of signs within a map. As we will see below, colours, shapes and numbers are not to be considered as mathematical-geometric signs or symbols but rather as surrogates that play a role in denominative projection; they can either replace the designator altogether or else serve to "enhance" it. The inclusion of signs on a map is the translation into graphic terms of a series of mental operations carried out by the cartographer (who is, one should not forget, a member of a specific society) – operations with one basic end purpose: the communication of a name. So the graphic end-product will be the result of the culturally-shared processes of selection, simplification, classification, synthesis and, in some

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[24] F. Farinelli, *I segni del mondo…*, p. 17.
[25] C. Jacob, *L'empire des cartes…*, pp. 146-147 and pp. 414-427.
[26] G. Romanelli, "Città di costa. Immagine urbana e carte nautiche", in: S. Biadene (ed.), *Carte da navigar*, Marsilio, Venice, 1990, pp. 21-32.
[27] Barthes is still fundamental to a discussion of the problems relating to symbolisation: R. Barthes, *L'émpire des signes*, Skira, Genève, 1970.

cases, symbolisation. This entire process is expressed in the map through the application of certain technical criteria that are intended to give a precise meaning to each sign, no matter how small and apparently negligible.

When one speaks of symbolism in geographical maps one is referring to an encoded whole that incorporates information through shapes, colours, numbers and names. While the codes used for numbers and names may follow those obtaining in the original lexical and numerical language, the codes relating to shapes and colours result in many types of graphic expressions.

The first of these types relates to the varying level of figuration that might be present, the degree to which a depiction is given in abstract form. Thus one can go from *figurative drawings* – which reproduce reality in an analogical form – to *geometrical forms*, that give some abstract rendition of the object[28]. A surrogate referring to a church which offers a faithful reproduction of the façade is one based on a figurative drawing, whilst a surrogate that offers a planimetry of the building is based on a geometric figure. However, if the church is represented by a cross, then what we have is a figure that takes no account of the figurative or abstract organisation of the actual building but simply refers directly to its religious function – and hence is a symbol. Figurative signs can take the form of dots, lines and outlines, or any combination thereof. Differentiation is by means of four visual variables: shape, size, orientation and intensity. Form and shape offer a simplified version of the actual appearance of the object, maintaining certain features that make it immediately recognisable (the extent to which they maintain them may depend on other – ideological – reasons). Size can serve to give an idea of importance, or indicate position in a hierarchy of scale (the same sign to a different scale may indicate some qualitative or quantitative feature of the object depicted). The orientation of the figure supplies other technical data: for example, the peak of a "wedge" in topographical cartography serves to indicate a site higher than the surrounding terrain, just as the "highlighting" in old maps could also serve to indicate elevation. The term intensity refers to the size of the sign itself – i.e. to the size of the dots, lines and outlines that compose it. Here again, such variations can serve to indicate a hierarchy of importance.

Distinctions with regard to colour follow the same procedure. Colours might be arbitrary, analogically related to those in the real world or else

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[28] With regard to types of sign, G. Anceschi argues that the spectrum used within cartography is very wide, ranging from fiction (orographical cartography, with the use of shading and colour) through linear reduction (the basis of Euclidean cartography) to the iconic sign (in thematic maps) (G. Anceschi, *L'oggetto della raffigurazione…*, pp. 45-51). However, if one looks at the analysis offered by J. Bertin – which is very close in approach to that adopted in the semiology of language – one can identify three types of figuration: the diagram, the network or grid (*reseau*) and the geographical map. With regard to the problems of symbolisation, the latter is the only one that draws on the contrast figurative/abstract (J. Bertin, *Sémiologie graphique*, Mouton & Gauthier-Villars, Paris-La Haye, 1967). The shifting scale of abstraction within figuration is also a central consideration in: R. Arnheim, *Visual Thinking*, Regents of the University of California, Berkeley Los Angeles, 1969. Reference is to the Italian edition: *Il pensiero visivo*, Einaudi, Turin, 1974, p. 181.

chosen because they meet certain ideological premises[29]. A river depicted in green offers an analogy with the real world, whilst the use of blue draws on a conventional attribute of water – and numerous sixteenth-century nautical atlases use scarlet symbolically to indicate the Red Sea. Sometimes actual links with the real world as perceived are not particularly relevant: for example, contemporary maps indicate built-up areas using black – an arbitrary choice. On the other hand, analogical use of colour includes the use of green to indicate the presence of vegetation or flat plainlands. Then there are occasions when colour has an ideological import: for example, in medieval maps there were constant colours to depict the four elements of air, earth, fire and water[30]. Finally, variations in chromatic intensity might indicate certain features such as depth, height, ground covering, etc.

These choices also make themselves felt in lexical surrogates as well. For example, in inscribing names on maps, the cartographer has to take into account the various mechanisms of perception that will come into play when reading them. Such names should not be considered simply as components of a linguistic system in which physical features such as form, size or spacing play no part in communication (they are actually another one of the conventional signs used in creating the map). Differentiation here can be seen primarily in the variety of characters and typefaces used, each one of which corresponds to geographical objects of a different category or order of importance. What is more, the choice of character is affected by the need for the entire representation to be comprehensible – hence their arrangement on the sheet is designed for ease of reading. For example, names or words relating to a simple dot symbol – which would normally be written horizontally – might well follow the outline of some other symbol if that makes for more efficient communication[31].

All of this should be taken into account because, whilst it is true that the elementary structure of maps is designed to respect an analogical system, it is precisely as a result of the choice and selections made within that system that certain related effects are achieved – all of which go towards producing a denominative instrument that can play an active role in communication through the combined use of analogical and digital systems. In short, what has been said so far with regard to the development and purpose of cartography should be seen as making a contribution to the construction of a gridwork of reference within which one examine the various systems brought into play in denominative projection.

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[29] On the arbitrary nature of colour codifications one can see: J. Bertin, *Sémiologie graphique…*, p. 85.

[30] In biblical exegesis white corresponds to the earth, purple to water, blue to the air and red to fire. Many medieval maps in Ptolemy's *Geography* seem to reflect this symbolism, whilst others follow a more naturalistic symbolism that has blue represent air, red fire, green water and yellow earth. See: F. De Dainville, *Les langages des géographes…*, p. 330. The most detailed treatment of the traditional symbolism of colours in the West is to be found in: F. Portal, *Sui colori simbolici nell'antichità, nel Medioevo e nell'Età Moderna*, Luni Ed., Milan-Trento, 1997.

[31] A. Sestini, *Cartografia generale*, Patron, Boulogne, 1981, pp. 192-195.

3.2 *Denominative Projection: Enhancement and Surrogation*

An essential characteristic of a map is that it unites a designator with some type of denominative surrogate (sign, colour, number or figure) which is intended to render explicit some quality of the object represented. Whilst one may find maps without designators, it would be unthinkable for a map to offer designators without some sort of surrogate: indeed, the presence of such surrogates is a structural characteristic of maps. Even in a limit case the very placing of the name serves to indicate the arrangement of objects in the real world. Thus, the relations of the object referred to be that name to other objects is specified through the use of a geometric code[32]. One can thus claim that surrogates form the framework within which designators are transferred from the territorial semiotic field (in which they are first coined) to the cartographical semiotic field (in which their codification is further developed). Hence, a study of how these surrogates are created and how they function entails a study of the *denominative projection* performed within the map. I have defined such projection as a cartographical metalanguage – that is, a complex of procedures that serve to "show" the designator and, to do so, draw on various aspects of figurative representation: spatial organisation, figuration proper and iconisation. One should recall that the first phase serves to render the referential aspects of the designator, the second uses surrogation to render various aspects of what is designated and the third serves to convey more deeply-seated meanings and implications. So, spatial organisation and figuration seem to be related to the sphere of denotation, whilst iconisation is connotative. One has to make this clear if one is to show the existence of the various ways in which denominative projection is developed. The distinction is also related to the presence of analogical and digital systems of communication, which – as I have already pointed out – come into play at different levels of communication to render more or less unique the identity of what they represent.

So, when the analysis of denomination shifts its focus onto denominative projection and the strategies involved in its performance, it has to pose the following questions. Does denominative projection increase or diminish the signification of a name? At what level of reading does it make that "enhanced" meaning explicit?

With regard to the first question, one might say that a map does not serve to increase the signification of a name but rather to streamline it, taking on only certain aspects and neutralising those that are redundant in that specific situation of communication. We can understand this more

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[32] The essential role of names can also be seen from works produced outside the West. Harvey cites the case of a fourteenth-century Arab chronicler who illustrates his work with a map of Iran composed simply of names arranged on a grid framework (P. D.A. Harvey, *The History of Topographical Maps. Symbols, Pictures and Surveys*, Thames & Hudson, London, 1980, p. 146).

clearly if we see denominative projection within maps in relation to a wider question of complexity – that is, to how man tries to establish his autonomy within a complex environment. We know that a social agent can only implement his choices and decisions if he is able to manage and master the complexity of the situation in which he is immersed. If the level of complexity is too high, he aims to reduce it in order to make action possible (in this specific case, we are talking about communicative action). And the map meets the problems raised by the complexity of a name's meaning and signification by employing surrogates. It is they which serve to neutralise excessive complexity, prescribing certain courses of interpretation and making communication possible – first of all for the cartographer (the interpreter of territory who is aiming to communicate choices and interpretations) and then for the recipient (who is concerned with being able to use the information received). However, surrogates do not only serve to neutralise excess information, but also to maintain an adequate level of complexity; when necessary, they "make good" information deficits. In fact, they can act as substitutes for an absent designator. Hence, a map appears to be a denominative projection that serves two functions – *enhancement* and *surrogation* (Figure 4).

One might compare enhancement to an *explosive* process, with the meaning inside the name being projected outwards thanks to the development of some of its communicative potential. *Surrogation*, on the other hand, uses figuration, colours, numbers or physical positioning to express meaning. And here one could speak of *condensation*, given that the surrogates do not behave as simple substitutes for the name; instead they might be said to produce (or, indeed, release) meaning through surrogative prescriptions. In other words, the need for efficient communication exerts external pressure upon the name, which leads to the emergence of otherwise hidden values and implications. The highest expression of surrogation, therefore, is the "mute" map, which is totally without names and communicates solely by means of surrogates. Thus one might argue that both of these functions in a map (enhancement and surrogation) work towards the achievement of a single purpose: the adjustment and balance of the density and explicitness of significance and meaning in order to achieve what is required for communication to take place. What matters is not what the name includes, but what can or must be conveyed by the document.

To answer the second question – that is, at what level of reading denominative projection works – one has to look at whether a map not only specifies and fixes reference but also acts upon connotation. One should point out again that one is not here considering a map as a simple instrument of orientation, but rather looking at the type of mediation maps perform in the process of territorialisation. So, if we take for proven that performative or symbolic designators are to be understood connotatively, some doubt still remains with regard to referential designators. We have to establish whether denominative projection leads to such designators acquiring some
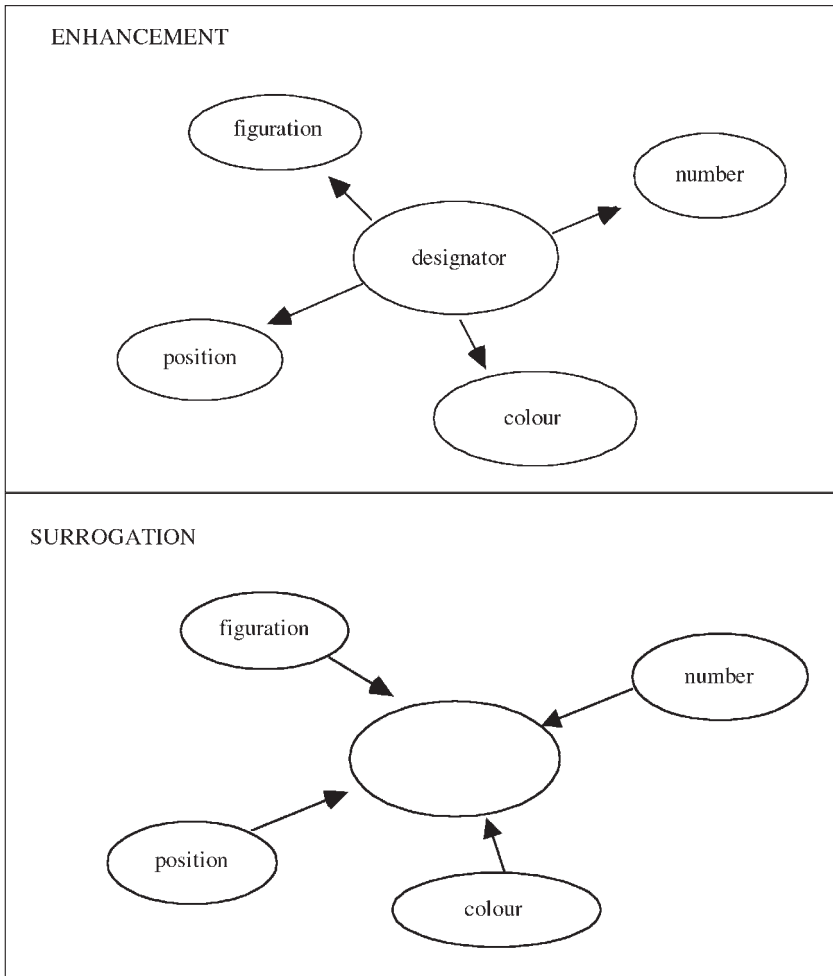
Figure 4 - *Denominative projection: enhancement and surrogation.*

connotative import[33]. This is a legitimate question when one thinks that what was said above with regard to the relation between the meaning within the name and the meaning made explicit by the surrogate does not rule out the possibility of denominative projection involving the grafting of additional

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[33] In effect, we will see later how denominative projection may have a negative effect on symbolic or performative denominators: the presence of "regressive" procedures within enhancement means that such designators are reduced to a simply referential role. See: section 2, chap. 5.

meaning and significance onto the meaning acquired by a name in the original linguistic construction of territory. In effect, the information contained and conveyed by the designator can be enhanced, transformed or impoverished over the course of time due to the accruement of semantic values and associations resulting from the use of the name in communication.

This aspect is to be seen within the dialectic of autonomy: as man acts to establish his mastery over informational complexity, he both reduces and stimulates that complexity. Thus, when designators are placed on a map, the associated denominative surrogates place constraints and demands upon them. This makes it more plausible to argue that there are no exclusively referential designators, given that all designators acquire the connotations which a culture creates for them through their place in cartographical representations. In effect, all designators are subject to criteria of selection in which the hierarchies of informational relevance in some way reflect social hierarchies[34]. Proof of the way surrogates within a map affect referential designators can be found in the very way letters are used in writing names. These letters can be upper or lower case, in different size typographical characters and organised according to a variety of spacings – with the result that the designator written in capitals will appear to be more important than that written in lower case letters, or importance may depend on the size of the typescript[35]. If we look at any normal school atlas and take referential designators that refer to natural features such as Mont Blanc or Monte Cervino, we see that the emphasis given depends on height: *M o n t B l a n c* is written in well-spaced italics, whilst Monte Cervino is written in unspaced roman type[36]). As another example, look at the characters used in giving the names of cities: their very size reflects the city's place in a hierarchy based on demographic, political, social, religious, economic or other factors. If we then look at what happens with symbolic or performative designators we have further proof that these serve to reinforce the deepest-seated semantic values of the designator. If, for example, the designator *lagoon,* the use of which we can understand from our practical knowledge, is used alongside signs that indicate hydraulic dynamics (of waterflow, tides, etc.), then the meaning of the name is extended to include performative aspects; or if the designator *Venice* is given alongside a figure depicting the Doge's Palace, there is a symbolic underlining of the city as the seat of power. The same thing occurs when reference to geographical features makes use of figuration, different colours or other denominative surrogates in the absence of a name. Thus it is clear that denominative surrogates are used in a map to render the connotations of a designator explicit – so that when there is no designator at all, the surrogates stand in for the social/semantic value it would have expressed.

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[34] On this point, see: F. Farinelli, *I segni del mondo…*, esp. pp. 20-28 and pp. 182-193.

[35] The key work on this question remains: F. De Dainville, *Le langage des géographes….*

[36] In many school atlases the two designators are given alongside height (4810 and 4482 respectively), suggesting that altitude is the basis for the difference in type of character used.

There would be a lot more to be said with regard to this point, bearing in mind the ordinal relation between denotation and connotation. Furthermore, connotation – be it performative or symbolic – can also be generated by *metaphor* and *metonymy*. The chain of meaning can, that is, be developed in a metaphorical way (on the basis of *associations*) or a metonymic way (on the basis of the parts that are *implicit* in the whole)[37]. I should here reiterate that, with regard to the communicative systems operating in a map, associations are to be seen as a characteristic feature of the analogical system (based on the identification of differences in a continuum of real qualities), whilst implications are a characteristic feature of the digital system (given they are based on distinctions which are part of a system of organisation that highlights opposition, identity and paradox)[38].

As far as denominative projection is concerned, our starting-point should be the identification of the approaches adopted in the various phases of figurative representation within a map. With regard to spatial organisation it is clear that there is an associational approach: whilst organising the referential features of a map, such organisation hinges on topography, which we know is an analogical system. As for figuration proper, it is clearly part of the digital system and thus uses an implicational approach (isolating certain aspects of the designator in a discontinuous way); however, it can also use surrogates that may (figurative drawing) or may not (abstract drawing) have an analogical relation to the real world. What is more, these surrogates may also make reference to physical qualities of the object represented or else to qualities that are (socially) associated with that object – and thus iconisation comes into play. In general, though both approaches are present, one can say that the focus is on the implicational – as the surrogates isolate certain qualities of the designated object in order to distinguish it, to establish its identity. In fact, only when one has resort to a symbolic surrogate does one draw on an association that rests purely on socially-attributed meaning without any reference to specific inherent qualities. A city standard, for example, is a symbol that reflects political power – and the use of the metaphorical approach here draws on sophisticated connotative processes. But when we do not have symbolic surrogates, then there is always some kind of metonymic approach at work, drawing out the implications that echo specific or isolated qualities of the designated object. The decision to

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[37] I do not discuss here the dense conceptual implications that the development of these relations has for territorial semanticisation. I simply limit myself to indicate the coincidence between the analogical and digital communicative systems and the development of metaphor and metonymy respectively. With regard to territorial semanticisation, A. Turco has shown how procedures of metaphor and metonymy in the process of topomorphosis – which starts with the base meaning of the designator (sign vehicle) – might then give rise to further meanings which, through systems of conjunctive or disjunctive relations, can then form veritable geographical syntagmas (A. Turco, "L'ordine infinito: simboli territoriali e dispositivi sociali presso i Senoufo della Costa d'Avorio", in: *Terra d'Africa 1993*, Unicopli, Milan, 1993, pp. 15-72, espec. pp. 30-33; *Id.* "Semiotica del territorio, congetture, esplorazioni progetti", in: *Rivista Geografica Italiana*, 101, 1994, pp. 365-383).

[38] See: chap. 2, section 2.

opt for "making the designator figurative" using a planimetry, outline, colour or some indication of size, necessarily involves a choice between the varied information implied by the designator – information which is then re-proposed in a new way. This process does not only focus on communication, it also establishes the social connotations of a particular designator. For example, when a sixteenth-century map shows Peschiera by means of designator and an indication of city walls, it is doing more than simply indicating that the place is a walled city – it is showing that Peschiera is the bridgehead of a defensive system that can regulate access to the entire mainland domains of the Venetian Republic. Similarly, in the same period, when a map showed the presence of a wood by means of a figurative depiction of trees it was less concerned with indicating the plants that made up that particular wood than with indicating that this natural resource played an important role in the Venetian economy of the day. Hence, thanks to the use of surrogates, the denotational import of a geographical feature takes on connotational import[39].

Thus one could say that depiction within a map involves a use of figuration which serves to transform the meaning of a designator into a number of surrogates[40]. In its turn, iconisation metamorphosizes the name endowing it with particular semantic values which, by echoing some particular social reference, endow the designator with symbolic or performative connotations. Whether the focus is on the former or latter of these connotations will depend not only on the specific function of the map, but also on the roles that these two play within the "metaphysical reservoir" of a particular society. If the purpose of a map is to highlight technical knowledge, the performative often prevails over the symbolic. In fact, in the societies within which maps emerge and develop, the symbolic aspect comes into play only when the aim is to assert some type of supremacy (be it political, economic, religious or based on some other factor). In these cases, the symbols used will serve as surrogates to highlight the aspect that is the object of focus. But the primary nature of a map – as the instrument of territorial praxis – usually means that only the performative aspects are highlighted.

Then there are cases in which there is focus on both the performative and symbolic – something which is to be explained by the need to include political interlocutors (interpreters) amongst the possible future users of the map. If performative aspects are intended to have a functional purpose in the performance of action, symbolic features are intended to regulate social relations. Thus, in specific practical-operational and/or political-social contexts, their relative importance alternates.

Figure 5 gives a visual account of the effect of denominative projection on the referential designator.

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[39] One must also remember that the associative implication is present in what I have called the "elementary structure of the map" – that is, the body of presuppositions which are the basis for topology. I have already looked at some of the repercussions of this p. 50 *et seq.*

[40] The role of figuration and iconisation is discussed above – pp. 28-38.

FIGURATIVE	REFERENTIAL DESIGNATOR	DENOMINATIVE PROJECTION
spatialization ⇒	topography ⇒	reinforcement of reference
figuration ⇒	designator+surrogate ⇒	acquisition of distinctive significance
icon ⇒	topography/designator+ surrogate ⇒	connotation: performative/symbolic

Figure 5 - *The effect of denominative projection on the referential designator: acquisition of connotational values.*

Hence, the various phases of figurative depiction within a map serves to modify the meaning/significance of a referential designator, and has a precise effect on specific segments of the denominative projection. Through the use of topography, spatial organisation reinforces referential aspects and thus acts upon denotational content; figuration emphasises the distinctive characteristics of the designated object through the use of surrogates; and iconisation works with the outcome of these two processes to endow the designator with socially-established values – thus enhancing its symbolic and/or performative value.

So one might conclude this section by saying that denominative projection appears to be a process that not only develops but also intensifies the communicative import of a designator.

3.2.1 *The Denominative Paradigm in the Context of Cartographical Genres*

The two denominative functions of maps – enhancement and surrogation – are also valid paradigms in outlining and evaluating different types of cartography. While it is true that denominative projection is present in any type of map, the presence and "intensity" of the two above-mentioned functions varies according to the nature and purpose of the document.

To better understand what I am trying to show here, I should perhaps reiterate the fact that the context within which a map is produced is a highly significant factor in its interpretation. Here, I am anticipating somewhat on the argument in Chapter Five – on the pragmatics of cartography – but I will restrict myself to a few brief points. First of all, I should stress that when I refer to the "context" I am not only referring to the purpose of a document but also the social needs and factors that generate it. A lot could be said here on the strength of my initial claim that a map is an ideological, technical, political and economic expression of a society. However, leaving this more broadly understood context in the

background, I here limit myself to the reasons behind the original creation of a map. I have already mentioned that a map meets two fundamental needs implicit within the intellectual appropriation of territory: description and iconisation. Thus, one can identify maps that focus on description as a mode of communication, and those which focus on conceptualisation – that is, which in their rendition of the world only partially respect the canons of analogy. All maps – be they administrative, topographical, nautical, military, political or thematic, planispheres or city plans – meet one or other of these two needs. Thus we can use the paradigm of denominative projection to identify a particular map's genre and say something about its social context. Through a description and theoretical account of sample documents, I will try to bring out how the paradigm can serve to make the classification of cartographical genres both more precise and more flexible. This account, which will not cover all the existing types of cartography, will have a specific purpose: to show that the true meaning of a map can be seized by considering it as a representational device that employs denomination – a document in which differences of genre are to be understood as the expression of different forms of denominative projection.

3.2.2 *Administrative Cartography*

An analysis of the dynamics of administrative cartography should start with a description of the main characteristics of such maps. In existence from the fifteenth century onwards, these might be described as representations that have a place in normal administrative praxis, serve to illustrate territorial projects or situations and are drawn up either by public institutions or by private bodies that are making applications/submissions to these institutions or authorities. It is with such maps that we see the emergence of "land cartography", a genre that supplements nautical cartography and introduces a veritable revolution into the scope of cartography. In effect, one passes from the registration of a linear space (confined exclusively to coastlines) to the measurement of area and the registration of an extensive territory as a whole[41]. A new perception of space begins to emerge, associated with the new political role of territory and the nascent Italian states' need for knowledge concerning the regions over which they desire to exercise administrative dominion. Here, one might point out

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[41] An interesting argument concerning the perception of space inherent in cartographical representation was put forward a few years ago by P. Janni. He claimed that the lack of "first-hand" maps dating from Classical antiquity is due more to the fact that physical space was seen "odologically" (thus excluding the concept of measurement of surface area) than to the fact these works had been destroyed over time. He saw the emergence of nautical charts as revealing this same linear approach in the representation of space (P. Janni, *La mappa e il periplo, cartografia antica e spazio odologico*, G. Bretschneider, Rome, 1984). On this subject, see also: C.Jacob, "Carte greche", in F. Prontera (ed.), *Geografia e geografi nel mondo antico, guida storica e critica*, Laterza, Bari, 1983.

that whilst the need for state territorial control was the driving-force behind the emergence of Euclidean cartography in eighteenth-century France, certain steps in that direction had already been taken in some Italian regional states[42]. Contemporary with the above-mentioned maps were those drawn-up to chart voyages of discovery and exploration, along with those designed to celebrate a particular seat of political power. However, it was the need to exercise territorial control that led to cartography becoming an essential feature of State administration, a necessary instrument for the implementation of government[43]. The four essential characteristics of such documents are: i) structural symbiosis of representation and written text; ii) use of large-to-medium scale representation; iii) manuscript form; iv) circulation within the state administration.

Written text and cartographical "text" are the two components that make up this instrument of administrative praxis. The interdependence between the two is ambivalent: the written text refers to what is shown in the map, whilst the map can only be properly understood by reference to what is stated in the written text. It is important to emphasise this situation of symbiosis because it reveals that there was no hierarchy of roles between the two parts but rather full integration. This is fundamental to our understanding of this type of cartographical document, in which the reliance on a written text means that the map representation itself does not have to perform all its usual functions.

The second feature listed above refers to the large scale of such maps – which, in effect, can range from representations of a single estate or piece of landed property, through representations of particular stretches of riverland to depictions of entire regions. However, in all these cases, for all there are individual differences in modes of measurement and representation, we have maps that we would now define as topographical – that is, drawn to such a scale that they make it possible to recognise the natural morphology and man-made characteristics of a particular area. As we know, scale is the first criterion of selection; density of information cannot go beyond a certain threshold if there is to be efficient transmission of cartographical information, so the details given in a map must respect the limits imposed by the scale chosen. And if one is to use cartographical maps to follow the initial processes of

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[42] Here one cannot avoid a reference to Venice. In fact, the Serenissima developed an administrative apparatus for the management and representation of its territories at a very early date, and some of the new cartographical techniques being used were forerunners of those that would be used in France. In effect, one can find innovative land registry surveys and other examples of map-making techniques in the Veneto long before the eighteenth century revolution in cartography (E. Bevilacqua and L. Puppi (eds.), *Padova il volto della città, dalla pianta del Valle al fotopiano*, ed. Programma, Padua, 1987; D. Gasparini (ed.), *Montebelluna storia di un territorio, cartografia ed estimi tra Sei e Settecento*, Comune di Montebelluna, Venice, 1992). The most recent work on the French cartography of the eighteenth century is: M. Pelletier, *La Carte de Cassini. L'extraordinaire aventure de la carte de France*, Presses Ponts et Chaussées, Paris, 1990.

[43] See the ample discussion of this kind of document in: M. Quaini (ed), *Cartografia ed istituzioni in Età moderna….*

territorialisation, then one must have large-scale documents that make it possible to pick out details regarding plans proposed and implemented.

What is more, the administrative map was a manuscript work not only during its early days (when printing was in its infancy) but also later (when most other types of cartographical documents intended for a wider audience were being printed). This point is worth stressing because it underlines how the administrative map was not designed for a "public" but for a few decision-makers and project designers. The very absence of a divulgatory role affects the type of information included. The administrative map was not designed to use the forms of contemporary cartography to communicate information of general interest, but to provide already identified interlocutors with certain specific information. Hence, it assumes the right to use the languages that are already in use amongst its intended recipients.

And this point is closely related to the fourth characteristic – the fact that such maps circulated within the public administration. Here, what should be emphasised is that administrative cartography functioned as part of the relations with/between public bodies. Even when such documents were commissioned by private individuals – as was the case with a number of land register maps [*cabrei*] – they obey the logic of public discourse and might well be used by the administration in assessing fiscal liability or other obligations. Hence, in the great variety of cartographical languages and conventions used one can identify a common respect for the rules established by the public authorities (in some cases, these were actually codified, though in others they remained implicit in the ideology at the basis of territorial policy).

At this point one should look at which features of administrative maps were most clearly imbued with theoretical implications. The first point to consider concerns the creator/interpreter of the document – that is both the *cartographer* himself and the *functionary* for whom the map is intended. In both cases, this is a socially important territorial agent who occupies a public role. Even where such maps were privately commissioned, they were the work of recognised technicians qualified as "public draughtsmen" after passing an exam that gave them the right to such a title[44]. Here we have authoritative territorial agents who very often occupy a double role: constructor of territorial images and implementer of territorial projects. In both positions – as cartographer or as interpreter of the proposal incorporated in the map – they operate with the pragmatic content incorporated within the written/drawn sign.

The second point to make here concerns the symbiosis between written and cartographical "texts", which leads to the action of denomination not following the same course and procedures as in other maps. In the most

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[44] On the figure and role of the cartographer, see: M. Quaini, "La cartografia a grande scala: dall'astronomo al topografo militare", in: M. Milanesi (ed.), *L'Europa delle carte*, Mazzotta, Milan, 1990, pp. 36-41.

striking cases, an administrative map may be entirely "mute", that is, totally without designators. There are various examples of this, to be found in a wide range of administrative offices: for example, such mute maps might well be those accompanying the application for authorisation of a particular project, or the maps included in generalised territorial inventories drawn up for the purposes of land registry and taxation. In this case, referential denomination is given in the written text to which the user is referred – or perhaps there is no such referral at all (it is taken for granted that the two documents will be consulted together, and a repetition of information is considered superfluous). Whatever the case, it is this specific characteristic which determines the distribution of roles in denomination between the written text and the cartographical "text", with the former taking over what is normally performed by the latter.

However, if by itself, this generic feature is of no great importance, it becomes so when considered in relation to the procedures applied in performing denominative functions. In effect, in these maps enhancement and surrogation are expressed in ways that are quantitatively different; or, it would be clearer to say, the administrative map is characterised by a *weak* function of enhancement and a strong function of surrogation. The weak enhancement arises from the fact that such maps are not intended to serve as instruments of reference: in effect, given that such works were intended for purely internal administrative use, the map does not aim to define a referential denomination (which might well simply be given in the written text). What is more, an administrative map does not serve as a symbolic object either – and so, similarly, it does not contain images that might well convey such symbolic messages. However, the scarcity of names present is counterbalanced by the presence of a large number of denominative surrogates, which aim to define geographical features by reference to the essential components of direct experience. The administrative map aims to function at the performative level; the illustration of a project implemented or to be implemented is primarily designed to increase the amount of practical knowledge that accompanies technical/operational knowledge in the process of decision-making. This is why there is *strong denominative surrogation*, and also why one can claim that *denominative projection in the administrative map is carried out at the performative level*[45].

One should also add another point that reveals the powerful political implications of such maps. Any project to be implemented or already implemented is part of a social project – that is, it answers to a territorial logic that arises from a specific ideology. Let us presuppose that each project proposes an end-result that can be achieved through strategies established by a particular rationale. This means that each associated act – including the denomination incorporated in cartography – is coherent with

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[45] There is a brilliant demonstration of this process in: L. Gaffuri, *Trasfigurazioni della pietà, l'azione territoriale dell'Ospedale Maggiore di Milano tra Sette e Ottocento*, Unicopli, Milan, 1996, esp. chap. V.

the objectives of the project[46]. At this point it would be ingenuous to try and establish the objectivity of administrative maps. Such maps have only a weak interest in giving a faithful description of territory, whilst they are deeply committed to an iconisation of territory, using images to expounded a theory – that is, illustrate the ideas that are the basis of the entire project.

So, administrative maps are a performative representation resting on weak enhancement but strong surrogation, and they operate at an iconological rather than a descriptive level. There are numerous examples that bear out this analytical description – for instance, that sizeable body of cartography drawn up by the various Venetian institutions responsible for the management of territorial resources.

Venetian Maps and Magistrature

Venetian cartography is unique in that, from the sixteenth century onwards, it was an ever-present tool in the working life of the various offices responsible for the management and protection of territorial resources[47].

Elsewhere, visual – and other – knowledge of sites (with the concomitant use of cartography as one of the instruments of administrative control) would become widespread only two centuries later, when a general registration of territory – in cadastral lots – would lead to a uniform method for the selection and organisation of information. The reasons for Venice being ahead of the times are to be found in the context within which Veneto cartography developed and also in the political background that generated the special administrative structure of La Serenissima.

In the sixteenth century Venice became a land rather than a predominantly sea power, and thus found itself having to govern an economy that was no longer based solely on trade but also on the exploitation of its own territorial resources[48]. The city thenceforward established a very different relation with its hinterland. Mainland territories now had a very precise role: they were the theatre in which the State asserted and affirmed its power. This was a political

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[46] For example, it has been shown that the cadastral registry of the territory of the State of Milan that was drawn up in the eighteenth century (during the time of Hapsburg rule) was, in part, intended to stimulate and intensify the development of capitalist forms of agriculture in the Lombardy areas of the Po valley. See: *ibid.*

[47] Of the many works on Venetian cartography, one might consult: E. Bevilacqua, "Geografi e cartografi", in: *Storia della cultura veneta*, v. 3, II, Neri Pozza, Vicenza, 1980, pp. 355-374; E. Casti Moreschi, "Cartografia e politica territoriale nella Repubblica di Venezia (secoli XIV-XVIII)", in: *La cartografia italiana, Cicle de conferències sobre Història de la Cartografia*, Istitut Cartogràfic de Catalunya, Barcelona, 1993, pp. 81-101.

[48] The fundamental works on Venice and the role it took on in its mainland dominions are: M. Berengo, *La civiltà veneziana nel Settecento*, Sansoni, Florence, 1960; D. Beltrami, *Forze di lavoro e proprietà fondiaria nelle campagne venete nei secoli XVII e XVIII,* San Giorgio Maggiore, Venice-Rome, 1960; A. Ventura, *Nobiltà e popolo nella società veneta del '400 e del '500*, Laterza, Bari, 1965; G. Cozzi (ed.), *Stato società e giustizia nella Repubblica Veneta (sec. XV-XVIII)*, Jouvence, Rome, 1980.

project that led to a new phase in the appropriation, control and management of the mainland. In short, a new type of territorialisation got underway[49]. This was the reason for the far-ranging revolution within the administration of the State, whose control of its mainland domains required a thorough framework of administrators, technicians and legislators. And thus some two centuries ahead of other European nations, Venice was using cartography as an instrument of territorial management – a task which the State had entrusted to a series of *Magistrature* (Authorities) with varying responsibilities. As early as 1460 a Senate decree had required all the *rettori* (city governors) of the mainland to draw up chorographical maps of the areas under their jurisdiction and forward them to Venice. These maps would be kept at the Venetian Chancellery – in the Council Chamber itself (where they were ready for consultation whenever needed). The instructions laid down that the maps were to show the longitude and latitude of sites, together with borders, the main characteristics of neighbouring states and information with regard to transportation routes. The maps were to be drawn up by experts after a series of on-the-ground measurements and surveys, and they were to respect all the characteristics of a geographical map "with signs indicating the winds, and east and west, with cities, rivers and plains and the distances between one place and another". Thus it is clear that good government was seen to depend on the collection of as much territorial information as possible – a task that was entrusted to the various *Magistrature*. And there is ample documentation of the history of the entire region of the Veneto to be found in the archives of these institutions, which were a very early feature of the Serenissima's administrative organisation. At the end of the sixteenth century, the city established a number of technical bodies capable of deciding and implementing territorial projects; these could draw on a whole range of different expertise and experience, and hence took on responsibility for all aspects of territorial management. This was partly due to the highly articulated nature of the Serenissima's state and administrative apparatus, but should also be seen as reflecting a new awareness of the problems relating to environmental resources[50] (Figure 6).

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[49] On the history of the Venice administration and the projects involving its territory, see these contemporary sources: M. Cornaro (1412-1464), *Scritture sulla laguna*, edited by G. Pavanello, in: *Antichi scrittori d'idraulica veneta, I, Magistrato alle acque*, Venice, 1919, (1987 reprint); C. Sabbadino, "Discorsi sopra la laguna", ed. R. Cessi, in: *Antichi scrittori d'idraulica veneta, II, 1, Magistrato alle acque*, Venice, 1930 (1987 reprint); C. Tentori, *Della legislazione veneziana sulla preservazione della laguna*, Venice, 1792. On the same subject one might also consult: S. Ciriacono, "Irrigazione e produttività agraria nella terraferma veneta tra Cinque e Seicento", in: *Archivio Veneto,* 112, 1979; *Id.*, "L'idraulica veneta: scienza, agricoltura e difesa del territorio dalla prima alla seconda rivoluzione scientifica", in: G. Arnaldi and M. Pastore Stocchi (eds.), *Storia della cultura veneta. Il Seicento*, 5/II, Neri Pozza, Vicenza, 1986, pp. 347-378; S. Escobar, "Il controllo delle acque a Venezia nel Cinquecento: tra progetto tecnico e progetto politico", in: *Storia d'Italia*, Annali, Einaudi, Turin, 1980, pp. 104-153.

[50] On the emergence of the various *magistrature*, see the following exhibition catalogues produced by the Venice State Archives: M. F. Tiepolo (ed.), *Laguna, lidi, fiumi cinque secoli di gestione delle acque*, Venice, 1983; *Id.*, *Cartografia, disegni, miniature della magistratura veneziana*, Venice, 1984; *Id.*, *Ambiente scientifico veneziano tra Cinque e Seicento*, Venice, 1985; *Id.*, *Ambiente e risorse nella politica veneziana*, Venice, 1989. Though other Italian states had
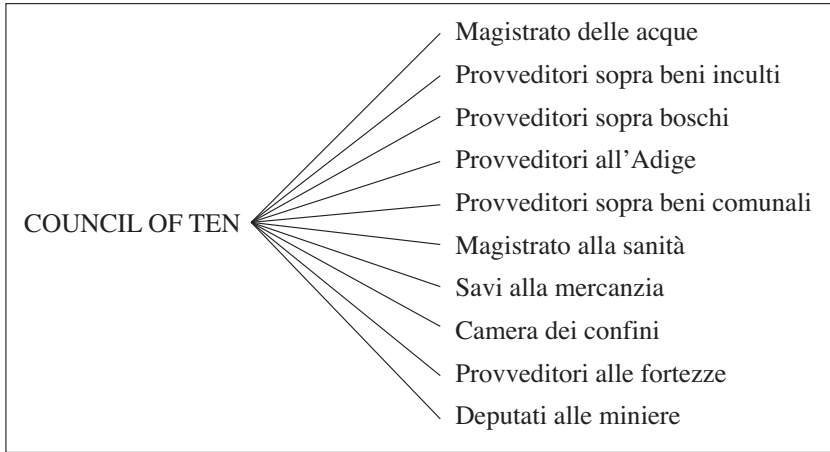
Figure 6 - *The Venetian Magistrature responsible for territorial management.*

The powers invested in the *Magistrature* were decisional, executive and technical, and – to an extent – they had total operational freedom, enjoying full independence in implementing and completing projects[51] (Figure 7).

Figure 7 - *The powers of the Venetian Magistrature.*

The "magistrates" could draw on the services of numerous illustrious technicians: almost all the city's great engineers and architects served – at least

administrative institutions for the protection and management of territorial resources, none of those bodies had either the characteristics or the integrated administrative role of the Venice *magistrature*. Amongst the vast literature on this subject, one might consult: L. Rombai, "Cartografia e uso del territorio in Italia. La Toscana fiorentina e lucchese, realtà regionale rappresentativa dell'Italia centrale", in: *La cartografia italiana, Cicle de conferències sobre História de la Cartografia*, Istitut Cartogràfic de Catalunya, Barcelona, 1993, pp. 105-146.

[51] Only certain important problems of public interest – such as those relating to the safeguarding of the lagoon – had, after presentation and discussion, to be formally voted upon by the Venetian Senate.
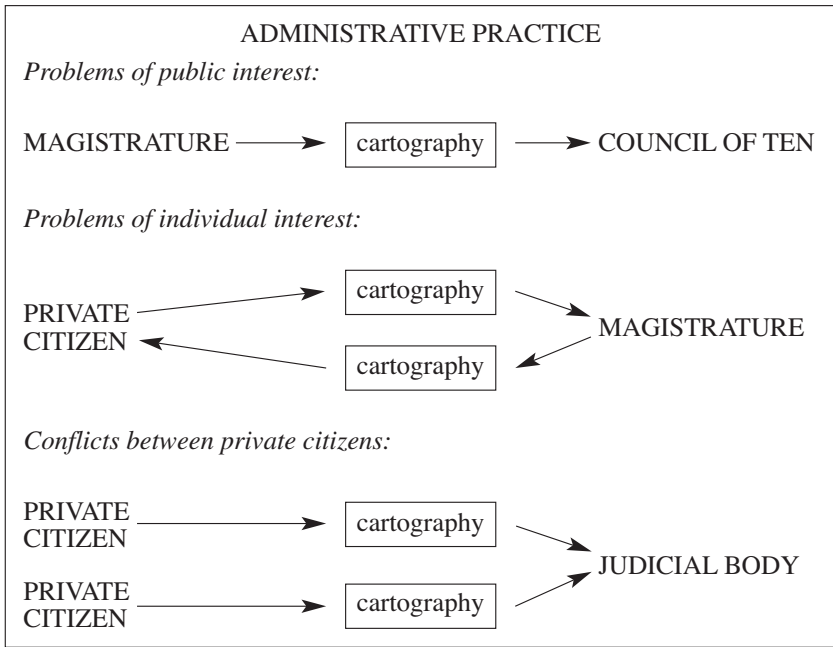
ADMINISTRATIVE PRACTICE

Problems of public interest:

MAGISTRATURE ⟶ cartography ⟶ COUNCIL OF TEN

Problems of individual interest:

PRIVATE CITIZEN — cartography / cartography — MAGISTRATURE

Conflicts between private citizens:

PRIVATE CITIZEN ⟶ cartography

PRIVATE CITIZEN ⟶ cartography — JUDICIAL BODY

Figure 8 - *The variety of administrative praxis.*

occasionally – as consultants, *proti* [head of works] or *periti* [experts]. This latter role was particularly important, given that those involved did not actually implement the projects decided by the powers-that-be, but aimed to effect some sort of balance between available theoretical and scientific knowledge and considerations of environmental protection. Alongside these authoritative cartographers at the service of the Serenissima there were also a large number of technicians or *perticatori* [measurer of fields, land surveyors] who produced the juridical/administrative cartography that was used in deciding land disputes or else were attached to the various "appeals" addressed to the Senate. This area of the State administration produced an enormous mass of documents, because any land dispute or claim naturally led to the commissioning of surveys and measurements by the parties concerned, while the state technicians themselves were also responsible for producing their own representation of the area in question. State functionary and privately-commissioned technician might often opt for different interpretations, thus giving voice to the various interests at play in a particular dispute. Indeed, the different languages – and different information – they chose to use, might sometimes lead to conflicting pictures of the same thing.

So, administration depended on a network of multiple relations that drew together different agents, according to the type of problem that was to be dealt with (Figure 8).

A map covering problems of public interest would be drawn up by the technicians of the *Magistratura* concerned and then presented before the *Council of Ten*, whilst disputes over private questions might result in two types of cartography: first there were maps commissioned by the private citizen who was raising the particular question, then there was the official map drawn up by the *Magistratura* which was responsible for settling the question. Similarly, disputes between private individuals or monastic orders – over such things as property rights, water rights, land boundaries, etc. – were again illustrated by two maps – one each for both parties involved – which were then submitted to the judicial body that could decide the matter.

When we find the same area or question illustrated by maps commissioned by bodies or individuals whose position differs from that of the administration, we can not only compare the different points of view of the cartographers involved but also compare the two documents in order to get some idea of the extent to which such maps were "theory-bound".

Nevertheless, however "distorted" such maps might be, cartography was gradually establishing itself as a constant feature of administrative praxis. This not only explains the large number of documents produced, but also enables us to see how maps became an essential means of symbolic mediation.

Two of the most important bodies responsible for territorial policy were the *Magistratura alle Acque* (Waterways Authority) and the *Magistratura ai Beni Inculti* (Authority for Uncultivated Resources). The first was responsible for all questions relating to the management and organisation of waterways and water resources[52], the second for all questions relating to land reclamation[53]. I will look at the work of two cartographers who worked for these Authorities: Cristoforo Sabbadino and Cristoforo Sorte – both engineers and *proti* for the *Magistratura alle Acque* and the *Magistratura ai Beni Inculti* respectively. Hence, they were not only responsible for drawing up maps, but also for making technical decisions with regard to the projects that might be implemented. This naturally means that the works they produced express specific views of territory and territorial development.

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[52] The *Magistratura alle Acque* played a very important role in the management of territorial resources because it was responsible for the very complex relation between Venice and its lagoon. In 1501 the Venetian Senate instituted the *Savi ed Eseutori alle Acque* – a permanent body with decision-making and executive powers. Its field of action covered three traditional sectors: lagoon, coastal areas and rivers. Though these were considered as interrelated, attention did focus on the lagoon, which was taken as of vital importance for the very survival of Venice. This lagoon, which was under threat from erosion and river silt, was the natural defensive barrier that isolated the city from the mainland but – at one and the same time – its own waters could be a threat for the raised – or laboriously reclaimed – areas upon which settlement depended.

[53] Another Venetian concern was the organisation and management of mainland resources. In 1556 the *Magistratura ai Beni Inculti* was set up to superintend land reclamation and the use of waterways and water resources.

Cristoforo Sabbadino's Map of the Territory around Treviso[54]

The first document we will analyse is dated 1558 and bears the title *Dissegno del Trivisan*. In fact, as well as this area and its rivers, the map also covers a sizeable part of the Venetian lagoon and a stretch of coast reaching as far as the lagoon of Caorle[55] (Figure 9). This is the area covered by a project that Sabbadino had been working on since 1540 and which is illustrated in a number of maps of the entire lagoon and associated hinterland[56]. The main aim of the scheme was to bring all the waters that flowed into the eastern part of the Venetian lagoon together in a single canal that would flow either into the Lio Maggiore or into the Piave itself – thus avoiding the lagoon altogether. The project was not implemented, but Sabbadino would return to it in one of his last dated "memos", drawn up in 1557 and thus very close in time to our map (which shows the same radically new reading of all the problems associated with water management as can be found in the proto's writings)[57].

His studies of the lagoon are the first to bring together a whole range of knowledge relating to tides, river flow and sea currents, which had previously been developed in utterly distinct areas of study. The result is a unified, dynamic and organic view of the lagoon, which is compared to a human body – with the influx and ebb of the sea's waters being seen as similar to breathing. If *one wants to keep this body fine, hale and healthy, then one must preserve it as a whole*, Sabbadino writes, and thus considers not only the "patrician lagoon" around the city of Venice itself but the whole extent of its waters from the Adige to the Piave – where the tides flow right up into the river estuaries and produce a beneficial ebb flow of *zosane* (lagoon and river-bed water), thus cleaning the lagoon, the built-up areas therein and the openings into the sea by flushing away fluvial deposits. It is, in fact, this very delicate peripheral lagoon environment – with its numerous

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[54] The analysis of this document is taken up from my "Rappresentazione e pratica denominativa: esempi dalla cartografia veneta cinquecentesca", in: G. Galliano (ed.), *Rappresentazioni e pratiche dello spazio in una prospettiva storico-geografica*, Centro Ital. per gli Studi Storico-Geografici, Rome, 1997, pp. 109-138.

[55] Coloured using paint and watercolours, this map is drawn on a parchment measuring 1023x745 mm. The scale is 1000 *passi trevisani* (Treviso yards) = 12 mm. (Archivio di Stato di Venezia, *Savi ed esecutori alle acque, Piave*, 5). For a fuller description of the document see: F. Cavazzana Romanelli, E. Casti Moreschi, *Laguna lidi e fiumi, esempi di cartografia storica commentata*, Archivio di Stato, Venice, s. d. (1984).

[56] The documents, in the Venice State Archives, are the following: 1545, The Lagoon with the island of Mazzorbo, Torcello and Burano, mm. 800x1300, (SEA, *Laguna* n. 8); 1546, Venice with the lagoon canals, mm. 2230x1500 (SEA, *Laguna* n. 9); 1556, The lagoon between the port of Brondolo and the Lio Maggiore canal, mm. 2400x1450 (1695 copy by Angelo Minorelli) (SEA, *Laguna* n. 13); 1557, Outside consolidation work in the built-up areas of Venice, mm. 620x830 (SEA, *Laguna* n. 14 bis); 1557, Chioggia and part of the Lagoon, mm. 1500x800 (SEA, *Laguna* n. 16). For a description and interpretation of these documents, see: E. Bevilacqua, "La cartografia storica della laguna di Venezia", in: *Mostra storica della laguna veneta* (catalogue to the exhibition held 11 July-27 September 1970), Archivio di Stato, Venice, 1970, pp. 141-146.

[57] *Magistrato alle Acque, Antichi scrittori d'idraulica veneta*, Venice, 1919-1952, 4 voll. See especially the volume: C. Sabbadino, *Discorsi sopra la laguna, II, I*.

settlements and wide variety of physical features – that the Chioggia-born Sabbadino depicts with such accurate draughtsmanship and carefully-nuanced use of colour. However, the survival of the lagoon – guaranteed by uninterrupted measures against the effects of river silting – concerns not only this very special habitat but also the islands that compose the city itself (which may not be part of the area depicted by the map but are an essential consideration in the proposal that is being put forward). This was the period when the traditional Venetian focus on maritime trade was shifting towards acquisition and exploitation of landed estates (the result – but often also the precursor – of Venice's military conquests on the mainland). Substantial economic interests were now centred around these country villas, which were a core for both agricultural and industrial activities. Moves to protect the lagoon itself – such as the re-routing of a river or the opening of a barrier in the fish farms – might well disrupt land irrigation or the working of watermills; so conflicts that look like theoretical discussions concerning the management of hydraulic systems were, in effect, the expression of a substantial clash of economic and political interests. The opting for one solution rather than another inevitably implied a view of the entire future of the Venetian State: was it to remain a thalassocracy or become a land power?

Such cartography could not present itself as offering a simple description of territorial data; its purpose was the presentation of a specific point of view with regard to that territory. This is why these maps operated more at the level of the iconic that the descriptive: the aim was to show the dynamics rather than the form of territory, in order to thence justify the proposals put forward on the basis of theoretical and scientific knowledge[58]. This aim is achieved by performative denominative *enhancement*. In effect, Sabbadino uses designators in different ways: those which have nothing to do with water are purely referential, without any emphasis being put of specific features, whilst when it comes to matters relating to tides, sea currents and rivers, denominative surrogates are used to enhance knowledge. In fact, he actual marks within the lagoon the results of marine tides: thanks to figurative and chromatic surrogates, the designator LAGUNA is specifically shown as an area without precisely-defined boundaries, an area which is delimited simply by a wide, indeterminate "amphibious" stretch of land (given that at both a daily and seasonal level, the ebb and flow of tides meant that boundaries were in some way elastic). The result was that it would be counterproductive to try and establish rigid barriers – such as embankments – to delimit the lagoon area: one must recognise the indeterminate nature of the lagoon and the need to keep it free of constrictive requirements. The dotted line indicating the areas that are periodically under water and the indefinite colouring (a cross

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[58] On the key economic – and social – importance of water resources, and on the attention the Serenissima devoted to such matters (to the point that it encouraged its scientists in this field to engage in an ample exchange of ideas with experts from other "water-based" States), see: S. Ciriacono, *Acque e agricoltura, Venezia, l'Olanda e la bonifica europea in età moderna*, F. Angeli, Milan, 1994.

Figure 9 - *Map of the Treviso territory,* Cristoforo Sabbadino *(1558).*

Figure 10 - *Map of the Treviso territory,* Cristoforo Sabbadino *(1558) - detail.*

between the green used for water and the brown used for land) indicating the area bordering the lagoon, aim to underline this dynamic feature (Figure 10). Marine currents are identified by the use of the designator MARE along with various surrogates (of colour or figuration) that indicate the presence of fluvial waters within the sea (shown pushed westward by tide flow and the general anti-clockwise motion of currents within the Adriatic). Finally, there is the designator FIUME PIAVE, which is used together with surrogates that indicate the Alpine source of the river and thus associate it with notions of danger: the volume of water in the Piave varies greatly with the seasons, and there are numerous unexpected spates. The river's meandering and frequent flooding are depicted through the use of colour and figuration. The river bed is shown in all its ramifications, with the same green-brown colour being used as that which indicates the "amphibious" areas bordering the lagoon. My claim that Sabbadino's aim here was to depict the dynamics of the Piave is borne out by the fact that none of the other watercourses in the map are depicted using these features (given that they flow from specific sources they do not have the same dangerous input of snowmelt – a danger which Sabbadino aims to depict cartographically).

However, the battle the cartographer was waging in defence of Venice and its lagoon was not only being fought against rivers and the violence of marine tides. There was another destabilising factor in the lagoon: humankind. As a well-known sonnet by Sabbadino points out: three "stations" of humanity have ruined the lagoon: patricians, engineers and private individuals.

One of Sabbadino's aim in the map is to illustrate the relation between man and water. Cartographically, the presence of mankind is indicated through territorial artefacts: settlements, roads, the re-routing of rivers and economic activities (fish farms). These constructions are indicated without any attempt at specific detail. Settlements are given by a designator used alongside a pink-coloured depiction of a church (a generic indication that this is a *pieve* – parish church – but without any attempt to include figurative surrogates that might identify characteristic distinguishing features). However, the use of designators to name all the settlements already serves to reveal the population density in the region and therefore indicate the demographic pressure that was no secondary consideration in the cartographer's presentation of the problems relating to the safeguarding of the lagoon.

Denominative enhancement is mainly concerned with hydraulic artefacts, or those which have some direct effect on the balance of water resources. FOSSAVECHIA and CAVANOVA, indicating the re-routing or channelling-off of rivers, are highlighted by a figurative depiction that makes them part of the natural hydraulic network (so that the use of *vecchia* and *nuova* – old and new – in their names is rendered semantically null and void): given that the increasing complexity of the system resulting from the presence of humankind cannot be considered as a temporary arrangement, human artefacts must be included within the permanent features of the entire hydraulic system. The river defences (MURI DE ...) placed along the banks of the Piave are indicated in the pink colour of other human

constructions and settlements – hence in the colour that is the most striking indication of human presence.

The economic activity depicted within the lagoon is that connected with the fish farms. However, the designators for these *valli* (VAL DOGADE and VAL ROZA) also indicate a serious conflict within the lagoon: on the one hand there are the important economic benefits resulting from these structures, on the other the negative effects they have on the free flow and ebb of the lagoon waters. The Venetian government had been at grips with this problem of fish farms for more than a century: often these structures had been dismantled as a result of official rulings, but then – some time later – they would be re-established because they were too profitable to abandon altogether. So, it is no coincidence that of all the economic activities sited in the lagoon, Sabbadino should choose to depict this one. Similarly, it is no coincidence that the colours and dotted lines used in indicating these fish farms show them to be part of the area of lagoon expansion – thus indicating that they obstruct its "breathing".

Another aspect of denominative enhancement is the repetition of certain designators with different-sized lettering and spacing. This not only means that there are various scales for reading the map but, more importantly, it can serve to indicate that certain territorial features can have an effect at both a local and regional level.

At this point it seems beyond question that the map itself is theory-bound, nor can one fail to see the role played by denominative projection. The presence of many designators – and the varying ways these are accompanied by surrogates – indicates the particular focus on the dynamics of the water system (which is described using the features available to the science of the day). What we have here is an important example of performative enhancement designed to support a precise thesis: given that rivers, sea and humankind all have an effect on the lagoon, the safeguarding thereof is only possible if natural dynamics are respected and the activities of man are in some way controlled and constrained.

Plan of Irrigation of the Treviso Area by Cristoforo Sorte[59]

The second document I will look at is a map of 1556 entitled *Disegno da adaquar il Trivisan*, which shows the upper plain of the Treviso area, with the lagoon to the south and the Pre-Dolomites to the north[60] (Figure 11). Almost contemporary with Cristoforo Sabbadino's map – and covering some of the same area – this map is concerned with the use of water resources for

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[59] The analysis of this document is taken up from my "Rappresentazione e pratica denominativa: esempi dalla cartografia veneta cinquecentesca".

[60] This water-coloured map is on paper reinforced with canvas and measures 1055x1835 mm.. There is no scale given (Archivio di Stato di Venezia, *Savi ed esecutori alle acque*, *Diversi*, 5). For a fuller description, see: F. Cavazzana Romanelli, E. Casti Moreschi, *Laguna, lidi e fiumi*, pp. 37-44.

agriculture and irrigation. In the mid-sixteenth century the marshy areas around the lagoon were drained and reclaimed, and at the same time opportunities emerged for more efficient exploitation of the region's agricultural land through the provision of an adequate irrigation system. In 1556, in order to meet the need for higher agricultural output by making more land available for cultivation, the Venetian Senate appointed three *Provveditori* to the *Magistratura ai Beni Inculti* (the body responsible for land reclamation and for the concession of water resources for individual use). One should recall here that Venice considered all water resources as state property, to be directly controlled and administered by officially-appointed bodies. The document I will discuss here does not bear the author's name. However there is an extant Senate *commissione* (letter of appointment) sent to Giovanni Donà[61] which makes explicit reference to one *maestro Christoforo da Verona*, who is to accompany Donà on his tour of inspection and "put into drawings the places and sites visited". This must be that same Cristoforo Sorte who is now recognised as one of the greatest of sixteenth-century cartographers. A multi-faceted personality, he had started his professional life as an apprentice in the Mantua studio of the painter Giulio Romano, but then gained experience in land-surveying (and, above all, in the mapping of mountain regions) working alongside his father Giovanni Antonio, engineer to Bernardo di Cles, Cardinal of Trento (it was in that city that the young Cristoforo would also come into contact with the North European tradition of landscape cartography). As well as working as a cartographer for the Venetian Republic, Sorte would for many decades serve as a *perito* (expert) on hydraulic engineering with the *Magistratura ai Beni Inculti*. He would, for example, be commissioned by the Venetian Senate to draw up five large maps covering the entire mainland dominions of the Serenissima. These were to hang in the *Sala dei Pregadi* in the Doge's Palace and would be a sort of celebration of the might of the State, offering a pictorial demonstration of its grandeur to those who would refer to the maps when making political decisions. A need for political secrecy – which probably made itself felt only at a later date – would subsequently lead to these maps being moved and shut away with other reserved state documents. With the fall of the Serenissima, this collection of maps would be broken up, and now they can be seen in different collections in Venice and Vienna[62].

This map of the irrigation of the Treviso area shows that Sorte was involved in the administrative surveys of the *terra firma* from the very early days of the *Magistratura ai Beni Inculti*. It also reveals how the cartographers who worked in sixteenth-century Venice performed a number of different roles, which meant that the ways in which they represented territory might vary widely. However, here we should give some account of the specifically

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[61] Who would become *Provveditore* at the *Magistratura ai Beni Inculti* a few years later.

[62] On Sorte's work – and his cartographical output in particular – see: J. Schulz, *La cartografia tra scienza e arte*, Panini, Ferrara, 1990, espec. pp. 65-95. The book also gives a full up-to-date bibliography on Sorte.

cartographical expertise of Sorte himself. Drawing on Leonardo's method of perspective – which met certain precise needs of cartography – Cristoforo Sorte would often vary the types of projection used within a single map, according to the type of territory he was representing: for plain areas he used a groundplan image, whilst for mountainous or hilly areas he adopted an angled bird's eye perspective. For plain areas he gave ground measurements, whilst with mountains and hills he gave the distance between the highest areas and some pre-established viewpoints (which he fixed himself). This enabled him to give readings of elevation that varied according to point of view – readings which could then be superimposed to give a volumetric image of the mountainous region concerned. However, the document we have here does not employ these two techniques: the map uses perspective alone – perhaps because the chain of the Dolomites to the north serves only to mark the boundary of the plain area that is the true focus of the map. Sorte has chosen a raised observation point, in the south-western area of the territory (shown in the bottom left-hand corner). The map itself is aligned with north towards the top – shown by an arrow in the upper margin of the sheet – whilst the other directions are indicated by the initials for the main winds. Indeed, the general cartographical procedures used here herald the innovations of modern cartography and indicate the professional stature of the man who produced it.

Cristoforo Sorte is in many ways a perfect cartographer for this study because he experiments with all the opportunities offered by the cartographical medium, fully aware that even the slightest sign within his drawing corresponds to a precise message. This leads me to argue here that his use of denomination is dictated by a clear awareness of the communicative possibilities offered by the map.

Like Sabbadino's map, Sorte's representation of territory emphasises the iconic. The thesis his work aims to support is that a programme to encourage exploitation of the existing irrigation canals (*Brentella di Pederobba* and the *Piavesella di Nervesa*), together with adequate concessions for the use of water resources, could make the whole of the (originally arid) upper plain of the Treviso area into fertile farming land. The depiction of the large number of – clearly imaginary – tree-lined fields throughout a large part of this area is obviously intended to allude to the inherent fertility of the soil, and thus offer a forceful argument in favour of the project proposed. The aim is, in fact, not only to demonstrate that the proposal is feasible but that it is actually beyond discussion.

From the point of view of denomination, this map adopts a different strategy to that in Sabbadino's work, opting for *weak* enhancement and *heavy* surrogation. By weak enhancement, I mean that there are only a few designators that have placename reference: TREVISO, MONTELLO, PIAVE, SILE and a few other settlements giving onto the rivers. That these are examples of referential denomination is borne out by the absence of surrogates that indicate characteristic identifying features of the object of reference. Apart from Treviso – whose city walls are traced out – all the

Figure 11 - *"Drawing for the Irrigation of the Treviso Area"*, Cristoforo Sorte *(1556)*.
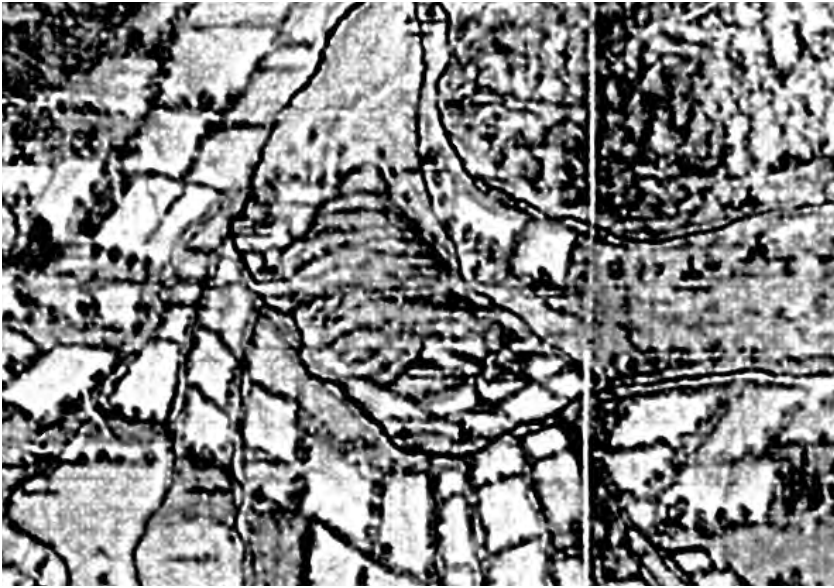
Figure 12 - *"Drawing for the Irrigation of the Treviso Area",* Cristoforo Sorte *(1556) - detail.*

others are indicated either with the conventional symbol for a settlement (a church) or by a conventional colour (blue for water). The focus on settlements along waterways emphasises the importance such canals have in encouraging widespread human occupation of the territory. For the rest, the map is empty of designators and functions by means of denominative surrogation, which aims to make the image appear "natural". Using forms and colours to offer an analogical rendition of the features of the territory, the cartographer attempts to communicate performative data: for example, the form of the highland mass together with the use of the colour brown indicates the beginning of the Dolomite foothills. The same surrogates are then used to give a figurative rendition of the cone-shaped landmass occupied by Montebelluna, bringing out how the site originated with the change in course of the river Piave (Figure 12). The use of colour and the figurative depiction of the watercourses offers an image of the sloping terrain and helps to distinguish between the upper river plain and the lower. The uplands are rendered using the colour ochre, which gives an idea of both altitude and aridity. This is contrasted with the lower plain, which is rich in water (often collecting in stagnant areas where insufficient gradient hampers drainage); in the map this area is shown covered in vegetation or with a blue-green colour used to indicate humid terrain. The ample lots of cultivated land – shown perspectively with scant respect for scale – are all linked with the watercourses or placed near them. This bears witness to the fact that the economy of the region is largely based on agriculture – which, given the specific character of the terrain, would benefit greatly from an extensive network of irrigation channels. As in the previously discussed map, the surrogates are used to provide a performative description, in that they enable one to grasp the features that emerge from empirical/practical knowledge of the territory in question. However, even more importantly, the surrogates indicate that the project for modifications is being put forward only after a careful consideration of the scientific data currently available. One should also point out how the use of morphological features in this depiction of the terrain not only indicates that nature is "governable" but also reveals how feasibly agricultural production can be stimulated. The end result is a clear argument in favour of the project for irrigation, which would have the added benefit of postponing the land reclamation projects around the edge of the Venetian lagoon itself. In fact, even though it is depicted in a partial and inaccurate manner, the lagoon is shown here as the continuation of the area under consideration, and actually emerges as the main concern in the project being put forward. The message of the drawing seems to be that it is the management of water resources – not the mere presence of water by itself or the original nature of terrain – that makes an area suitable for settlement and the development of profitable human activity. So here again we can make out a communicative purpose that is clearly iconic: the proposal of land reclamation as a programme of action that can make a positive contribution towards the safeguarding of the lagoon.

To sum up what has been argued so far means summarising the various levels at which the two maps have been analysed: first of all there is the question of the documents themselves and then the question of the theoretical framework adopted in examining them. Let us look first at the results of our division between designators and denominative surrogates in these maps. The use of surrogates in denominative projection has been revealed to contain mechanisms of enhancement. In effect, the map itself is an enhancement of denomination; it has a life of its own and therefore can establish which information is to be communicated and which is to be "neutralised". We have also seen that the metrics of cartography applied here does not only decide the order in which things are represented, but also has an influence on their significance and meaning: enhancement and surrogation are used in an attempt to achieve a balance between the density and clarity of performative meaning. In short, if it is to convince the recipient of the validity of the project embodied, the map has to: a) decide just how much information will be conveyed; b) guarantee an adequate level of specific detail; c) direct attention to certain emphasised aspects.

The end result of this is the transmission of a theoretical core of information – that is, a process of iconization. The highest expression of this is in the maps' use of symbols: the goal to be achieved is rendered through a synthesis in which designator and surrogates function in a symbolic mediation that reflects social praxis and ideological constructs. The map is not a window thrown open onto the world, it is a deceptive symbolic system which may appear to be natural and transparent but which conceals within it a mechanism of representation that is cryptic, distorted and arbitrary[63].

But it is precisely this theory-bound nature of administrative cartography that enables us to see territory as process. This emerges because the use of surrogation and denominative enhancement reveals that the map does not depict landscape pure and simple (in its most banal form) but rather a series of territorial dynamics, which are the result of the relation between humankind and nature. From the level at which we are interpreting the map, we see that it does not only serve to register an already-completed achievement, but to indicate intentions, knowledge and projects for future territorial modifications. It is not important to know whether the fields in Sorte's maps actually existed, or whether one could actually see the dispersion of river waters within the sea as one can see them in Sabbadino's map. What is important is that these messages – which we might define as "illusionary" – show how technical experts could use maps as means of persuasion in public debates. The cartographer could emphasise and underline those elements which, amongst all the information contained in a map, were the factors most worthy of taking into consideration – and in doing so he performed a highly effective rhetorical operation.

To discover Venice's policy with regard to water resources, one can look at

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[63] On the "non-transparency" of maps, see: J. B. Harley, "Deconstructing the map", in *Cartographica*.…

a whole range of material; one can even study contemporary engineering treatises in order to understand the level of technical know-how available at the time. However, it is maps that show us how this knowledge was transmitted to the organs of government. An inspection of such documents reveals the extent to which the symbolic mediation they performed could influence debates on these technical questions. It becomes clear that a map was a cultural product that, in its turn, determined culture in a variety of ways: it drew on the cognitive heritage of a specific society at the same time as it increased that society's territorial knowledge. In effect, cartographical knowledge respects the conventions laid down for the exercise of social control but is, at the same time, an autonomous means of communication, capable of presenting new territorial strategies. And it is this ability of maps which means that they can impose a new interpretation of the world, whilst still remaining part of that mechanism of social control which produced them.

3.3 *The Icon Bursts onto the Scene*

If we now turn from the social role of the maps just analysed to the implication of the above-mentioned link between designators and surrogates, it is clear that it is time to offer a more precise definition of the union between the two. So, let's look at the results of this pairing. The most significant effect seems to be that on the designator, due to: i) a reinforcing of referentiality; ii) an accruement of connotation; iii) prescription as to how the meaning of that designator is to be understood. So one can take the grouping of designator-surrogate as forming a solid unit, which is in some way independent of the designator taken on its own. This unit is the end-result of the process of "making figurative" – which is one of those that serves as a means of semanticisation. In fact, we have already seen that through this process of "making figurative" referential designators can acquire connotative aspects. Hence, we could argue that denominative projection acts on all designators, developing and increasing their content and associations[64]. Similarly, we have seen how different communicative systems can be brought into play within a single unified "container". Therefore, we are justified in seeing all these outcomes as resulting from one specific juncture (Figure 13).

Thus one can refer to the designator-surrogate unit as a complex which has a precise role, and which corresponds to what in studies of semiotics is defined as an "icon" – that is, a *figure that takes on a designator, endowing it with a specific "investment" that can reinforce its reference and also produce a connotative transformation*[65]. Given that it is not the product of primary semanticisation, the icon does not have a direct link with the object to which it refers (the original referent being the designator). This is why there

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[64] See figure 5.

[65] This is an adaptation of the definition developed within the field of linguistic semiotics (A. J. Greimas and J. Courtés, *Sémiotique…*, p. 178).
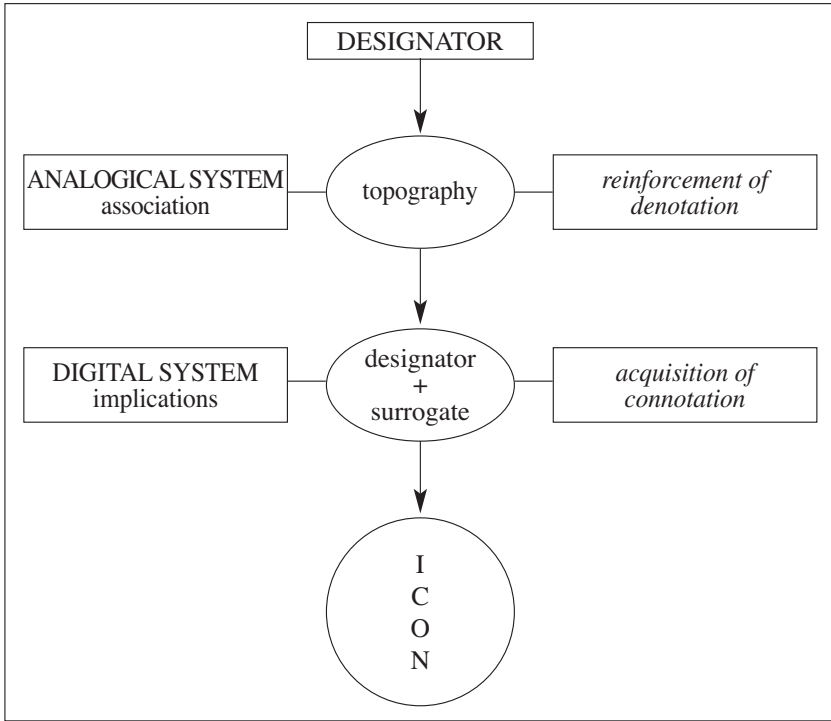
DESIGNATOR

ANALOGICAL SYSTEM
association

topography

*reinforcement of
denotation*

DIGITAL SYSTEM
implications

designator
+
surrogate

*acquisition of
connotation*

I
C
O
N

Figure 13 - *The result of denominative projection: the icon.*

I
C
O
N

ROME

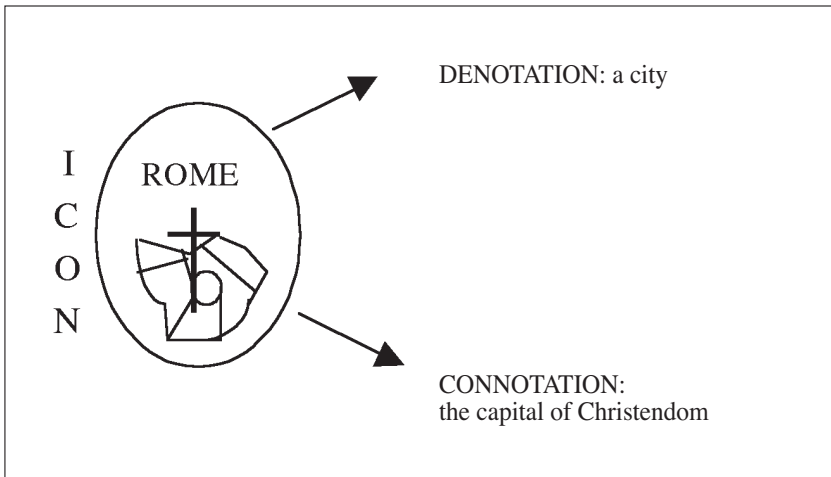DENOTATION: a city

CONNOTATION:
the capital of Christendom

Figure 14 - *The various levels of the icon.*

are not as many icons as there are geographical features; the number of icons is determined by the possibilities arising from the pairing between designator and denominative surrogates. The city of Rome, for example, can be indicated by a designator and a small circle, and this icon – the pairing of an abstract figure and designator – serves as a generic underlining of the fact that Rome is a city. However, if the same city were indicate by designator and a figure depicting the Vatican, the icon would underline Rome's significance as the centre of Christianity (Figure 14). Similarly, other pairings could present Rome as the capital of Italy, a compendium of Classical antiquity, a centre of the film industry, etc.

One can see the same variation in outcome with icons that refer to natural features or phenomena. A mountain can be rendered by contours, which identify "that" geographical feature simply thanks to their layout on the page: from their shape and the distance between them one can recognise the various faces of the mountain and thus the total appearance of the whole. In this case two denominative surrogates – contour lines and their arrangement on the sheet – produce a denominative projection by means of surrogation. And yet the same mountain could be rendered using a designator together with a different figurative surrogate – a "molehill", or a number indicating altitude, or a surrogate that gives information concerning vegetation rather than height. All of these various ways of making the designator figurative create icons. Thus the icon is the product of a pairing between designator and surrogates, or between surrogate and surrogate. All of this is not without its effect at the semantic level, because the codifications that are created within the icon are closely related to the type of reference/designator involved.

Hence the icon is a *knowledge-bearing sign whose content reflects values and forms social behaviour, and which functions thanks to both denotation and connotation*. The first can be seen in the icon's referential function – that is, in the fact it is possible to situate the designators within the map – the second can be seen in the creation of meanings that in some way echo social context.

Let us look at the relation between the denotative result of an icon and the type of designator involved. As is well known, designators vary, depending upon whether they indicate an individual entity or a class. In the first case, the designator might be defined as *rigid* – that is, a name that applies to one site only; in the second case, the designator might be defined as *attributive* – that is, a name that can be applied to any site as long as it possesses certain defined properties. So, "river" is an attributive designator and "Piave" is a rigid designator. At which point one might argue *that icons develop rigid designators only*. This claim is not only based on the result of empirical study, but can also be supported by theoretical reflections.

We have already said that an icon is a pairing between designator and surrogate or between surrogate and surrogate. But in that first case, if the designator were attributive it would be redundant to use a surrogate along with the name (given that the former could only repeat already indicated

attributes without adding anything further). What is more, the positioning of the designator on a map is essential in making it rigid: the cartographical message always tends to identify only *that* object (if only because the objects are placed at a precise point on the map). For its part, an attributive designator refers to a feature indicated by a single surrogate: a point on a map serves the same function as "place", a peaked line is the equivalent of "a mountain", a blue line "a river", and so on. But when those single surrogates are linked with a name or another surrogate, then what is indicated is *that* place, *that* mountain, *that* river. So at a denotative level, what the individual surrogate does is communicate what could be communicated by an attributive designator (for example, the nouns "river", "place", "mountain", etc) – but it cannot make a contribution to cartographical communication unless it forms part of an icon with other surrogates. In effect, it is the icon that makes for communication – given that the surrogate taken by itself cannot convey additional information. The icon, on the contrary, enhances communication at a denotative level and thence identifies the geographical feature in such a way that it transforms the content of an attributive designator, making it in many ways similar to the content of a rigid designator. In other words, at a denotative level the semantic action of the icon influences the very identification of the object indicated by the designator (thanks to an intensification of information).

At a connotative level, one must consider the role that the icon plays in the process of *topomorphosis*. In effect, at a semiotic level, the map is a metalanguage, and so one cannot identify as specific to it processes which, though perhaps present, actually belong amongst those of the first-level generation of "territory" as such[66]. We can recognise, however, that the process of symbolisation carried out by the map – taking up what has been established by denomination and developing its communicative import – has an extremely important result. This is because denominative projection does not simply involve the addition of meaning to referential designators but may actually lead to a re-ordering of the hierarchy of meanings – thanks to what is conveyed by symbolic and performative designators. This fact is not without important practical implications, as we shall see later.

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[66] The conceptual networks that reveal the application of social requirements upon territory are discussed in: A. Turco "Semiotica del territorio…", p. 373; *Id.*, "L'ordine infinito…".

Chapter Four

THE SYNTAX OF MAPS

Une ligne toute seule n'a pas de signification;
il en faut une seconde pour lui donner de l'expression.
(E. Delacroix)

4.1 *Iconic Connections*

As will have become clear by now there is something rather artificial about an analysis of maps that attempts to discuss their different "components" in isolation; an approach that considers cartographical metalanguage as made up of a number of autonomous segments fails to understand the real nature of that language. Codified signs begin to function as such precisely because incorporated within a series of relations – which, in part, arise from the act of codification itself and, in part, from the pragmatic use and application of those signs.

My starting-point in the discussion of the syntax of maps will be the syntactical analysis of territory. We know that this is to be based on the identification of the relations between designators – that is, on the links established between signifiers and which thus render concepts communicable. I will thence look at the relations that are created within the icons that are the product of denominative projection (all the time recognising that connotation is not a question of a fragment of a sequence associated with a single icon but rather a question of the concatenation between all the icons themselves).

A map may be seen as an assembly of symbols, each one of which is at the centre of a network of connections with other symbols. In effect, the icon reveals its symbolic nature by presenting itself as a "figure" that communicates certain connotations linked with the designator. So, if semanticisation transforms territory into an assembly of symbols in which syntax "is nothing other than symbolic coherence"[1], then the map, by codifying the "figures" that can render the connotations of a designator, creates symbols which, in their turn, are revealed to have their own rules of syntax. It should also be remembered that an analysis of the syntax of maps – that is, of the relations between icons – necessarily involves a focus on the mechanisms which are at work in the production, organisation and functioning of the syntagmas that form the framework for cartographical narration. This is to say that the connections are not to be understood simply as something that makes the presence of symbols coherent; what one must look at is their innate capacity to generate new levels of

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[1] A. Turco, "Semiotica del territorio congetture, esplorazioni, progetti", in: *Rivista Geografica Italiana*, 101, 1994, pp. 365-383, see p. 373.

communications (which go beyond the original intentions of the person who created the map).

The syntactical analysis of the semanticisation of territory can focus on both denotation and connotation, which – as we have seen – are the two practices as the basis of the codes governing this process[2]. The analysis of territorial semanticisation reveals the presence of certain forms of syntax, highlighting how these employ the *referential* role of the object/symbol (in relation to others), its *iconic* status (what its presence means in this particular context of symbols) or its *spatial* location (the physical/natural relations between object/symbols). If we then look at connotation, we see that the syntax of *territory* is constructed of concatenations of *conjunctions* or *disjunctions* which give rise to specific *syntagmas* – that is, to relational wholes which enable one to understand how a particular territory functions.

Taking this approach to cartographical syntax, let us look at how the meaning of the connection between icons can vary according to the type of analysis being applied. If one looks at their *denotative* function, one sees that icons are fragments of discourse, which acquire coherence when organised in specific relations to each other; if one looks at their *connotative* function, one sees that, within the map, icons create syntagmas that can generate a specific discourse or focus in relation to territorial process. One should, of course, point out that it is the denotative role of icons that lays the basis for this second function. In fact, as R. Barthes points out: "la connotation n'est que système, elle ne peut se définir qu'en termes de paradigme; la dénotation iconique n'est que syntagme, elle associe des éléments sans système: les connotateurs sont liés, actualisés, "parlés" à travers le syntagme de la dénotation: le monde discontinu des symboles plonge dans l'histoire de la scène dénotée comme dans un bain lustral d'innocence"[3]. So the two levels at work in semanticisation cannot be considered independent of each other, because connotation depends on denotation. It is important to stress this at the beginning as our aim is to focus on the self-referentiality of the map – that is, on its ability to take an activity role in communication thanks to the meanings that are generated within it. In other words, what interests us here is the *shift from denotation to connotation*. Hence, syntactical connections are to be investigated through the production of new combinations (or new series of syntagmas) – and thence justify our claim that what a map transmits is not a territorial reality but a cartographical reality.

Before I start my syntactical analysis, I want to insist on the fact that the elementary structure of the map is designed to reinforce the *referential* function of the icon. So, at the level of denotation, reference is one of the bases on which syntactical connections are formed. Once placed on a sheet of paper or parchment, an icon – by its very location – enters into relations

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[2] A. Turco, "Semiotica del territorio…", pp. 373 *et seq.*
[3] R. Barthes, *L'obvie et l'obtus*, Ed. du Seuil, Paris, 1982, p. 41. Reference is to the Italian edition: *L'ovvio e l'ottuso*, Einaudi, Turin, 1985, p. 40.

and connections with other icons: it is at a certain distance from them, above or below them, placed centrally or marginally. Hence, through these *disjunctive or conjunctive relations* with other icons it can play a part in creating referential syntagmas.

Another important type of disjunctive or conjunctive relations between icons depends on their distinguishing characteristics – that is, on what identifies them as different from or equal to each other (whether they refer to the same geographical feature or to different features). In effect, the icon is not a symbol that refers to a designator but is one of the many possible ways in which that designator may be communicated. So, if the icon of a wood – based on the combination of a figurative surrogate and a chromatic surrogate – appears in the same map for two different woods, maintaining the figurative surrogate unchanged but with some variation in the chromatic surrogate, then we know that there is some difference between these two woods (be it type, state of preservation, ownership or some other characteristic). In this case, the specific feature indicated becomes that which establishes identity. Similarly, in hydrography, the use of the colour blue with varying figurative codes enables us to understand whether the representation is a depiction of a large or small, narrow or wide, long or short river, lake or water mass. In these cases, the icon underlines what is considered the most important feature (size, quality, function, shape) that can serve to distinguish between two geographical features of the same type. However, when they refer to different types of geographical feature or phenomenon, the relative importance of an icon with relation to others is indicated disjunctively or conjunctively. That is to say, an icon stands out from amongst others not because of differences in one particular distinguishing feature, but because of its place in a hierarchical relation. Size, colour and position are considerations that serve to emphasise the central – or marginal – importance of the icon.

The very selection of the icons also says something about the occupation of *space*: the mere presence of the icon on a map indicates the importance of the physical/natural feature depicted. However, if that feature is placed in relation to others, then it goes to form part of a syntagma that makes it possible to trace out territorial dynamics. That is to say, that the occupation of space is indicated both by the empirical content of the icon (which can be recognised as relating to the feature represented) and by the relation between icons. A map may contain icons relating to hydrography, morphology, pedology or vegetation – and the coverage of these aspects results not only from their recognised physical/natural presence in the area charted, but also from the recognition that these fundamental components in the physical dynamics of territory can only really be understood by a consideration of the relations between them.

This is all more explicit at the *connotative level*. The syntactical organisation of territory establishes a precise order in the connection between icons. So, for example, a road map will place the icons relating to features of the road system hierarchically higher than icons relating to other

features. What is more, if we look at the relations between icons within the same syntagma, we can see the *conjunctive* and *disjunctive* links that establish the role of each icon in the representation of territory. We know that at the connotative level we are inevitably dealing with socially-accumulated knowledge which, as part of a map, has been submitted to specific modes of inclusion and organised within strict logical connections. What is more, we have seen that reference itself is to be determined by the connections that are established between icons thanks to their location on a map.

But perhaps an empirical analysis of specific works will make my argument clearer, and then later we will be able to go into further points in greater depth.

4.1.1 *The Cartography of Woodlands*

Here again I will base my discussion on Venetian administrative maps; and, again, if one is to understand the logic behind these works, one has to say something about the political/social context in which they were produced.

These maps of woodlands clearly show the social importance attributed to such territorial resources. In fact, if it is true that each society tends to dominate a highly complex real world thanks to the representation it makes of it, it is also true that such representations stimulate the implementation of projects for the productive use of territory. From this point of view, a woodland is not seen as a simple feature of the natural landscape but as a resource, something which can facilitate survival. Thus one must look at territorial policies – understood as the expression of a social will – if one is to follow the process of territorialisation and understand the type of relation that is established between humankind and its environment. The maps discussed here show the role the Republic of Venice took in the management of woodland resources on the *terra firma* – and, in particular, they reveal the territorial praxis that was implemented in order to study, manage and exploit these resources. Such praxis, as we have already seen, should be seen as part of the specific relationship that Venice established with its mainland territories (above all, from the sixteenth century onwards)[4]. It is worth recalling here that, from both an administrative and environmental point of view, there was a close interconnection between woodland and water resources. For example, two types of project were drawn up and/or implemented in order to prevent river deposits from silting up the lagoon: the first aimed to limit such deposits by re-routing

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[4] This does not mean that before Venice had not acquired the timber she needed, but that she did so simply by drawing on the supplies available in her mainland territories without thinking of instituting any kind of forestry policy. However, with the expansion of the Serenissima into a Mainland State and Sea State (the former commencing with Istria and Dalmatia in the twelfth century to then expand to the Treviso Marches (fourteenth century) and, a century later, to the Padua, Friuli and Cadore regions) various public offices began to take on reponsibility for the development and implementation of such a policy.

waterways, the second aimed to maintain woodlands as a way of slowing down land erosion in mountain areas and thus reducing the amount of detritus actually being carried by watercourses[5]. Waterways and woodlands, the lagoon and mainland mountains, were thus bound up in a close interweave that was one of the key considerations in Venetian policy in this area. Nor can one ignore the political importance of a presence that was necessarily wide-ranging (since Venice's aim was the exercise of control over the entire dynamics of the river and woodlands systems). Rivers and woods were the place where the State might present itself as a power capable of governing the natural world and – as a result – social development.

However, if environmental protection was the basis of Venice's relation with woodland resources, the city's interests in these areas did not end there. Venice itself was built on wooden piles and possessed a large fleet, so timber was one of its key raw materials. It is, therefore, no surprise that a massive amount of extant documentation reveals the Venetian government's interest in this natural resource[6].

One can identify three main objectives in Venetian forestry policy: i) environmental protection (against deforestation, land erosion and river deposits/lagoon silting); ii) management of woodlands (regulation of watercourses, silviculture); iii) exploitation of woodlands (surveys, inventories and the regulation of timber-felling)[7]. One should also add that the Serenissima was active here in a double role: on the one hand, it judged disputes between private individuals, on the other it was itself a litigant, asserting its authority over that of the various mountain communities, which saw the woodlands as part of a local agricultural system that had its own specific requirements (often in conflict with the interests of Venice itself and the measures it had taken to protect them)[8].

Hence a full overview of this variegated picture requires us to look at the work of various *magistrature* if we are to understand all the different aims and practices of Venice's solidly-based forestry policy[9]. It is interesting to

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[5] On the legislation regarding these territorial features, see: I. Cacciavillani, *Le leggi veneziane sul territorio 1471-1789. Boschi, fiumi, bonifiche e irrigazioni*, Signum ed., Padua, 1984.

[6] To understand the importance of timber for maritime cities, one need only bear in mind the argument put forward in: F. Braudel, *La Méditerranée et le monde méditerranéen à l'époque de Philippe II*, Colin, Paris, 1949. Reference is to the Italian edition: *Civiltà e imperi del Mediterraneo nell'età di Filippo II*, Einaudi, Turin, 1952.

[7] L. Susmel, "Il governo del bosco e del territorio: un primato storico della Repubblica di Venezia", in: *Atti e Memorie dell'Accademia Patavina di LL. SS. AA.*, 94, (1981-82), t. II, pp. 75-100; L. Susmel, F. Viola, *Principi di ecologia, fattori ecologici, ecosistema, applicazione*, Cleup, Padua, 1988.

[8] On the role of the mountain area comunes: I. Cacciavillani, *I privilegi della reggenza dei Sette Comuni*, 1339-1806, Signum, Padua, 1984.

[9] On the legislation governing the subject, see: A. di Berenger, *Saggio storico della legislazione forestale dal sec. VII al sec. XIX*, Venice, 1862, republished in: A. di Berenger, *Dell'antica storia e giurisprudenza forestale in Italia*, Treviso-Venice, *1859-1869*, pp. 527-622 (anastatic reprint of the entire work under the title *Studi di archeologia forestale*, Accademia Italiana di Scienze Forestali, Direzione Generale dell'Economia Montana e delle Foreste, Florence, 1965).

note that as awareness of the multi-faceted problems increased, so the administrative apparatus set up to deal with it became more finely-honed. In the early decades of the sixteenth century, Venice established a *Magistratura sopra legne e boschi* [for timber and woodlands], which would remain active until the very end of the Republic – and whose work would, to a large extent, be carried on by the various bodies set up in the nineteenth century. However, various aspects of woodland management came under such authorities as the *Provveditori all'Arsenal*, the *Savi ed Esecutori alle Acque*, the *Proveditori sopra Beni Inculti*, *sopra Beni Comunali*, or others. It should also be pointed out that legislation on woodland issues came not only from the Senate but also from the Council of Ten – a situation that gave rise to numerous conflicts of authority and indicates the importance this question was considered to have as a matter of national security[10].

From the sixteenth century onwards cartography features more and more in the administrative documents dealing with territorial matters, being used either to illustrate implemented projects and policies or else to propose others. This presence can also be noted in documents relating to woodlands: the written document is accompanied by an illustrated document which is no mere supplement but figures as an integral part of normal administrative praxis (a consolidated position whose effects and consequences we have already discussed).

Environmental Protection in the Belluno Area[11]

To follow up our outline of Venice's forestry policy, we will now look at a document concerning a question of environmental protection – a map drawn up by two private citizens, Iseppo and Tommaso Paulini, who were owners of woodland in the Belluno area and in the early years of the seventeenth century applied to the Venetian Senate for a ruling on a matter of environmental equilibria[12] (Figure 15). The drawing itself is part of a manuscript codex – consisting of forty hand-written pages, some water-coloured drawings and several hand-coloured prints taken from elsewhere – in which the two men put forward their project for the protection of the Venetian lagoon. One should perhaps point out here that it was not at all uncommon for Venetians who held no public office or position to officially

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[10] F. Cavazzana Romanelli, E. Casti Moreschi, *Laguna lidi e fiumi, esempi di cartografia storica commentata*, Archivio di Stato, Venice, s. d. (1984).

[11] The present analysis of these documents takes up in part what is contained in: E. Casti Moreschi, "Cartografia e politica territoriale: i boschi a Venezia", in: *Storia Urbana, 69*, F. Angeli, Milan, 1994, pp. 105-132.

[12] On the 1608 Paulini codex – now in the State Archives, Venice (Secreta Materie miste notabili, reg. 131) – see: R. Cessi, A. Alberti, *Un codice veneziano del "600" per le acque e le foreste*, Poligrafico dello Stato, Rome, 1934; F. Cavazzana Romanelli, E. Casti Moreschi, *Laguna, lidi e fiumi...*, pp. 45-51; M. F. Tiepolo (ed.), *Boschi della Serenissima. Utilizzo e tutela*, (Exhibition catalogue) Archivio di Stato, Venice, 1987, p. 36. The map I study here is a water-coloured drawing measuring 407x513 mm. (page number: cc. 14v-15).

submit suggestions relating to matters of general public interest – indeed, they were actively encouraged to do so. Of course, such submissions were not only motivated by public-spiritedness or by a desire to see one's own project upheld as valid and feasible, there might also be financial rewards – either direct payment or a share in future profits resulting from the implementation of the scheme. The Paulini were no exception, and should their project meet with the Senate's favour they had their own request to make: appointment as lords of the chiefdom of Fontanabuona in Friuli. What is more, their very interest in questions relating to woodland resources was hardly disinterested, given that they themselves owned a number of woods in the mountain area. Nevertheless, having said that, one must recognise that their project does manage to take an overall view of a problem, moving beyond the usual parochial outlook of such schemes to achieve a completeness of analysis that bears comparison with what is to be found in the most advanced territorial projects that were enjoying currency in the Venice of the day. The basic premise of the two men's proposal can be put very briefly: not only does the river system have a decisive effect upon the environmental balance of the lagoon, but both are closely bound up with a third factor: woodlands and forestry. The Paulini argue that silting in the lagoon is mainly due to the decline in the extent of mountain woodland areas. Destroyed – either accidentally or deliberately – by fire (in the latter case, to free land for agriculture), forests and woodlands were no long able to resist the erosion of mountain slopes and river banks. The result was that rivers were more heavily laden with the detritus that was the main cause of the silting problems in the lagoon.

The map offers a figurative summary of the main argument and proposal contained in the manuscript: not only should there be legislation to stop the burning of woodland resources, but watch-towers should be erected to offer comprehensive warning of any nascent blaze. As a result, the defaced mountain slopes would once more become flourishing verdant areas – just like those that one can see in neighbouring Austria (in the top left of the map, beyond the yellow line marking the border) or on the Montello (where the so-called "Wood of St. Mark's" was a reserved source of timber supply for the Venice Arsenale and thus subject to special restrictions and jurisdiction).

Now, let's look at the document more analytically. Depicted in perspective, the area shown is divided into two distinct entities: the river plain and the mountains. However, approximations of scale arising from the map's use of perspective are not enough to explain the inversion of proportion in the depiction of these two areas: the foreground is occupied by a rather confined river plain whilst the background opens up into a wide and ample mountain valley that is unrealistically large in comparison. Whilst the drawing of the uplands area gives us no precise information on altitudes, it does indicate certain important morphological differences between mountains and plain. In the latter, the presence of humankind is indicated by a number of settlements – which are totally lacking in the mountain areas (where the presence of man is

indicated by one consequence alone: the destructive effects of his fire-setting). The entire layout is designed to underline the importance of the mountain areas, and all the information contained is presented from this point of view. At the same time, the relation between man and nature is the basis for the proposed project of environmental protection (as we have seen, the action of humankind can even be noted in those areas which one tends to consider natural – that is, in which there is no obvious human presence).

The icon indicating woodlands uses several denominative surrogates, including figuration and colour. The variations in the latter can change the meaning and significance of the short vertical strokes used to mark the presence of trees. In the area around Belluno, the colour brown is used to indicate the stripping of the slopes and the presence of dead or unhealthy vegetation, whilst in nearby Austria green serves to indicate the flourishing state of woodlands. Montello itself is not identified by name but is easily recognisable, both from its position and from the use of a particular tree symbolism that employs the surrogates of figuration and colour to indicate general layout and the presence of a species of tree particularly associated with the area (the oak). Hence, we have three different icons used to indicate the same natural feature of woodland. This makes the map an interesting case-study of the connections that are established between icons referring to the same geographical feature – icons which are in some sort of conjunctive relation to each other.

In all three of the above-mentioned cases, denominative surrogation rests on the combination of figuration and colour. The Austrian and Belluno woodlands are distinguished from each other by colour differences, whilst the Montello woodlands are characterised not only by the use of colour but also by a special type of figuration (the short vertical strokes that, almost identically, are used to render the woodlands of Belluno and Austria, here become more detailed and offer a stylised rendition of a particular species of tree). This is a perfect case of how the representation (of a wood) acquires meaning and significance not only from the single icons used to depict it (which all tend to underline one special aspect thereof) but also – and, perhaps, above all – thanks to the organisation of relations between the different icons that all refer to the same territorial feature. One might also point out how, at a syntactical level, the conventional signs employed here function either analogically or digitally. The figurative surrogate may be said to communicate analogically when it actually reproduces the shape of the object depicted (the oak tree, in the case of the Montello), whilst there is digital communication when – as in the case of the woodlands of Austria and the Belluno area – there is an abstract sign (the short vertical stroke) which only functions as a representation of a tree thanks to convention. Though with greater difficulty, one might see the same distinction at work in the use of colour: "analogical" colour being that which reflects common sense experience (and thus communicates what is an easily-shared message), whilst "digital" colour aims to communicate a particular situation and thus might be considered as "abstract". In the case of the present map, the use of green

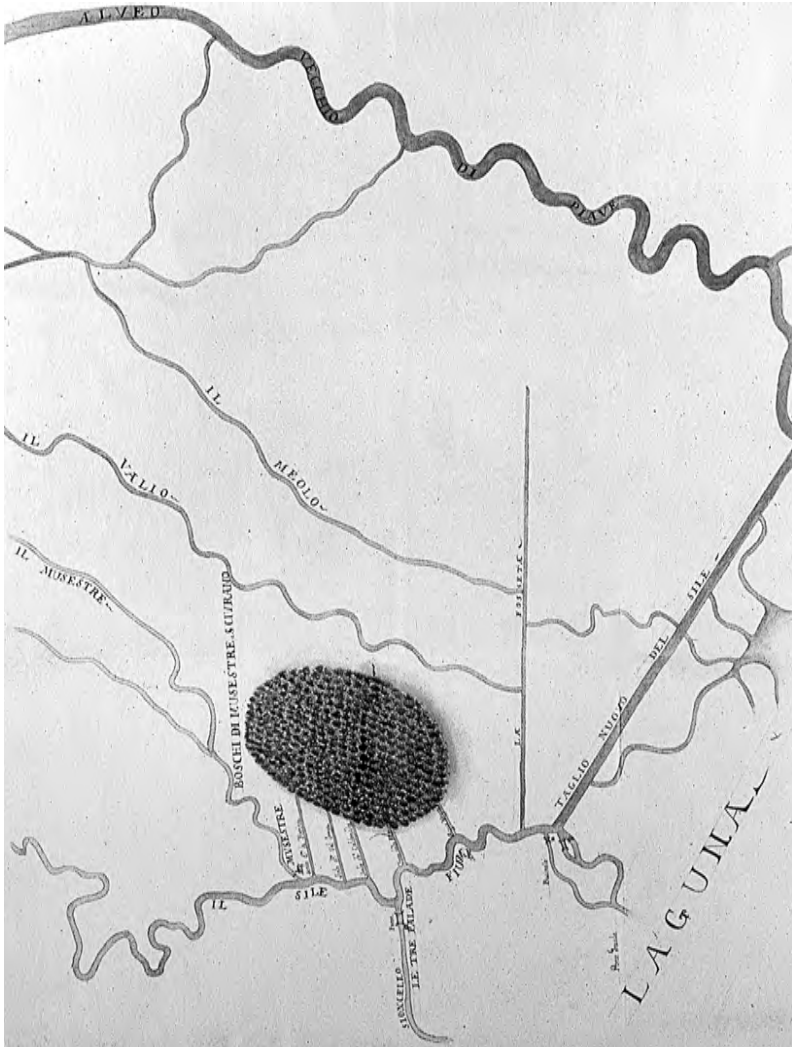Figure 15 - *Map of the course of the river Piave from Belluno to the sea, Iseppo and Tommaso Paulini (1608).*

Figure 16 - *The Woods of Musestre and San Cipriano* (1752).

for trees could be described as analogical, whilst the brown used for the unhealthy trees is digital. The importance of all this for communication has already been discussed. What I want to emphasise here is that the use of different means to depict a single feature or phenomenon leads to the transmission of a message that is read/perceived analogically. In the present case, quite apart from the variety of communicative instruments it draws upon, the map activates a rhetorical mechanism of persuasion.

If we now look at the connections created between the icons for the woods and those referring to other territorial features, we see that both reference and "iconicity" are comprised within the field of denotation. In effect, the wood can be seen as a "feature" of landscape at the same time as one sees the emergence of a hierarchy of importance – emphasised, on the one hand, by the icons that indicate the particular features of the wood, and, on the other, by those which refer to other features and (through repetition and stylisation) seem to take on a role that is more referential than connotative. However, the connotative connections present form veritable syntagms of representation: the icons that identify the specific and particular features of the wood are contrasted with those more general and approximate icons that serve to depict the other features of the landscape. And we should also understand the use of colour in this sense: the vague and pallid tones (that are so well rendered by the technique of water-colour) throw into relief the stronger colours of the wood – thus highlighting its iconic status as the "paradigm" that establishes the nature of the territory as a whole. This is particularly clear with the figurative surrogates: for example, the stripping of the woodlands affects the whole environmental system due to the resultant transport of solid detritus down river to the lagoon – and this solid detritus is depicted along the whole course of the rivers Cordevole and Piave. The icon in this case is an enlarged rendition of stones and pebbles (which is totally out of sync with the – admittedly approximate – scale that one finds in all maps of this kind).

The map contains a high degree of denominative surrogation. There are only a few actual designators: one "Val Serpentina" to indicate the region covered (written in large well-spaced capitals) and some for inhabited centres – for example "Cividal" (Belluno) and Treviso (rendered by an icon of a towered city with the bastion of the bishopric)[13].

Here one should also note, even if only in passing, the different function of denomination in administrative and topographical cartography. In the former, the main purpose is not actually denomination itself, but rather the enhancement of denomination through the representation of a plan of territorial organization. This is to say, that when an administrative map is drawn up the territory has already been encased in a system of reference that enables one to see it as known and, therefore, manageable. However, the fact that denomination is not the prime aim of such cartography does

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[13] The inclusion of these city names is clearly an expression of that administrative hierachy which saw the cities of the mainland functioning as a sort of node in a network for the exercise of Venetian power over the *terra firma*.

not mean that the designators used do not in some way acquire new meaning through their involvement in the dynamics at work in the administrative document. For example, that "Val Serpentina" is the only designator referring to a region is not without significance: its presence indicates that some selection was carried out, to focus on one area rather than another (further confirmation of the hierarchy of information we have seen in the way other representational codes are employed).

Hence, we might argue that in this Paulini map communication functions through *the combined action of icons* (some referred to the same phenomenon, some to a variety of different phenomena). The connections established between these icons is not a neutral one: there is, as we have seen, a hierarchy, with iconic precedence taken by the depiction of the woodlands.

These are some of the features that emerge from a syntactic analysis of the document. However, as I have already mentioned, the map does not merely aim to reproduce information, it also functions as an instrument of communication – that is, it necessarily involves a counterpart, an interpreter. I have already indicated that this interpreter is not just any individual but one who occupies a certain position within the community. The interpreter here is a territorial agent who has a public role and uses maps to obtain information in order to pursue objectives which involve society as a whole. It is through the interpreter that the map fulfils its full role as an instrument. In effect, its linguistic/symbolic contents are translated into a series of practical/pragmatic relations: it increases knowledge of the territory; suggests modes of territorial management and organisation; can *mediate* between conflicting interests.

The Paulini map is addressed to a very high level interpreter: the Venetian Senate, a political body which can decide upon the course(s) of action to be followed. Hence the message is addressed to a clearly identified agent, and all the three actions it performs reveal its mediatory role: it represents territory as a complex system (and thus renders it as a intellectual concept); it describes and suggests a specific interpretation of territorial dynamics at the same time as proposing possible courses of action (the fire watch-towers, or the re-direction of water-flow at the mouth of the Piave); it emphasises the woodland as the crucial element in the territorial system and indicates how mountain uplands can have an effect on coastal lagoon[14].

If a map is a cultural product – revealing the expressive schema and the ideology of the society that produced it – this drawing is, at both a graphic and formal level, an expression of seventeenth-century Venetian culture. However, it is more than a document of social communication: its use of varied modes of communication in conveying its message means that it actually increases territorial knowledge; its proposal of a new interpretation of territorial phenomena means that it makes an addition to the cognitive patrimony of the Venetian society it addresses. The depiction of the woodlands in a certain way, the representation of their relation to other

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[14] A legend within the map explains the author's intentions and how the document is to be read.

territorial features and – above all – the establishment of the woodlands as the central focus of the entire representation – all this causes the interpreter to believe it is possible, indeed desirable, to consider the woodlands themselves as a key element in any project for the protection of the lagoon.

And this interpretation is borne out if we follow the course of affairs in the period after the Paulini map. Historical evidence shows that, quite apart from the nature of the individual measures taken, there was a growing awareness within the Venetian Senate of the need for an over-all approach to territorial management – and that a key feature in such a project would have to be woodlands[15]. There was a new perception of the relationship between the various areas involved: the mountains, which up to that time had only marginally impinged upon the concerns of the Venetian administration, took on a central role in plans for the protection of the delicate balance within the lagoon. It is therefore reasonable to claim that the Paulini map was either the cause or expression of a tendency that would play a decisive role in changing Venetian territorial policy in this area.

Silviculture: Drainage and Irrigation for Woodlands in the Plain

This section will examine a document drawn up in relation to questions concerning the protection of an area of woodland and the implementation of a project of silviculture. Here we have a depiction of a plains area of woodland, where the representation of watercourses and wooded areas is not concerned solely with matters of environmental protection (the link between these two natural resources might be a functional one but could often be conflictual, due to the interests involved). The document in question is an eighteenth-century map showing "the woods of Musestre and San Cipriano" together with the networks of watercourses around them[16] (Figure 16), and was drawn up to accompany a report on the drainage of this wooded area prepared by Giovanni Poleni (an important mathematician, engineer, architect and philologist from the University of Padua)[17]. Standing between the rivers Sile, Musestre and Vallio, the woodlands are therefore quite close to the Venetian lagoon.

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[15] I. Cacciavillani, *Le leggi veneziane...*, pp. 89 *et seq.*

[16] This water-coloured drawing on paper dates from 1752 and measures 390x510 mm. (it is now in the State Archives, Venice: *Secreta Archivio proprio Poleni, reg. 11*). Information regarding the assessment and interpretation of this document is to be found in: E. Casti Moreschi, E. Zolli, *Boschi della Serenissima, storia di un rapporto uomo-ambiente*, Archivio di Stato, Venice, 1988; E. Casti Moreschi, "Criteri della politica idraulica veneziana nelle sistemazione delle aree forestali (XVI-XVIII sec.)", in: R. H. Rainero, E. Bevilacqua, S. Violante, *L'uomo e il fiume. Le aste fluviali e l'uomo nei paesi del Mediterraneo e del Mar Nero*, Marzorati, Settimo Milanese, 1989, pp. 17-24.

[17] On this multi-faceted figure and the contribution he made to the science of hydraulics within a European context, see: *Giovanni Poleni idraulico matematico architetto filologo (1683-1761)*, Accademia Patavina di scienze lettere ed arti, Padua, 1988. On his theories for the management of water resources in woodland areas, see: E. Casti Moreschi, "L'opera di Giovanni Poleni nella sistemazione delle aree boschive", in: *Giovanni Poleni...*, pp. 93-112.

And management of water resources in the area was a complex matter, given there was a sharp clash between the interests of Venice and those of the local land owners: the former tending to see rivers as hostile forces that threatened the survival of their lagoon, the latter seeing them as sources of power (for mills and workshops) and convenient transportation. An already-complex situation was compounded by the fact that ease of drainage was essential to the very survival of the woodlands. Poleni had discussed this question several times, and was well-aware that an area of tall vegetation had certain particular properties with regard to rainfall and evaporation (forests caused high ground humidity and low evaporation) – and these properties that were particularly serious in a region where impermeable soil led to the formation of areas of stagnant waters that had a deleterious effect on trees and other vegetation. As we will see from the map we are about to analyse, the question of drainage was one of vital importance, with a total of five canals running through the woodland to then drain off the superfluous water into the River Sile. What is more, the woods of Musestre and San Cipriano fell within the wider question of the management of the entire area around the Venetian lagoon – a matter to which Poleni had addressed his extensive expertise several times. His report here is a response to a collection of writings put together by other important hydraulic engineers who had been commissioned by the Venetian *Magistratura* to put forward proposals[18]. In effect, Poleni's document is a "memorandum" that contains a short treatise relating to the management of water resources in this particular area of woodland.

Here one should emphasise the importance of the map accompanying his report: if not drawn by his hand, it does give us a clear vision of Poleni's approach to the matter under discussion, and reveals that he felt the need for a visual representation to demonstrate both first-hand on-site inspection and to give a more forceful idea of the close functional relations between the various features of the territory. The culture of the Enlightenment put great weight on the use of written treatises to outline and discuss issues; however, Poleni also tackles contingent practical problems here, with cartography playing a key role in the communication of his ideas and analysis.

From a technical/stylistic point of view, the document lies half-way between the iconic rendering of an hypothesis and the visual representation of a problem to be dealt with. Against a white background – with no points of reference for orientation – one sees a representation of only three territorial features: the lagoon, the rivers and the wood. These, Poleni is underlining, are the features that should be seen as interrelated to each other (whatever the particular problem it is that has to be dealt with).

A designator is assigned the entire task of representing the Lagoon: the mere name serves to condense the symbolic, political, administrative significance of the site of the Venetian capital. The rivers are represented

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[18] For example, Giminiano Montanari, Bernardino Zendrini, Matteo Lucchese and Tommaso Temanza (Archivio di Stato di Venezia, *Archivio Proprio Poleni, filza* 11, *f.* 201-7).

using the designator, a figurative surrogate (that charts their course) and a chromatic surrogate (the blue of water). The main focus is on the woods: a single icon covers the entire area, identifying its size, shape and main constituent (oak) with careful draughtsmanship. Let's look at this main icon.

The designator appears in the upper part of the wood: "Boschi di Musestre e S. Civriano". One should note this double information: the designator informs us that the wood comes under the influence of the river Musestre (which determines its hydraulic balance) and also that it is a private wood owned by the monastery of San Cipriano on Murano. So, this is a performative designator coined in the drawing-up of this document – in other documents the wood is named differently, identified either by its location or by its ownership. This is further proof – if proof were needed – that the inclusion of a name (and choice of name) in a map is no straightforward operation but indicates precise choices and aims.

The figurative surrogate uses an analogical sign (a minutely-drawn tree) aligned in rows – just like any other cultivated crop. In fact, this wood is the product of silviculture, and this is described by the use of graphic means that indicate the size and shape of the cultivated area as well as the crop itself. All three aspects suggest just one interpretation – that is, the wood can only be read as a man-made object.

Though the present colour (brown /green) may be the result of the deterioration of the paper, it is clear that the original was intended to make a specific allusion to the crop of timber (and therefore indicate the importance of the wood as a source of raw materials). And if we look at all the other icons used in the map we see that, once again, it is the wood that determines the syntactic relations between them. The detail and care with which it is named, outlined and coloured contrasts with the rather spare depiction of the other territorial features: in this case, the hierarchy is based on the communication of information derived from direct empirical experience. The area of woodland, therefore, is represented using surrogates and modes of communication that convey the significance of the wood as a territorial feature/resource to be managed as a complex entity.

Whilst allowing that the implementation of projects relating to the woodland should take into account the requirements and needs linked with the other geographical features, the map nevertheless focuses attention on the wood itself – thus emphasising that by giving priority to forestry policy one also obtains positive effects for the other components of the territory. Poleni's proposal here involves the regulation of water supplies, the periodic felling of trees, reforestation and a careful choice of plants. In short, silviculture is seen as depending upon clear knowledge of the crop and its site; and when it does incorporate this knowledge then it cannot but have beneficial effects on the territory as a whole. As the map shows, Poleni is convinced that as well as establishing some order in the river system, one should also set up a network of drainage canals feeding directly into the Sile. In a "Memorandum" of 1758 addressed "To the Provveditori and Chiefs of the Arsensale at time of timber-felling", he offers ample and

extensive illustration of how trees should actually be felled. He discusses where and how a tree should be cut, and in what season (a decision depending not only on the life cycle of the plant but also the year, month and phase of moon)[19].

Again it is helpful to consider the role of the interpreter in order to see how this document works as a means of symbolic mediation. This is a map addressed to an interpreter with a socially important role: the technicians and engineers called upon to express an opinion on this particular problem, people possessing a certain type of technical knowledge. In the closely-argued debates promoted by the Council of Ten or the relevant *Magistratura*, Poleni's proposal was ultimately recognised as the most adequate not so much because it was innovative in its handling of the overall system of waterways and woodlands but because it extended scientific knowledge of the problem, introducing additional considerations relating to the specific needs of woodlands and the most satisfactory way of meeting them[20].

The Land Registry Map of the Cansiglio Uplands. Initial Census and Use

The third document that I will look at proposes a regulated and controlled use of the forestland depicted (the woods of the uplands of Cansiglio and Alpago – again in the Belluno area). Like the Montello – which provided the stout oaks for shipbuilding – the Cansiglio area also played an important role in the Venetian state's economy: it produced a large number of the beech trees that were used in the production of oars. Already in the early years of the sixteenth century, the Serenissima found itself having to take steps to protect this wood (which equipped a good twenty triremes a year) from gradual deforestation.

In 1548 legislation made the area the exclusive preserve of the Arsenale,

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[19] Poleni took up the ancient belief that the moon might influence the physiology of plants, arguing that the lymph flowing within plant stems could be affected by the magnetic shifts resulting from the phases of the moon and thus fluidify or solidify accordingly. The very date at which one felled a tree – and thus put an end to its life – could affect the way in which the plant dried out (and hence how the timber seasoned). These rules were already being followed in the previous century, as we can see from the detailed forest registry relating to the Cansiglio woodlands (which I look at below): the document included a calendar with a moving central section that made it possible to calculate the date and month when the phase of the moon was propitious for the felling of a tree (Archivio di Stato di Venezia, *Archivio Proprio Poleni, fil*. 29). On the importance of the moon in ancient forestry science, see: A. di Berenger, *Dell'antica storia…,* pp. 477-479.

[20] Poleni held the Chair of Experimental Philosophy at the University of Padua and was responsible for the creation of the first experimental laboratory in Italy. His standing with the Venetian government was such that his opinion was considered sufficient to resolve any debate in the areas of his expertise (Archivio di Stato di Venezia, *Archivio Proprio Poleni, filza* 11, *f.* 80-82). From the registers it is clear that those called upon to express their opinion on this matter included some of the most prestigious technical experts of the day: Giminiano Montanari, Bernardino Zendrini, Matteo Lucchese, Tommaso Temanza – who, as we have already seen, drew up their own technical reports on the subject (see note 18).

and thus the wood came under the direct jurisdiction of the Council of Ten. The first step taken was to "conterminate" the wood – that is, clearly mark the ill-defined boundaries with marble signposts. This was the first move towards the drawing-up of a general inventory of woodlands, which would ultimately find concrete expression in the land registries. And the present map comes from one such registry – that covering the Alpago area – which was compiled in 1638 for the *Lords and Governors of the Arsenale*[21].

One should point out that these land registries did not serve the same purpose as their modern counterparts; they were drawn up for a specific public office and served primarily as an inventory of the specific assets and resources under that office's jurisdiction: the aim was to have a precise picture of the distribution, quality and extent of such assets in order to administrate them more efficiently. The forestry land registers were drawn up to put an end to haphazard forestry management – due in part to encroachments by local communities upon woodland theoretical reserved for state use, and in part to the individual exploitation of available timber resources without any concern for replanting or preservation.

As far as the misguided use of forestry resources was concerned, there had been numerous complaints that the felling of trees did not respect the basic criteria that were at the basis of an intelligent use of woodlands. These complaints covered such things as inexpert woodmanship, the felling of trees that had yet to achieve the prescribed diameter and the tendency to fell in easily-accessible areas (leaving large parts of the forest untended and therefore subject to gradual decay). The *rettori* [experts] sent to make on-site inspections suggested as a solution that the woodlands should be divided into "lots" that were to exploited in rotation (thus guaranteeing the constant renewal of forestry resources). In fact, "chance felling" was particularly unsuitable for beech trees, while "rotation felling" would make for natural renewal[22].

This is a general outline of the problems being tackled in the years immediately before Zorzi de Christofolo, *proto de remeri* [expert to the oaryards] compiled his land registry, which not only inventories woodland, giving some indications with regard to the correct method for timber-felling (illustrated with detailed drawings), but also divides forests up into lots.

All in all, the land registry is a finely-produced document complete with 24 maps and an elegant frontispiece[23] (Figure 17). This is a very special type of administrative document because communication depends almost entirely upon cartography: written text serves as a corollary limited exclusively to clarifications (added within the drawings themselves). Obviously, this will be

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[21] On the history of the administration of this forest area, see: M. F. Tiepolo, *Boschi della Serenissima...*, pp. 60 *et seq.*

[22] As is well-known, the first term relates to selective felling, the latter to random felling.

[23] The document comes from a cadastral register of 1638 and is a water-coloured drawing on paper embellished with hand-painted details. It measures 425x620 mm. (Archivio di Stato di Venezia, *Provveditori sopra boschi, reg.* 150 *bis*). A reading of it is to be found in: E. Casti Moreschi, E. Zolli, *Boschi della Serenissima...,* pp. 69 *et seq.*

of great importance in our analysis of the map, which dates from a period when the normal administrative document consisted of a written text and (perhaps) some illustration. Here, graphics become the main means of communication – a choice which is perhaps to be linked to the fact that a map is the most suitable and complete way of linking together information with regard to the size, location and type of woodlands.

The land registry comprises indications covering how to establish a plant's age and recognise those trees which are not to be felled – information completed with a lunar-based calendar for tree-felling. Each single lot is drawn in detail and its boundaries are listed in a legend, which also covers the number of trees, the number ready for felling, the number of oars that might be produced from that timber and when the remaining trees will be ready for felling.

Whilst accepting the general outline of forestry policy that I have described above, the author of this map also uses his document to express an additional point: correct forestry management will also take into account the need to maintain a constant proportion of good and non-viable trees. In fact, the latter serve as barriers against wind and other weather factors; their elimination could lead to the destruction of the better timber. Such a thesis is illustrated in the numerous drawings that make up the land registry. However, the summary drawing – which is the one we will look at in detail – has a different purpose: it aims to offer a convincing picture of how the forest should be divided into lots.

The map is unusual in a number of ways. It follows different criteria of composition to those we have already studied; its technical and formal structure is unlike any we have so far encountered and it comprises an explicit appeal to political decision-makers. The plan for forestry management that is the *raison-d'être* of the map is expressed in a depiction of woodlands which is practically abstracted from geographical context. What other geographical references there are – such as the indication of the town/village of Farra and the position of the lake of the same name – serve simply to identify the location of this particular area of woodland. One can also read the four large wind-roses to the left of the map in referential terms (given that they serve to indicate North). There is also a symbolic reference to the census and measurement of this area of forestry in the way the metric scale is adorned with geometric compasses (which are obviously amongst the instruments used in measuring land area).

From a technical/formal point of view one should focus on the dual nature of this document, a compound of pictorial rendition and written text. The title and the numerous tables of information given within the drawing are intended to provide a textual supplement to the cartographical information conveyed.

As for the third difference referred to above – the explicit presence of state power – this can be seen in the most striking of all the symbolic images in the map: that of the sword-wielding lion which figured in the seal of the Council of Ten. Clearly this is a reference to the state body that had placed

this particular area of woodland under its direct jurisdiction – a state body which united the legislative, decision-making and operative powers necessary to implement a project of territorial management.

Now let's look at the icons used in the map. Designators play an important role, so the denominative projection here is clearly enhanced. The very presence of a title – "Drawing of the Wood of Alpago in the district of Belluno..." leads one to consider just how important lexical surrogates are in conveying the message. The title serves to "remedy" the abstract depiction of the wood itself: given that there is no cartographical information that enables us to identify the location, the name enables us to "place" the woodland depicted. The title then continues, informing us that the map is the result of an on-site inspection carried out by the Podestà and Capitanio of Belluno, Andrea Badoer, during the period when the land registry was being drawn up. Hence we are informed that the map was made on a special occasion – and that it has been subjected to very authoritative assessment. This authority – the local representative of Venetian power – is also indicated by other designators. For example, the "palazzo" shown at the centre of the uplands, is the temporary residence of the *magistrati* responsible for overseeing the management of forestry resources. The two designators "Canseia" and "Val Menera" name the two uplands shown at the centre of the map with a written indication of "casere" – that is, sparse settlements which are contrasted with "Fara", the centre of settlement shown down in the valley. Scattered across the map are enclosed panels identifying the name and location of the various lots.

The figurative surrogate for trees covers the entire area of woodlands, whilst there are a few other surrogates used to indicate the presence of mountains and of housing. Green, on the other hand, is used to delimit the areas of woodland, so that the neighbouring areas seem to be totally devoid of vegetation (be they the mountains depicted in the foreground, or the actual upland itself).

Starting from the left – and running round the map in a clockwise circle – numbers are used to indicate the succession of the different lots (which are thus shown as forming a single integral whole). Another feature depicted to good effect is the network of roads and tracks used in transporting timber: the red lines winding through the valleys and across the slopes of the wooded areas indicate the routes by which the timber reached the waterways that would then be used in transporting it to the lagoon. Even when such roads and tracks did not actually exist but were only at the planning stage, the map shows them as already in full operation (thus forcefully arguing for the need to build them).

Symbols play an important role in the map: they serve to communicate the plan of operation actually being proposed, to represent the presence of political power, and to indicate how the survey was carried out (and thus guarantee the feasibility of the project being put forward). The icons here take up codes that are characteristic of the language of the Venetian administration in general – where extensive space was dedicated to the

celebration of the political system as such. Thus at a symbolic level the map is a very effective mediator between proposal and acceptance: the woodland is presented as an easily manageable entity, and thus the validity of the project is beyond discussion.

So one can see that the cartographical interpretation of the woodland works thanks to the connection between the complexity of the map and the complexity of the actual forest. However, the analysis of the map reveals the specific mechanisms of representation and communication it employs to render that complexity.

As I have already mentioned, the symbolisation used to depict the forest is not aimed at offering a precise account of its ground area; the purpose is to present the woodland as a system in which there is constant interplay between natural and man-made factors. The forest becomes a "geo-system", in which balance and equilibrium can only be maintained by the further action of humankind[24]. The map depicts "various" woods – understood not as simple botanical entities but as bodies subject to the numerous influences of man's operation upon territory. One can see this just as well when we look at the interpretation of the wood in relation to other territorial features. The wood is seen as in a position to regulate the dynamics of the environment as a whole, to preserve or establish equilibrium. The symbolic coherence at the basis of the representation presents the wood as generating a system of principles that might be taken as the basis for the management of the entire territory.

From a social/environmental point of view, the wood reiterates that territorial action is part of a social project. In this sense, the project is also ideologically coherent because it sees private individual interests as subordinate to public interests: it proposes a general operation of conservation and justifies some necessary links between the natural order of things and the principle of state control over territory. Hence one can recognise woodland as making a contribution to the definition of social relations. In effect, woodland is the focus of specific public interests, and thus its preservation and perpetuation can be taken as guaranteeing the continuance of the conditions necessary for the maintenance and consolidation of the state.

All the documents we have looked at emphasise the importance of healthy woodlands for a harmonious relation between State and territory, between lagoon and terra firma, between local and state, private and public interests. Conflict does not exist if one is working for the protection of forest. So, given that it is the only territorial agent capable of guaranteeing the maintenance of woodland, the State is also put forward as an institution that can implement a far-sighted programme of actions intended to maintain balance between the various dynamics at work in a compound environment. Hence, the complexity of the environment is seen as entailing

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[24] On the concept of "geo-system" and the de-structuring mechanisms at work within such a system, see: H. Isnard, *L'Espace géographique*, Presses Universitaires de France, Paris, 1978. Reference is to the Italian edition: *Lo spazio geografico*, F. Angeli, Milan, 1980, p. 117.

Figure 17 - *The Cadastal Map of the Cansiglio Area, Zorzi de Christofolo (1638).*

Figure 18 - *Map of Lombardy*, Giovanni Pisato (1440).

a number of opportunities for man: relations should not be defined by natural conditions but by the "man-made" conditions that can be imposed by the State as part of its many-faceted action to achieve specific objectives. One should remember that action is only possible where complexity has not exceeded certain thresholds, beyond which it becomes difficult to govern and thus generate new imperatives (meaning there are new – and different – choices to be made). For this reason, the social agent must take steps to reduce complexity and thus permit the successful completion of action.

From this point of view, the map is a very effective instrument. On the one hand, it emphasises the complexity of the forest, but on the other it generates information that facilitates the management of that complexity. So whilst underlining that the forest forms a complex system, the map provides the cognitive tools that make it possible to operate that system. In effect, it facilitates the process of territorialisation – and in doing so, establishes what direction that process will take.

The map's *representation* of woodland makes it an object of attention for both a politician and technical interpreter. In effect, the depiction of woodland is important for those who must make decisions and for those who must implement them. One might say that attention is focused on the "map woodland" – that is the place where the project is to be implemented. The map becomes synonymous with the wood itself, and one takes the former for the latter[25].

After these varied analyses of actual maps, certain questions remain legitimate. Is semiotic analysis an instrument that is theoretically valid for all types of cartographic representation? Is the course of analysis followed so far valid when applied to cartographical documents that have no support texts? In other words, might what has been revealed by this semiotic study cartography really be the result of an interpretative model that is valid, but essentially incomplete, when applied to a map unaccompanied by linguistic discourse? To try to answer this question I will now apply the categories of that analysis to a different genre: political-military cartography.

4.1.2 *Political and Military Maps*[26]

When one qualifies cartography as "political/military" one is referring to the subject-matter (the specific characteristics of the information conveyed) rather than to an explicit statement of purpose behind the creation of the

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[25] This is not only true of woodlands, but of all the other features that are depicted in cartography. On this subject, see: C. Raffestin, "L'evoluzione del sistema delle frontiere del Piemonte dal XVI al XIX secolo", in: *La frontiera da Stato a Nazione. Il caso Piemonte*, Bulzoni, Rome, 1987, pp. 101-111.

[26] Part of the analysis given here can be found in: E. Casti Moreschi, "State, cartography and territory in the Venetian and Lombard Renaissance": in: D. Woodward, G. M. Lewis (eds.), *The History of Cartography*, v. 3, University of Chicago Press, Chicago, in printing.

map. Hence, this type of cartography is well-suited to our purposes here, because it gives us an opportunity to test the efficacy of our analysis upon maps about whose actual creation and final purpose we have only scant information. There are, of course, historical sources and archive material that help to put such maps in context; but generally these cover the cartographical procedures adopted or the identity of the body or person who actually commissioned the work, without saying anything explicit with regard to their real ends. Therefore, one has to look elsewhere if one is to understand what constitutes the political/military nature of such maps. The corpus of such cartography traditionally groups together documents that are very different in nature: maps covering entire defence systems or extensive border areas, and ground-plans of proposed or completed fortresses and fortifications. In effect, there are two very distinct genres here, which are also addressed to different types of recipient. The former are addressed to the organs of government (the bodies that can decide military strategy), the latter to the public bodies responsible for the building and maintenance of defence structures (for examples, bodies such as the Venetian *Provveditori alle Fortezze*, set up in the sixteenth century)[27]. This division into two genres also has a chronological basis: fifteenth-century maps are concerned with systems for the defence of territory as a whole, sixteenth-century maps offer us the ground-plans of new fortresses[28]. This is why it is better to treat fortress maps/ground-plans as a separate genre (which I will not deal with here because – from the point of view of recipient and audience – it can be compared to the administrative cartography I have already examined).

To understand the logic behind the genre I will discuss, one should say first something about the political and social climate in which such maps were produced. After the consolidation of its mainland frontiers, the Republic of Venice initiated a vast programme of defence building between 1458 and 1471[29]. The new mainland state had a dangerous bottleneck in the west, where enemy seizure of a narrow corridor of land would have cut off the Venetian troops stationed in the Brescia area and the totally isolated Verona. To avoid such a possibility, the Serenissima set about fortifying certain centres (for example: Asolo in 1458) in order to guarantee access to Brescia; and at the same time, it constructed a number of defences systems that involved the re-directing of watercourses. Further confirmation of the

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[27] Before this date, one can find documents of military cartography in offices other than the *Provveditori alle fortezze* – for example, those of the *Provveditori alla terraferma*, *Dispacci Rettori* [City Governor Dispatches], *Provveditori ai beni inculti*, *Processi*, *Savi ed esecutori alle acque*, *Provveditori delle Rason Vecchie* [State Auditors], *dei Deputati del Consiglio dei Dieci sopra miniere* [Council of Ten Mining Inspectorate], etc..

[28] Given that siege maps and field maps, which are normally classed as "military", date from much later and are very different in form and content, I have excluded them from my analysis here.

[29] Amongst the numerous works on the fortifications policy of the Venetian Republic, see: E. Concina, *La macchina territoriale. La progettazione della difesa nel Cinquecento veneto*, Laterza, Rome-Bari, 1983; M. E. Mallett, *L'organizzazione militare di Venezia nel '400*, Jouvence, Rome, 1989.

importance Venice attached to its rich possessions in Lombardy is provided by the extensive work on the fortifications of Brescia itself which began in 1466 (one should not forget that the well-organised armies of the Duchies of Mantua and Milan were an ever-present threat, constantly on the look-out to hinder Venetian expansionism). The presence of these uncomfortable neighbours to the west and south-west explains why it was only towards the end of the fifteenth century that the Republic turned its attention to its eastern defences. However, there it followed a different policy. In the territory "beyond the River Mincio" the threat had been a regular army which tended to focus its attention on large cities and towns; but in the East the threat came from raiding parties of Turkish horsemen, who swarmed over the plains of Friuli. Their movements were totally unpredictable, and hence Venice had to think in terms of a continuous line of defence on a territorial scale. The first part of this came with the new defences at Fogliano (1478) and the strengthening of the bastions along the River Isonzo. However, the shifting turn of events in the sixteenth century led to a change in Venetian military policy in both the east and west: having seen that battle in open field exposed them to greater risks, the Venetians focused defence policy on the creation of a string of fortresses that would serve not only as a base for troops but also as key features in a defensive war of attrition against the invader; hence the design for Palmanova in Friuli and the construction of the new city walls in Brescia and Bergamo (which are considered some of the greatest examples of sixteenth-century fortifications).

Now, before going on to look at some of these maps, let's consider some of their theoretical and descriptive features.

The main characteristics of political-military cartography can be summarised in five points: i) absence of complementary/supplementary written text; ii) average scale; iii) manuscript rather than printed maps; iv) no circulation beyond political bodies; v) contents almost exclusively limited to matters military.

So, unlike administrative maps, these works are not accompanied by any written text; what is more, they generally have no title or written explanation of the reason behind or occasion for their creation. The cartographic information defines and completes itself. To the same scale as chorographical descriptions, these maps cover large expanses of territory – and yet also show a degree of detail (whilst respecting the limits upon density of information, they provide precise indications of orientation and a clear, defined account of fortified areas).

Manuscript military maps provided precious information on one's own territory or on that of the enemy (often obtained by devious means); hence they were considered as state secrets, for the eyes the governing authorities alone. This meant that they were not concerned with communicating information of general interest; to an even greater extent than the administrative maps we have looked at, their focus was well-defined and their audience clearly identified. A direct consequence of this is that they limit themselves to very specific areas of information: they present facts of

military relevance, data that might be useful when deciding upon troop movements or upon the defence of strongholds.

This makes the image they give of territory very special, and their focus highly exclusive: their sole concern is the provision of data that might be useful in defence or attack. So, here again, it would be pointless to try and use these maps to discover information about the more general appearance and organisation of territory at the time. One should remember the specific aims of these documents, bearing in mind that any information that does not fall within their specific sphere of interest is rendered in a very summary and generic manner.

What is more, from the theoretical point of view of denomination, one should also point out that the particular purpose of these maps leads them to adopt very unusual types of surrogation and enhancement. The presence of a large number of designators relating to only a few categories of territorial features (accompanied by only a few uniform surrogates) gives rise to two specific characteristics. In the first place, there is the fact that the designators serve a primarily referential function and the surrogates (the true means of denominative projection) serve primarily at the level of symbolic communication. In effect, these surrogates comprise a small body of icons that function connotatively: the designators are accompanied by unchanging symbols used to depict a fortress or walled town (and the same repetitiveness can be seen in those surrogates which are unaccompanied by a name but communicate via colour, etc.). This repetition has one main purpose: the specific qualities of a particular area/zone are ignored but, at a connotative level, the use of a constant body of symbols serves as a clear and unambiguous indication that what is represented is of political/military importance. Hence, the unchanging icons that use figurative or chromatic surrogation to indicate fortifications or watercourses, also have a clear connotative content relating to military relevance (the features indicated are, it is implied, likely to be either a help or hindrance in moving troops or supplies). Similarly, numbers on roads serve to connote distance as a military consideration (affecting tactics and modes of transportation, for example).

So we can claim that in political-military maps enhancement and surrogation function through a special use of surrogates, which – due to their unchanging repetitiveness – take on a particular connotative function. In effect, in political-military maps denominative enhancement has a powerful role, whilst surrogation has a weak role. The powerful role of enhancement is the result of the military uses to which the map will be put: given it will be used for reference, the document must define places with precision – and it does this by means of designators. On the other hand, the political use of the map means that it has to contain an efficient representation of certain key symbolic features – and this means unchanging repetitive surrogates. In short, the military use of the map heightens its referential content – offering a number of useful indications for troop movements – whilst the political function of the map centres on

the generation of symbols that serve to indicate territorial dominion in all its strategic importance.

When discussing administrative maps, I underlined how all programmes of territorial transformation necessarily have an ideological content, and here we see how projects for political expansion or territorial defence necessarily draw upon the conviction that the consolidation of dominion is the result of military might. Similarly, I also pointed out that it would be ingenuous to expect administrative maps to be objective, to offer a faithful picture of the real world. And this point is even more applicable to political/military maps, which for the above-mentioned reasons present a highly iconic rendition of territory (as a possible theatre of war or space of military manoeuvre). This is why one might define such maps as embodying a *denominative projection that functions, selectively, at the symbolic level.*

Hence, one might outline the role of political-military cartography by saying that it offers a *symbolic representation in which the roles of denominative enhancement and surrogation are, respectively, powerful and weak – a representation that is heavily iconic and very selectively descriptive.*

But now let's look at some specific cases, which as well as introducing us to the work of some great cartographers will also help to illustrate the points I have just made.

Giovanni Pisato's Map of Lombardy

One of the oldest of extant maps, this covers the cities and territory between Verona and Milan – an area which, at the time, was divided between "this and that side of the Mincio" (Figure 18)[30]. As I have already mentioned, the river Mincio, which cut across Venice's mainland state where it was most narrow (in the area of Peschiera), marked a sort of dividing-line between the Brescia and Verona regions. And given the vulnerability of this junction, Venice strengthened it with a system of defences that went under the name of *Il Serraglio* [The Closure]. This, therefore, was the main theatre of war between Venice, Mantua and Milan – and in his 1440 map Giovanni Pisato outlines the important military features of the region (the military nature of this work meant that it was subsequently kept "up-to-date" – as one can see from the erasure of the banner flying over Bergamo or the date under the Venetian flag in

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[30] The map dates from 1440 and consists of a water-coloured pen drawing on parchment. Measuring 650x890 mm., it is now in the Biblioteca Comunale di Treviso (ms. 1497). The work occupies an entire parchment with a "neck" of about 27cms (at the end of which is a hole which served when tying shut the rolled-up map). We know nothing about the author, except that his name is given in a small panel in the upper right-hand corner. The details of the map's representation are studied in: M. Baratta, "La carta della Lombardia di Giovanni Pisato", in: *Rivista Geografica Italiana*, 20, 1913, pp. 150-163, pp. 450-459, pp. 577-593. More recently, the work has been discussed in: G. Mazzi, "La cartografia: materiali per la storia urbanistica di Verona", in: L. Puppi (ed.), *Ritratto di Verona, lineamenti di una storia urbanistica*, Verona, 1978, p. 54.

Cremona, which records that the Serenissima's forces took and sacked the city in 1496).

The information given is selective and concerns fortifications and those territorial features important for troop movements (settlements, bridges, watercourses). The large trees scattered around the territory without any precise location indicate the presence of large woods that might be a hindrance in manoeuvres (or else offer a convenient refuge).

The political/military function of the map is clear from the icon used for centres of habitation: each one bears the banner of the State which controls it (be it Venice, the Viscontis' Milan or the Gonzagas' Mantua). Iconographic stylemes serve to indicate towns as walled cities, whilst less important sites are given with precise indication of a castle, where present – for example, Lazise or Sirmione, Garda or Torri del Benaco – or with a more generic indication of a church, town or collection of houses (for example, Pescantina). The more important fortified sites on this territorial chessboard are shown to greater "scale" (Valeggio, Peschiera, Lonato and others) and with a, schematic, rendition of their defences. This is the case for example with the Scaligero castle at Peschiera, with the citadel and castle of Verona and with various bridges that are given in their true form. The size of the figurative surrogates establishes a hierarchy of importance, whilst the actual draughtsmanship helps to make each one recognisable. Colour too plays a role in indicating fortifications: the pink used for towers and bridges – primary defence structures – is deeper than that used elsewhere.

The presence of Lake Garda, Lake Como, the Po and the myriad of rivers that cut across the plains of Lombardy, all serves to underline the central importance of water in the region. Within the economy of the map, these lakes and rivers are all depicted "oversize": dry terrain appears as narrow tongues of land between the various massive watercourses (which are shown to be navigable by the presence of boats). Bridges are of key importance to movement within Lombardy, and they too are shown with some attention: fortified bridges – such as those at Valeggio, Peschiera and Mantua – are again depicted "outsize". The constant green-blue colour used for the water indicates the interconnected nature of this water network and suggests possible military uses (flooding terrain to hinder troop movements).

Initially, roads were not shown; but at a later date, thin ink lines were drawn in between the main centres of habitation, accompanied by a number to indicate distance. The reason for this later addition was clearly the military importance of the information (for example, in deciding the time necessary for troop movements, and the feasibility of attack or retreat). Further confirmation of the military use of the map comes from the (later) inclusion of another feature of the defence system between Venetian and Mantuan territory: that long wall which the Veronese built in 1345 to run from Valeggio sul Mincio to the source of the Tartaro near Povegliano. By altering the course of the Mincio, this wall made it possible to flood vast

expanses of territory and render them inaccessible. Similar tactics might also be used in the Valli Grandi marshlands in the Verona area.

The information included does not aim to offer a description of the territory as a whole, but rather to suggest a system of defence that will make it impregnable. And the entire message is conveyed in the language of cartography, with the denominative surrogates (in particular) serving to offer a reading of each feature of the territory in terms of strategic importance within an overall scheme of defence. The designators identifying locations or watercourses are accompanied by figurative or chromatic surrogates that – with different degrees of emphasis or "enlargement" – indicate the role of each fortified area and the military importance of rivers and lakes. And at the same time, numbers supply important information that can affect the choice of routes and itineraries. Hence the icons are not simple agglomerations of information: they propose a reading of a complex system which has to be understood and respected. The ultimate purpose is to present the complexity of territory as contained and structured by the defensive system itself – that is, as under the total control of man.

It would, therefore, be difficult to see Pisato's map as other than an example of political/military cartography. Though it bears no title or accompanying text, the purpose and function of the map becomes explicit thanks to an analysis of its cartographical language – further proof that if one considers this language not as the result of arbitrary choices but rather as the means chosen for the expression of a precise message, one can understand the basic function of any sort of map. Cartography operates a denominative projection that establishes a particular order in the world. And this order is especially clear if we look at the syntax of maps: icons which indicate the same object have the same symbolic meaning when seen in isolation, but when part of a syntagma they serve as the basis of order. If one looks at reference from a syntactic point of view, the position of the icons for inhabited centres reveals the role these centres play as intermediate points in possible itineraries; whilst if we look at the icons themselves, we see that there are different types of functional hierarchies between the various centres. And, if we look at the icons relating to rivers, we see that they indicate the main physical-natural component of a network of watercourses at the same time as expressing the unity of that network (which is revealed to be a dynamic system that has a range of potential uses). However, the most obvious feature in the map is the rendition of territory itself: the conjunctive mode proposes an organisation of territory designed to serve specific military aims, whilst the syntagma used indicates the functional coherence of the territory as a whole. The end purpose of the map also explains the absence of disjunctive syntagmas – which might have been formed around the icons referring to territorial features, but are absent because they would not have served any military purpose. The exclusion of those features which play no role in strengthening or weakening defences was inevitable: in order to focus attention on matters of prime importance, one must exclude information concerning the marginal.

The So-called Almagià Map of the Region Around Verona

Another political/military map might well be the fifteenth-century parchment which I have already mentioned as a probable example of the maps drawn up as a result of the Venetian decree of 1460 (Figure 19)[31]. Leaving aside the question of whether it was intended for display in the Sala dei Pregadi in Venice, one can hardly deny that the work is an account of an area that was essential in defending the approaches to Brescia – that same region between Verona and Mantua which Pisato depicts in his parchment (where the defence focus is on the large wall between Valeggio and Villafranca).

The map is very well-known, not only for its aesthetic and stylistic qualities but also for its rather special composition (it consists of six parchments glued onto a single sheet of paper) and for the mystery that surrounds it (we don't know where, when, by whom or for whom it was produced)[32]. So far a number of different dates have been advanced, the contradictions arising from the presence of certain "anachronisms" within the map itself[33]. In effect, it is not possible to date the work with precision because it depicts urban features or refers to historic events that belong to different periods. However, one explanation here might be that, precisely because of its role as a political/military map, the document was constantly updated – and therefore filled with "anachronisms".

So, I will here "bracket out" the question of dating, and proceed to analyse the map as an example of political-military cartography.

The document has all the particular descriptive features of this genre of map: the numerous designators refer to cities, towns, roads and rivers. In other words, the denominative extension is limited to a few specific territorial features that reveal strict selection in the choice of information for inclusion. Surrogates are used to show the presence of woods near some of the centres of habitation (thus indicating their possible strategic role in situations of war). A group of features that do not appear in the previous

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[31] Of about 1439, the so-called "Frari" or "Almagià" map of the territory around Verona is a water-coloured drawing on parchment (2248x3002 mm.). Now in the Archivio di Stato di Venezia, Miscellanea Mappe, dis. 1438.

[32] I do not dwell on these aspects, but refer the reader to the discussions in: R. Almagià, "Un'antica carta topografica del territorio veronese", in: *Rendiconti della Regia Accademia Nazionale dei Lincei*, XXXII, (1923), fasc. 5-6, pp. 61-84; F. Cavazzana Romanelli and E. Casti Moreschi, *Laguna, lidi e fiumi...*, pp. 60-65; G. Mazzi, "La conoscenza per l'organizzazione delle difese", in: P. L. Fantelli (ed.), *Il territorio nella cartografia di ieri e di oggi*, Cassa di Risparmio di Padova e Rovigo, Venice, 1994, pp. 117-124.

[33] Almagià, who was the first to study the document, based his dating on the presence of some small vessels shown to the north, between Lake Garda and the river Adige. These were held to refer to an incident of the year 1439 during the war between Venice and Milan – when, to maintain contact with the besieged city of Brescia, Venetian forces brought up by land and river 25 cases of arms and six galleys, which they then transported across to the city on the other side of Lake Garda. Recently, G. Mazzi has suggested a later date, arguing that the map shows building work within Verona that only got under way in the first years of the fifteenth century (G. Mazzi, "La conoscenza per l'organizzazione delle difese", in: P. L. Fantelli (ed.), *Il territorio nella cartografia ...*, pp. 116-145).

Figure 19 - *The "Almagià" map of the territory around Verona (c. 1439).*

Figure 20 - *Map of Padua and the surrounding territory,* Francesco Squarcione *(1465).*

parchment, but which here could not have been ignored (because of their importance in deciding troop movements) comprises the various mountain ranges (the Lessini and the Alps). In those areas there are fewer designators, and those that are given are often distorted versions of the actual names (evidence that these inaccessible regions marked the furthest outposts of Venetian expansion on the mainland and had yet to be "absorbed" into the intellectual life of the Serenissima)[34].

As in the previous document, the denominative surrogates are both figurative and chromatic, serving to highlight citywalls and important rivers. For their part, the main arterial roads are accompanied by numbers indicating distance. Spreading out from the central hub of Verona, the roads in fact form the framework around which the entire map is constructed. So, if we look at this feature not only from a technical point of view (as that which serves to shape the map) but also from the ideological point of view, we see that Verona is presented as the feature which radiates order over the entire territory. Yet while the map indicates the city as a key strategic node in a system of defence, it also renders its internal organisation, indicating the seats of civil and religious power. One should not underestimate the symbolic significance of this large icon depicting the city as an important political entity: look, for example, at how sharply it contrasts with that depicting Mantua – which may be represented by a large-size icon but is without detail (thus revealing the city's marginal role in the economy of the drawing).

Here too surrogates aim to offer a picture of territorial order. This is rendered using size (with the cities being shown to different scales)[35] and different types of projection (orthogonal, perspective, planimetrical). Verona emerges as the most important city and its surrounding territory is the most heavily fortified; in effect, it appears as the key to the Venetian republic's defences against the threats posed by enemies to the west and south. This bears out the hypothesis I put forward with regard to this map: the organisation of space created by the basic structure around which this map is constructed suggests that the work was drawn up for the Venetian government and intended to serve some political/military purpose[36]. This, therefore, would support the argument that the depiction of Mantua is precisely that of an enemy city – as one can see from the bare outline of the urban layout (up-to-date information about an enemy city would have been hard to obtain)[37].

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[34] With regard to denomination, see Almagià's work, which gives all the place-names in the map.

[35] The scales used by the anonymous cartographer are, approximately, 1:7,500 (for Verona); 1:10,000 (for Mantua); 1: 40,000 (for the extra-urban territory shown at the centre of the map) and 1:60,000 for the areas shown towards the margins of the map.

[36] That the document was drawn up in Venetian circles is confirmed by the sources used and, above all, by the archive history of the map.

[37] The plan shows fourteenth-century architectural features, with large city walls surrounded by lakes. To the south is a system of defences which, like that running between Verona and Brescia, is called a *Serraglio* and is based on the flooding of land in case of attack (the expanses of water to the south of the city were much less extensive than elsewhere).

However, my reading of the map rests primarily on the semiotic coherence of the information it contains. The first confirmation of this coherence comes from the information selected for inclusion: whilst there are all those features that form the core of political-military cartography, other features are ignored. The map contains large areas that are devoid of information; hence, from a territorial point of view, one can see it is conjunctive rather than disjunctive. The syntax of the map shows each icon to be part of the syntagma of political-military discourse. For example, how could one deny the strict – and deliberate – link between the depiction of defensive walls and the defensive role of the watercourses? What is more, the icons present in the map enable one to read the territorial hierarchy at various levels. So, from a military point of view, the different scale of the icons used to depict centres of habitation reveals the clear intention to show their respective place in a general hierarchy of strategic importance; and at the same time, the larger – and hence more precise – iconic description of the urban fabric of Verona emphasises its political importance. The spatial rendition is equally surprising, with the use of systems of projection that give a faithful representation of the morphology of the territory as a whole. The most significant datum here concerns altitude, variations in which are indicated in the syntagma formed by the icons depicting the Alps, the Lessini and the hills around Lake Garda (completed and supplemented by the icons for the plains areas and the large *Valli* around Verona). The syntagma starts therefore with a representation of height; but after having established the relative links between the uplands, it also includes the plain areas – from the upper plain (the slope of which is rendered by the course of the rivers) to the lower plain (flooded because at a lower level).

In short, description certainly plays an important role in this large parchment. However, the syntax of the work reveals that its main purpose lies elsewhere: it aims to offer an image of the territory ruled by Venice and organised around Verona as an area of political importance which – as an inevitable consequence of that political importance – is also a possible theatre of war.

Francesco Squarcione's Map of Padua and the territory around it

Caution is needed when defining Francesco Squarcione's map of Padua and surrounding territory[38] (Figure 20), a work that is of indubitable

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[38] This is a watercoloured drawing on parchment dating from 1465 and measuring 1170x1010 mm. (now in the Padua, Biblioteca Civica, Miscellanea ms. 53v e 177 r-v.). Almagià argues that the parchment was an immediate response to a 1460 decree issued by the Council of Ten calling for the creation of a corpus of maps covering the entire territory of the *terra firma*. More recent studies suggest that decoration plays as important a role in the map as documentation. The work of the Paduan artist is part of a general cataloguing of the area around the city of Padua – as is borne out by the commission (discovered by L. Puppi and L. Olivato), which also provides information on the actual use of the map: it was not to be transferred to Venice but hung in the City Chancellery office ["offitio Cancellarie

importance for various reasons: its antiquity, the material on which it is drawn, and the special character of its draughtsmanship[39]. The document was intended for the City Chancellery office in Padua, but its actual purpose is not clear: it has yet to be established whether it was intended as a political-military or administrative map. In effect, whilst giving a clear account of the defensive system (well-represented by icons that establish a hierarchy of importance), the document also includes a number of small centres and villages that have nothing to do with territorial defence. However, a semiotic analysis immediately throws into relief one particular detail: the figurative system used in the map works on two different (formal and communicative) registers according to whether it is dealing with military or non-military aspects of the territory. Icons which compound designator, figurative surrogate and colour are used to represent the walled city of Padua, the territory's network of watercourses and the various fortifications alongside the rivers (and at the two river junctions in particular). On the other hand, the centres of settlement are indicated by an icon consisting of designator and symbol (a standard styleme consisting of a chapel surmounted by spires). This joint use of analogical and symbolic figuration can be, in part, explained by reference to the period in which the map was drawn up. The fifteenth century was, in cartographical terms, a period of evolution and transition: elements of a medieval language (concerned with indicating the symbolic essences of the world) co-existed alongside elements of a more modern language (concerned with the faithful reproduction of the real). So, the use of symbols here is to be seen as a "left-over" from more traditional cartography, whilst the use of analogical signs indicates the recognition of the greater efficiency of this new way of representing the world[40]. However, as if this division were not enough, the map also gives one the strange impression that one is looking at two super-imposed images: one that meets the requirements of a referential account and one in which cartography is totally devoid of referential anchorage.

So, with regard to our initial question concerning genre, one might argue that this presence of multiple conventions indicates that the document had a dual role, as both a political/military and administrative map. Figurative surrogates are used to indicate the defensive systems and symbolic surrogates to offer a visual "list" of settlements. This theory rests on the claim that the aim is to propose a hierarchy of information, with the new

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Communis"]. See: R. Almagià, *Monumenta Italiae Cartographica*, Istituto Geografico Militare, Florence, 1929, p. 12; L. Puppi, *Andrea Palladio*, Electa, Milan, 1973, pp. 89-90; L. Puppi, "Appunti in margine all'immagine di Padova e il suo territorio secondo alcuni documenti della cartografia tra '400 e '500", in: *Dopo Mantegna*, Electa, Milan, 1976, pp. 163-164; G. Mazzi, "Iconografia di Padova ai tempi del Cornaro", in the collection of essays *Alvise Cornaro e il suo tempo*, Townhall, Padua, 1980, pp. 232-234.

[39] The parchment is actually formed of a number of hides.

[40] Only with the codification of cartography in the eighteenth century would this be abandoned for abstract signs.

cartographical language (considered more efficient in the representation of the real world) being used to indicate fortifications, and thus highlight a precedence of interest (over the simple "listing" of settlements). This reading of the map at two levels enables one to offer a new interpretation – which is all the more welcome given that all previous attempts to "read" the map on the basis of analogies with other known documents have proved unsuccessful. Hence, we are faced with the enticing possibility that finally one will be able to resolve the enigma of one of the most important extant cartographical documents of the period. In effect, the idea of a dual purpose does not conflict with what we know about the map's historical context: the Chancellery Office for which the document was drawn up dealt with both political/military and administrative matters. The period in which the cartographer was working – characterised, as I have pointed out, by the overlap of different languages and the absence of a rigorous codification between them – meant that he could exploit different interpretative approaches and leave a certain freedom of choice to the actual interpreter of the document. Of course, these choices were not totally open, given that they were in part delimited by the communicative action of the icons. As we have seen, a semiotic analysis reveals that the different coding of the icons implicitly establishes a hierarchy of information and interest between the varied contents of the cartographic message.

An analysis of the syntax of the map also produces surprising results. In effect, we have a series of connections within a single level of communication and a number of interferences between different levels. If one looks at the syntax of the icons for defence features one can easily make out how it incorporates reference, spatial location and also territorial role (the icons indicating rivers and fortified cities reveal their referential relation to the real world as well as illustrating certain physical-natural characteristics of the objects represented; but, above all, the syntax highlights the interdependent role of those features in the defence of the territory as a whole). It is more difficult to make out a clear syntax in the depiction of the settlements: the icons seem to be regularly distributed without any reference to specific location or territorial interdependence. In effect, they do not respect the fundamental presupposition of cartography that the arrangement of signs on the sheet reflects the arrangement of objects in the real world: aligned in geometrical rows they are simply catalogued without offering us any chance of establishing the distance between them or how they actually stand in relation to each other. However, these same icons do take on meaning if seen in relation to the icons relating to the system of defences: their reference is established by the network of watercourses, which divides the territory up into a number of limited environments within which the settlements can be localised. What is more, if they are seen in relation to the icons for fortifications, they are once more seen within the syntagma of the territory as a whole (with their marginal importance rendered evident and clear). In short, the icons for centres of settlement take on meaning when they are seen in relation to the icons relating to the defence system.

So, one might argue that this identification of a double level of semantic codification – and the presence of one syntax that is entirely generated by another – reveals the presence of interacting discourses regarding territory, and thus enables one to appreciate the complex nature of this particular representation.

In short, the documents so far discussed as examples of political-military documents reveal certain constant features. They are based on a rigorous selection of information; they use denominative surrogates in various ways so as to give an image of territory that provides information which will be useful in drawing-up strategic projects and deciding tactics; they reinforce the idea of total and effective territorial control (exercised under – and thus legitimated by – the authority and power of Venice herself).

This analysis of these documents has, I hope, shown the full usefulness of the semiotic approach, which provides us with an unusual key for interpreting and decoding the cartographical languages of the past. At the same time, the theoretical groundwork reveals certain "formal invariants" in this particular genre of documents, and thus throws light on the multi-level connotations within these maps (connotations which previously had been left to the interpretative talent and intuition of the scholar).

4.2 *Visual Perception and Hypertext*

Consideration of a map as a semiotic field has revealed the communicative systems at work in the semantics of cartography, as well as indicating how the syntax within a map offers us syntagmas for the reading of territory. At this point I will return to certain aspects that serve to consolidate the idea of a *map as an act of symbolic mediation – an instrument of communication that plays an autonomous role in the development of the communicative process itself*. These aspects concern the mechanisms of visual representation, and the various mechanisms of those polystructural systems that lie at the basis of hypertextual communication. In effect, here I will be looking at the ways in which an interpreter/recipient perceives and organises the cartographical message[41].

A map communicates visually, with the signs within it functioning as symbols to express given social projects or cultural values. This means that though the choice symbols in structuring a map is always the result of cultural background, it is also true that these symbols must comply with certain criteria established by the – practically unvarying – mechanisms of human perception. In effect, the visual symbols here are part of a wider codified language – a language which is made up of a body of different codes that

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[41] C. Jacob argues that the perception of the message conveyed by a map implies, first of all, the recognition that a known cartographical language is being used. This precedes the analogical recognition of the reality depicted because what makes the message recognisable as such is its graphic organisation and schematisation, its visual rather than rational content. See: C. Jacob, *L'empire des cartes, approche théorique de la cartographie à travers l'histoire*, Albin Michel, Paris, 1992, pp. 368-369.

determine the map's nature as a verbal-visual system[42]. I have already emphasised the importance of syntax within the code of a map (position and form produce information shifts that have an effect upon content). Now, I want to stress how the way in which signs are connected meets the implicit rules of visual perception – that is, the information arises from optical stimuli caused by the relation between signs of similar or different types.

The spatial image of an object is not formed by observing the object alone but by determining its spatial relation to the points around it. Similarly, on a map, each sign contributes information with regard to the significance of others (irrespective of whether they are placed close together or far apart). The idea of space as a pure container for objects is the fruit of abstraction: what we experience and perceive as a single portion of the real world is actually the product of a series of relations between a number of elements. The same applies to the area represented in a map: overall information conveyed is not equal to the sum of the individual symbols contained, but is the result of the influence the location of each sign has on the significance and meaning of all the others[43].

All of this has an effect on the perception of the message: the juxtaposition of signs with special characteristics can lead to the perception of differences or variations in size (so the eye does not actually perceive them as they are on the map). As J. Bertin has pointed out, a whole series of well-known "optical illusions" comes into play here and can have an effect on the person viewing a map. The alignment of signs, the combination of colours, etc. can all focus the attention on a particular feature or object[44].

Thus technical features affect the message: the codes at one's disposal, the number, size and juxtaposition of signs, all provoke what R. Arnheim calls "visual thought" – that is, they have an influence on perception and, through their interconnection, can impinge upon communication[45].

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[42] U. Eco, *La struttura assente*, Bompiani, Milan, 1988, p. 109. Interesting studies on cognitive perception of visual-verbal systems are also being carried out in the area of artificial intelligence, where it would seem that the influence of the technical means of conveying the message is of great importance. See: P. Tabossi, *Intelligenza naturale ed intelligenza artificiale*, Il Mulino, Boulogne, 1988.

[43] On this influence, see: E. Cassirer, *Philosophie der symbolischen Formen*, Cassirer, Berlin, 1931. Reference is to the Italian edition: *Filosofia delle forme simboliche*, La Nuova Italia, Florence, 1961, p. 32 and p. 41.

[44] For example, perception of an image can be seriously impaired if the size and scale is not appropriate to the objects portrayed. See: J. Bertin, *Sémiologie graphique*, Mouton & Gauthier-Villars, Paris-La Haye, 1967; *Id.*, *La grafica e il trattamento grafico dell'informazione*, Eri, Turin, 1981.

[45] Arnheim emphasises how visual perception triggers off a mental process that leads to visual thought – that is, to the formulation of concepts that are the result of duly selected visual stimuli. In this process, selection leads to the retention solely of what has been observed and examined most attentively. At the same time, one does not let oneself be disturbed by those stimuli which are in a form that interrupts the process of visual assimilation. Given that reasoning concerning an object starts with the way in which that object is perceived, inadequate perception can undermine the entire process of thought that follows on from it. Thus at the basis of the formation of concepts is the perception of form: when looking at an

If we bear this in mind together with what I have already said about the communicative systems employed in maps, then it as clear that the context within which cartographical discourse operates can vary a great deal – from the logical to the rhetorical. Some contemporary philosophers have insisted that in inter-subjective communication persuasion plays a more dominant role than demonstration. Whilst this latter is based on the production of conclusions that are inevitable and necessary (once the initial premises have been accepted), persuasive discourse procures assent to certain conclusions independently of their coherence with accepted premises[46]. This definition enables one to then decide if a communicative instrument (or representation) can be described as logical or rhetorical. For its part, *visual representation is primarily an example of rhetorical communication*. The characteristic feature of a visual image is that the relation between *signifié* and *signifiant* is almost tautological[47]. In other words, the sign in the message is not drawn from some constituted reserve, it is not codified: in effect, we have the paradox of a message without a code. For example, a photographic image rests on the correspondence between object and referent – that is, the object must in some way participate in the symbolic praxis in which it figures as a "means" or as "evidence"[48]. From which it is clear that it is the technique used in constructing a representation that makes it possible for this latter to be seen as an "image". Hence, a map cannot simply be defined as a visual image; it is the result of a body of codes which may draw on both analogical and digital mechanisms of communication – which means that it is the product of precise technical choices (the object – "territory" – does not figure as a straightforward "means" in the creation of the representation). However, precisely because of the mechanisms of perception upon which it does draw, the map does function as a visual "means" – and, as such, does make use of mechanisms of persuasion. This co-existence of textual and visual means within a single communicative instrument implies that maps function within the field of both logical and rhetorical discourse. On the one hand, the map is based on declared premises and therefore takes on the connotation of scientific demonstration. On the other, it offers itself as a visual representation that draws upon dynamics of persuasion. The logical operation embodied in the map (its semantic codification and canons of construction) means that the

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object one can only be said to have perceived it – when one has made it correspond to some organised configuration – which, in its turn, is the result of several elements that (taken together) form an abstraction of the object. The perception of forms depends upon the application of formal categories, which because of their simple, generic nature may well be called visual concepts. These concepts constitute the instruments that enable us to solve the various perceptual problems caused by the fact that objects in the world are complex and irregular (R. Arnheim, *Visual Thinking*, Regents of the University of California, Berkeley Los Angeles, 1969. Reference is to the Italian edition: *Il pensiero visivo*, Einaudi, Turin, 1974).

[46] M. Pera, *Scienza e retorica*, Laterza, Rome-Bari, 1991.

[47] R. Barthes, *L'obvie et l'obtus*, Ed. du Seuil, Paris, 1982. Reference is to the Italian edition: *L'ovvio e l'ottuso*, p. 26.

[48] L. J. Prieto, *Saggi di semiotica II*, Pratiche ed., Parma, 1991, pp. 124 *et seq.*

concept of cartographic space is accepted precisely because it is obtained through *scientifically demonstrable rules*; however, the use of analogical (visual) systems means that the efficiency of a map as an instrument of communication rests upon rhetoric. This multiple system of communication thus generates a basic ambiguity: the map participates in communication and produces unconditional assent on the part of the interpreter at the same time as it realises all its full potential as a means of persuasion.

The second point to consider is that, as a visual and textual artefact, the map may well be defined as a hypertext, a means of communication based on the interaction of different languages[49]. A term that has gained wide currency thanks to its employment in computer language, a hypertext can be defined by three main characteristics: i) ability to handle a variety of different data; ii) specific ways of organising data; iii) multiple juxtaposition and interrelation of data. It is clear from this first broad definition that the function of a hypertext is to create connections between different ways of representing data. At the semiotic level, it is syntax which can tell us whether a particular communicative system is a hypertext or not. It should be underlined that, from a structural point of view, a hypertext is characterised by the presence of a variety of languages; a precondition for a hypertext to function is the combination and interconnection of codes from different languages. Similarly, whilst a hypertext is not the only communicative system that can handle data of varying natures, it is the only such system in which there is no pre-established order for the management of this data. Whilst in a traditional systems, data is organised in different but rigidly sequential series (branching one from the other in a pre-established order), in a hypertext one can create new connections and interconnections at will. Of course, this does not rule out the use of traditional schema for organising data – that is, a hypertext might well follow usual textual syntax – but the real potential of a hypertext is that each sign, word or point of an image can be linked with any other of the signs, words or images present.

As will be clear, this makes it possible to manage all types of information. For example, on a computer, the data can comprise text, images, voice recordings, sounds, animations, external input, and so on. However, one should here distinguish between the ability to handle certain types of data and the ability to take any one particular datum as constituting a two-directional node of inter-connection. In short, one should not merely see a hypertext as a mechanism for ordering information and downplay its ability to range over unprescribed areas.

The important feature of a hypertext is that it offers the interpreter/user an open schema within which to follow various routes of connection between the information, "surfing" between data and establishing multiple links between

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[49] On this topic, seen from very different viewpoints, see: G. Butti, *Lavorare con gli ipertesti*, Tecniche nuove, Milan, 1991; D. Scavetta, *La metamorfosi della scrittura dal testo all'ipertesto*, La Nuova Italia, Florence, 1992; G. P. Landow, *L'ipertesto. Tecnologie digitali e critica letteraria*, B. Mondadori, Milan, 1998.

the different codes. When a hypertext envisages the use of traditional configurations for ordering information, these are exploited primarily by the author rather than the interpreter/recipient. In these cases, the user can chose a determined route through the information, but he will not be able to "surf" freely because the creator of the hypertext will have built in a focus on certain specific routes. However, as for every means of communication, one should not forget that there are really two interpreters: the person who creates the hypertext and the person who uses it. When the former reserves the right to indicate certain pre-established routes, one might compare him to a printer laying out images and text on a page, who can re-order the information and thus create various different publications according to his target public. The same might be said of the user: qualifications of status or ability means that he/she can accede to one route rather than another[50].

From all of this it is clear that the function of a computer hypertext involves the presence of physically separate data. This is due to the technological instrument being used: a computer allows one to extrapolate and combine data – but this data is only visualised in hypertext form once the connection between its various components has been made.

At which point one has to consider whether a map can be seen as functioning in the same way as a hypertext. There can be no doubt that such is the case: by reason of its very special linguistic structure, a map can certainly be defined as an example of hypertext. We know that a map is a polystructural text within which different codes exist in patterns of interaction that are not pre-established. Those who wanted to argue the contrary might point out that, unlike a computer, a map does not "visualise" the connections decided by the user of the document but simultaneously presents all the possibilities of combination between the various codes employed. One could answer the objection by observing that it rests merely on a technicality, that it ignores all the hypertextual functions of a map (with all the syntactical possibilities it offers), to focus simply on the way in which these possibilities are presented. Secondly, even if one gives this objection full weight and accepts that a map performs its function between the two agents of communication (the creator of the document and the user of the document), it is none the less true that the outcome of communication can only be judged in the action of the interpreter (the person applying the pragmatic interpretation of signs) – irrespective of the technical means used to convey the message or the person(s) at the origin of that message. This process will become evident when we look at the pragmatic function of maps – seen when the interpreter puts his own intentions into practice under the influence of the information conveyed in cartographical communication.

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[50] In computer science, these guided trajectories have a myriad of applications. Think, for example, of the creation of courses for students which adapt to their gradually increasing knowledge, or – in relation to a particular city, the ability to offer tourists an "ideal" tour of museums, churches, etc.

A second objection might be that all types of polystructural language are basically hypertexts. This, however, fails to take account of the fact that for other polystructural languages, the information is read according to a firmly-established trajectory. A comic strip, for example, is a polystructural text; but it has to be read from the beginning to the end (and even if we allow that other trajectories are permissible within it, they could only follow one of two directions: forwards or backwards)[51]. What makes a geographical map a veritable hypertext is the fact that, as well performing all the other functions of a hypertext, it offers the user the chance to "surf", to navigate, their way between information[52].

So, if a map has a hypertextual syntax, this means that the icons, codes and elementary structure of the map are to be seen as capable of activating the transformations that make it possible to create shifting syntagma. Such shifts will not only involve the passage from the denotative to the connotative level, but also an infinite variety of permutations according to the role that the interpreter plays in the act of communication.

Obviously, this means also that the person constructing the map can hardly lay out information to be "unfolded" in one pre-established sequence – which is not to deny that the cartographer plays a role in "directing" information. What such a claim does underline is that while the message conveyed is undoubtedly the outcome of the intentional actions of the creator of the map, it is also – if not, above all – the outcome of the action performed by the map itself (in indicating to its user additional new information)[53].

So from a semiotic, structural and perceptual point of view, the map is clearly self-referential. The techniques used in creating it, the functions it performs and the intentions of its creator all offer interpretative possibilities that are then made explicit by the action performed by the actual user of the map. However, what is made explicit through use is already formed into units of meaning within the document itself. Hence, one might say that the map is self-defining (Figure 21).

4.3 *The Self-referentiality of Maps*

From what I have just said it is clear that the self-referential action of maps is manifest in their semantics and syntax. The encodings and connections between icons create syntagmas – and these express a new view of territory

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[51] In this case, I am not referring to interactive narratives, where it is possible to create plotlines by freely "jumping" from one point in the text to another.

[52] With regard to the narrative of geographical maps, Eco observes how an interpreter can "navigate" within them along different routes created using a multiple series of connections, which may all be governed by the same codes or else range over a number of codes. See: U. Eco, *Sei passeggiate nei boschi narrativi*, Bompiani, Milan, 1994, pp. 73-75.

[53] Self-referentiality may be defined as the ability of a map to have a life of its own, to activate mechanisms that enable it to carry out new functions. On the concept of self-referentiality, see: A. Turco, *Verso una teoria geografica della complessità*, Unicopli, Milan, 1988, pp. 125-134.
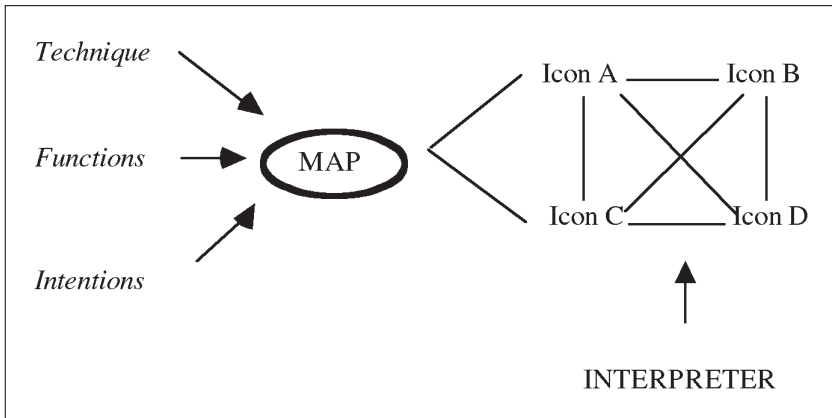
Figure 21 - *The self-referentiality of a map.*

(perceived and organised on the basis of the possibilities offered by a visual hypertext). However, when one looks at self-referentiality it is clear that such a state is not the exclusive preserve of maps. On the contrary, considered as "self-definition" it is a characteristic property of all structures (and, therefore, inevitably a characteristic of territorial structures as well). Here, it is perhaps useful to take up some of the concepts used in the analyses that see geography as the linguistic construction of a world. These studies have shown how the management of a complex environment naturally involves the formation of structures that are nothing other than operative fields – objective physical locations in which complexity is (to varying degrees) diminished and therefore rendered manageable for the agents involved. Such structures can be defined as "operative fields" because it is through them that the agents achieve certain specific objectives. This is easy to understand when one remembers that the reduction of complexity occurs through a mediation of meaning: the internal coherence of such structures of reduced complexity depends upon the fact that the objective set is both recognised and recognisable. So, thanks to this mediation of meanings each such site has a purpose, serves some end[54]. What is more, a structure distinguishes itself from its surroundings not only by its boundaries but also by the fact that it is composed of specific components and interrelations; and if it is to function fully as a operative field it must maximise potential (perhaps by a diversification of its functions and uses). This inclination to diversification is the main reason for the gradual emergence of a self-generating process which can guarantee the survival of the structure, irrespective of the primary purpose for which it was first created. It is this process which results in those accessory functions that enhance a structure's stability, enabling it to withstand "disturbances" in the environment (that is,

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[54] Here I take up the geographical meaning of "structure". See: chapter 3, part 1.

sudden increases or reductions in complexity). Structural self-referentiality (self-generating diversification) promotes the mechanisms of organisation and furthers duration through time by transformations of syntax (a syntax whose initial characteristic of "self-definition" serves to make it independent of the environment). As its "self-referentiality" becomes more firmly established, the survival of a structure no longer depends on the functions it serves to perform but rather on the gradually consolidated and ramified organisation of its components, which is what makes it possible for it to perform such functions at all. Hence, the functions that a structure "activates" can be seen as moments of self-organisation, which permit interaction between structure and environment. The ability of structures to act upon themselves is a formidable instrument of self-referentiality; it is that which enables a structure to realise its full potential through the implementation of new modes of operation and control[55].

This opens up implications and themes of study that I am to follow up in depth. In effect, what I have claimed about cartographical syntax and the formation of new syntagmas reveals that the map incorporates a self-generating mechanism[56].

At an initial level, the self-referentiality of a map serves two purposes: it means that map is accepted as such and also that its participation in communication is not delimited entirely by the intentions of its creator. If we look at the role of the map in the process of territorialisation – with its precise function of specifying denomination – we recognise that denomination as such involves a body of signs which contains information, permits the further elaboration of information and makes possible the transmission of information. In short, such denomination entails a unified semiotic area within which each element can function independently[57]. Thus the autonomous mechanism of the map is based on the symbiosis of denomination and cartography, with both functioning to achieve the same aim: the intellectual appropriation of territory. What is more, as we have already seen, in polystructural systems such as maps, information is not static but varies in use according to codes (that is, according to the possibilities of manipulation within the communicative instruments themselves)[58]. *So the map is a system of signs that, once created, has its own life; it develops in relative autonomy to all that has preceded it (including the aims it was initially intended to serve).* In this sense, the system of signs becomes self-referential: because it can provide the recipient with possibilities of use that are sometimes different from the intentions behind its creation (at the same time as it reveals a capacity to influence action upon the things that it depicts and

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[55] A. Turco, *Verso una teoria...*, pp. 106-134.

[56] By "self-generation" I mean "that process whereby a system produces, transforms or even destroys the components within it – those components which interact to give the system its individuality" (A. Turco, *Verso una teoria...*, p. 131). Here, self-generative mechanisms are to be understood as producing that body of messages activated by a map independently of the intentional act of its creation. The map's structural features and communicative mechanisms show it to be an autonomous structure that is valid over time.

[57] *Ibid.*, pp. 84 *et seq.*

[58] E. Cassirer, *Filosofia delle forme simboliche…*, pp. 9 *et seq.*

represents). Hence the map's power to represent reality comes from its ability to regulate the complexity of geographical space through the application of a metrics. Geographical space is thus seen as *cartographical space*, and this "newly created reality" can serve as the basis for orientating multiple courses of action.

One should also add that the map produces meaning and defines the order of geographical features through representation – and hence uses organisational modules which (thanks to such basic categories as "perception" and "memory") enable it to endure through time. Thanks to memory, maps were consolidated over time: they played a key role in the representations which enabled the West to constructed its own geography and, even more so, to apply its own model of territory onto lands of which it had no direct experience. For the European countries engaged in colonialist expansion a map or drawing was essential if they were to be able to refer to the territorial colonies[59]. The mass of military maps that have come down to us – and of which I have discussed just a few examples – reveal that each strategic operation, each battle-plan, each troop movement was necessarily linked to the study of a drawing-board representation, a project diagram.

"Perception" and "memory" also play a role in the attitude of the recipient, who uses the map as either a source or depository of information. Memory is established through symbolic representations based on norms – just as codification, historically established through the use of symbols, in fact functions as self-referential communication. Today no one enquires if the codes proper to modern cartography have been applied in the drawing-up a geographical map: contours are used to indicate land formations, denomination serves to indicate reference, the metrics of cartography are applied so that the distribution of objects of the map analogically reproduces their distribution in the real world, etc. All of this is taken for granted. These modes of representation trigger a self-referential mechanism: we have now memorised the precise characteristics of a geographical map and know how the signs within it are to be interpreted. Those who use this document are applying a consolidated codification; history legitimises the multiform attributions of meaning that are implicit in any interpretation of a map. When C. Jacob argues that comprehension of a map does not rest on the reading of what is in front of you but on your background experience in interpreting other such documents, he is saying that the interpretation of a map is primarily a case of recognising the ways in which a map defines itself as such[60].

So the circularity of self-reference shows the map to be a system that does not need external additions to define its own identity, which can therefore establish itself as independent of the territory it represents.

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[59] In the next chapter, which deals with the pragmatics of cartography, I will return to this point and look at how the "mode" of cartographical representation becomes so indispensable in itself that it can actually take precedence over the presence of territory.

[60] Put more precisely: "The perception of a map implies (...) at a first level, the identification of a known code, of an internalised cartographic language, rather than the analogical recognition of the space represented. Here, one might draw a parallel with our preception of a Impressionist painting of a landscape. At first, one recognises a painting as

Inverting the claim "the map is not territory itself", one gets the paradox that that is precisely what it is: the map is territory recognised as territory. And here we get to the further development of the map's self-referential abilities: the map moves beyond presenting itself as territory to present itself as at a higher level than territory, superior to it. In the pages that follow we will see examples of how the model presented by cartography can actually take precedence over the information derived from direct experience of the territory itself. The map thus turns its intrinsic limitation into a strong point: being a model it can't duplicate reality but it can (only) replace it.

However, it is useful to point out that cartographical self-reference works in two ways: there is an *internal* aspect, involving the interference between the various semantic and syntactic levels of the hypertextual communication, and an *external* aspect, with the mere existence of the map – and therefore our idea of what constitutes a map – affecting each subsequent document (which must in some way correspond to it). It should also be pointed out that the map is a complex system that develops self-referentiality through an interdependence of self-reference: it embodies a self-organising process that orders and transmits knowledge independently of the intentions of its creator and the intentions of those who habitually use it. So we might define the self-generating nature of maps as the result of a logical construct of symbols which is capable of impinging upon the strategies of control the agent intends to apply[61]. And it is this agent we will now look at to complete our analysis, seeing the interpreter of a map as a territorial agent who engages in the pragmatic interpretation of the signs therein.

belonging to the genre "Impressionism" – clearly identifiable by a number of stylistic traits. The recognition of a general category of objects comes afterwards, with the generical definition of this as a landscape painting that offers us a vision of nature (often determined, characterised and focused according to the aesthetic standards of the age). The final stage is the recognition of a particular landscape – for example, of the shores of the Marne." (C. Jacob, *L'empire des cartes…*, p. 368).

[61] A. Turco, *Verso una teoria…,* p. 89.

Chapter Five

THE PRAGMATICS OF CARTOGRAPHY

The moral that emerges from the history of cartography
is that human ambitions are always being cut back
(Italo Calvino)

From what I have argued so far, it is clear that the self-referential action of a map cannot be considered in isolation from the role of the interpreter, the person who turns to it for information which may be helpful in achieving certain objectives. In effect, it is only by being interpreted that a map reveals its status as an object capable of influencing the process of territorialisation (not only as a means for the intellectual appropriation of territory but also as an integral tool in the implementation of that process itself).

Thus we have come to the point where we must consider the pragmatics of cartography – that is, the interplay of cartographical sign and interpreter[1]. Let us start with Morris's definition of pragmatics as *that area of semiotics which examines the uses and effects of signs in relation to behaviour*[2]. Thus pragmatics relates to the conditions of communication, to the interaction between two implicit interlocutors: the person who constructs the semiotic field and the person who uses it (and in some way comes under the influence exercised by the means of communication). So, once again, though our discussion will aim to evaluate the three distinct aspects in the generation of signs, it cannot avoid a consideration of semiotics as a whole. This is even more necessary when looking at the pragmatics of cartography, where the implications of semantics and syntax make themselves felt to the full.

We know that the relation sign/interpreter cannot be seen as a mere contemplation of the world. It is a highly selective process in which the agent picks up indications as to how he/she might satisfy particular needs and requirements in the real world.

However, the relation between signs and interpreters – who are, first of all, members of a society – cannot be seen as "standardized". Culture, social position, profession, age, etc., all have an effect on the competence and awareness of the latter. And these levels of awareness and competence, in their turn, are not just an individual matter; they become part of the circuit of social communication (which recognises agents as having a particular role, as being defined by the position they hold in society). This is why

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[1] Each act of communication requires a "double presence": the provider and recipient of information. If, as is the case with a map, this information is transmitted using an object of artifice, then the knowledge introduced therein by the artificer is retrieved thanks to the recipient's knowledge of the medium.

[2] Ch. Morris, *Sign, language and behaviour*, Braziller, New York, 1946. Reference is to the Italian edition: *Segni, linguaggio e comportamento*, Longanesi, Milan, 1977, p. 211.

"knowledgeable interpretation as a cognitive act becomes, when considered as a communicative act, authoritative interpretation"[3]. So, let us now look at those two key figures in the semiotic process of cartography: the person who constructs the map and the person who uses it.

5.1 *The "Interpreter" of Cartography: Cartographer/Recipient*

Two things must be specified in identifying the "interpreter" of the art of cartography: that person's role within cartographical communication and their collocation within the society where they live and work. With regard to the first, one should point out that within cartographical communication there are two "interpreters": the *cartographer* (who constructs the document) and the *recipient* (who uses the information gleaned from it). The communicative role of these two figures can be distinguished with great precision. The cartographer is the person who adopts a pragmatics of signs to communicate precise, "intentional" information, and to do so he/she must have certain specific characteristics: they must have knowledge – or, at the very least, a mental representation – of the territory concerned; they must have mastery over certain technical instruments; they must be familiar with the conventions obtaining; they must have some purpose in constructing their map, and – last, but not least – they must have a recipient for their work (be it a community as a whole or a restricted group of individuals). This person's role is defined, therefore, when society recognises their ability to transmit cartographical information. The recipient, on the other hand, applies the pragmatics of signs in order to obtain information. This is a figure of whom specific abilities are not required, even if the recipient must obviously be familiar with the current modalities of cartography if he is to use the map (which is a model based on a general system of conventions). What is more, the recipient must have some purpose in using the map (though that purpose might be the mere collection of information for its own sake). So, both these figures make choices: the former in presenting cartographical information, the latter in receiving it.

These individual prerogatives, however, are not totally exempt from social norms. Just as the codification of cartographic language is the product of a specific society at a specific point in time, the interpretation of a map is subject to specific conventions that impose limits and requirements.

So, whilst maintaining their status as persons capable of acting individually, the "interpreters" of cartography become such because they are members of a specific society, of a specific culture. However, the importance of "authority" in cartographical interpretation changes according to which of the two roles we are considering. The construction of a map implies a

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[3] A. Turco, "Semiotica del territorio: congetture, esplorazioni, progetti", in: *Rivista Geografica Italiana*, 100, 1994, pp. 365-383, see p. 377.

Cartographer ← [RELATIONS] → Recipient

– knowledge
– intentions
– technical capacities
– social needs

– knowledge
– intentions
– technical capacities
– social needs

Intention behind communication

CARTOGRAPHICAL SELF-REFERENTIALITY

Effects of communication
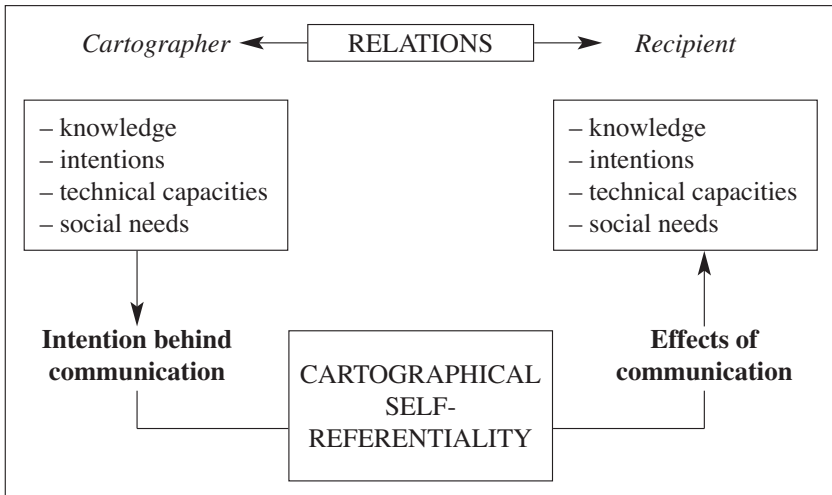
Figure 22 - *The pragmatic sphere.*

certain social "standing" because not only is the agent someone who must have a specific technical qualification, he/she is also engaged in the communication/generation of "new" knowledge (to be added to society's fund of shared information). However, the status of the interpreter who turns to the map for information is not as "explicitly" defined: the authority here does not lie in the simple use of the document but in the social relevance of the decisions taken on the basis of that use. Thus, only when the interpreter/recipient has a social function that involves the exercise of power can one speak of "authority" coming into play. Otherwise, the social significance of the recipient's role lies exclusively in the fact that they are proficient in the semiotic pragmatics required to receive the message transmitted by the cartographer.

However, if we pass from the analysis of these figures individually to look at the communicative relation between the two of them, it is clear that at a pragmatic level the relation between cartographer and recipient function thanks to the self-referentiality of the map (Figure 22).

By recognising the central role of self-reference in the relations between these two figures, we can see the active role of symbolic mediation that the map plays in the communicative process. This is why I have chosen to view the map not as an simple instrument or as the outcome of individual choices but rather as a social product.

Hence, a map is the product of a culture and, in three precise ways, it then becomes part of the culture that produces it. Firstly, it links up with and supplements the territorial knowledge of the specific society that generated it; secondly, it offers itself as an autonomous means of communication within that society; and, thirdly, it presents itself as an innovative interpretation of

the world (which nevertheless respects the mechanisms of control applied by the society which produced it).

So, whilst adding to territorial knowledge, it puts itself forwards as an autonomous means of communication which can convince a society to accept an innovative interpretation of the world (that, in its turn, then becomes part of a shared cultural fund of knowledge). One should not forget that what I have called the "internal" and "external" self-referentiality of a map means that such documents necessarily draw upon the cartographical work that precedes them whilst, at the same time, acting as a dynamo to generate innovation.

This symbiosis map/society can also be seen at the basis of certain communicative results that have emerged as constant factors in the analysis of the documents we have so far studied. One such factor is the map's tendency to voice the political/policy needs that led to its production rather that the individual project/view of the person drawing it up. This aspect of maps emerges with particular evidence in those predating the eighteenth century, when cartographical language was yet to be subjected to rigid codification and thus the cartographer had a freer range of stylistic options. Unbound by particular formal obligations, he could express himself in his own personal style of draughtsmanship and composition; and yet, as we have seen in the previous two chapters, even such pre-eighteenth-century maps reveal the same cartographical logic – further proof that what really mattered were the mechanisms of self-referentiality.

Nevertheless, one must note the radical change in the roles of cartographer and recipient with the emergence of Euclidean cartography. With regard to the former, there was a weakening of both his social and technical role. Cartographical language was thenceforward subjected to a rigid grid, and the cartographer lost all opportunity for personal individual expression (whilst, in the past, the conventions to be respected did leave some margin for free interpretation). What is more, the growing interest in cartography shown by nascent nation/states led to the institutionalising of map-making: the cartographer thus became little more than a technician, transferring onto the map what had already been established elsewhere. From being a figure capable of drawing the world, the cartographer became a topographer, expert in the techniques of land-surveying and charting. Certainly, he continued to apply the rules that ordered the representation of territory, but he was no longer the custodian of those rules. There were similar changes in the figure of the recipient: given that the message was now conveyed within a system of rigidly-established meanings, it presented itself as univocal, so the interpreter did not take part in interpretation as such; he passively absorbed what the map placed before him. In effect, this was the triumph of cartographical "self-reference" – with a maps defining themselves as maps (and thus defining what was the world).

As we shall see in a moment, the technical means of cartography – the map itself – gradually reinforced its rhetorical mechanisms and its rigid selectivity of information, thus undermining any possibility for either the

cartographer or the recipient to apply critical initiative[4]. Maps became a very efficient referential instrument at the same time as their connotative contents were weakened. This is why I will now look at length at the semiotic implications of the Euclidean codification of map-making. All my examples relating to the pragmatics of cartography will use this type of map, in order to bring out the strengths and limits of this imposition of norms.

5.2 *The Pragmatic Implications of Euclidean Codification*

In the section dedicated to the semantics of maps, we looked at the technical innovations introduced into eighteenth-century cartography. This process was an expression of a particular social ideology, and should be seen as a consequence of the way drafts and documents based on field-work were codified at the end of the seventeen/beginning of the eighteenth century, when the adoption of certain procedures for the collection and cataloguing of data established the rules that should be at the basis of any scientific praxis. This helps us to understand how maps became a product of a culture of codification, which took as its paradigm the geometrical/mathematical procedures of measurement. And this paradigm made itself felt not only in the construction of the map but in every single sign included therein. Just as the map was to be constructed according to parameters of geometrical precision, so the signs used in it should be equally mathematical – at which point the figurative sign gave way to the abstract sign. Henceforward, icons would consist of numbers and figurative surrogates that related solely to size, and colour would be used in a codified way, without any necessary analogy with the real world: green would indeed indicate vegetation and blue water, but then red indicated roads, black man-made constructions and bistre uplands, etc. In short, the passage from figurative to abstract representation meant that it was not longer possible to render the individual aspects of an object perceived by empirical experience.

The new system of signs offered an abstract interpretation of what was depicted. As Arnheim has pointed out, this abstraction should not be considered as some sort of abbreviated representation, which invites the observer to fill in the realistic details that are omitted[5]. This is not sketch notation. If it were, it would require recipients to take decisions of their own with regard to the nature of what they are observing. On the contrary, the cartographical sign presents itself as finished and complete, playing an independent role in interpretation. Each icon suggests a thesis about the key qualities of an object – and the univocal nature of this thesis derives from the

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[4] Abstraction/codification can be seen in terms of what G. Anceschi calls a "specialised convention of representation" – that is, the means whereby an act of representation takes an object and "abstracts" it from its context. See: G. Anceschi, *L'oggetto della raffigurazione*, Etaslibri, Milan, 1992, p. 59.

[5] R. Arnheim, *Visual Thinking*, Regents of the University of California, Berkeley Los Angeles, 1969. Reference is to the Italian edition: *Il pensiero visivo*, Einaudi, Turin, 1974, pp. 167-172.

fact that both map and interpreter are using the same convention. So, the first objective that is achieved is that the cartographical message is accepted automatically. In fact, there is no longer any opportunity to set one's own empirical experience of reality against the representation of it given in the map: one accepts the message a-critically. However, if abstraction has this negative effect, it also has a positive one, in that it facilitates the transmission of concepts (which was handicapped by analogical representation, by the use of figurative signs that aimed to reproduce the form of the object depicted). As Lotman has underlined, the codification of the meaning of signs produced a process of abstract generalisation – the end result of which was that intellectually simpler devices could be used to generate more complex forms of knowledge[6]. So, on the one hand, the control of complexity is more efficient, and, on the other, the abstract sign (with its established meaning) excludes the necessity/possibility of checking the representation against the reality represented. The result is a self-sufficient body of signs that does, however, require a key if it is to be read – and that key is the *legend*, which might be defined as the interface rendered necessary by the move from an analogical to a digital system of signs. The shift from a continuous to a discontinuous system results in a transformation of signs, and here the legend serves as a necessary supplement of information; it gives every sign a univocal and circumscribed meaning which – and this is the important point – is exclusively denotative and refers only to certain visible aspects of the objects depicted (shape, size, quantity). *Codification is the abstraction of cartographical language and leads to a loss of connotative meaning. At the same time, the fact that attention is focused on only certain visual qualities of objects emphasises the referential role of language.*

The most surprising result of this process of codification/abstraction in Euclidean cartography is that while it leads to an increase in knowledge, it also leads to a sizeable drop in meaning. The paradox might be summed up like this: just as cartographical language is subject to (formal, graphic and iconic) codification – abstraction that is intended to strengthen its ability to transmit messages – the very depth of meaning so transmitted is compromised (because selection focuses only on certain few and limited material qualities of objects). This is why the eruption of Euclidean logic into cartography leads to a loss of meaning, given that what has disappeared – with respect to pre-Euclidean cartography – is the ability to render the symbolic essence of the world. From the medieval period right through the Early Modern age, the world had been understood as a symbolic fact – with such understanding being enriched with the products of empirical experience; however, at the same time as this perception was lost, the referential function of the map was increased: the object represented could be recognised through certain locating devices alone[7].

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[6] J. M. Lotman, *La semiosfera*, Marsilio, Venice, 1985, p. 105.
[7] This does not rule out that connotations might be, in some cases, be transmitted. However, when this happens, such social values are communicated either by documents that do

Let's now try to follow this process from a theoretical point of view. We have already seen that denominative projection functions through the mechanisms of enhancement and surrogation implicit in the icon. This latter serves to communicate the connotative aspect of the name (and when the name is missing – for example, in the presence of referential designators – the icon serves to initiate a connotative metamorphosis). Now, however, I would suggest that within the process of enhancement there are mechanisms of stasis and even inversion. This means that, over a period of time, a block occurs: *within the process of enhancement there may well be phases of regression*. Consider this process of enhancement/regression in terms of lines of force: centrifugal lines of force lead to the emergence of meaning, whilst centripetal lines of forces work in the opposite direction and obstruct it. Thus we have a dynamics of "de-enhancement" and contraction: the outward action is obstructed by an internal contraction that favours not communication but simplification (indeed, banalisation). In this case, we can talk of denominative projection involving a process of regression that limits the very significance of a name (*reducing it to its denotative value alone*). Barthes argues that connotations communicated through a representation considered purely denotational thence acquire the "objective" mask of denotation[8]. In Euclidean cartography the communicative possibilities of icons are used to pass off designators – which may be laden with connotations – as mere denotations. Exploiting the contradictions arising from the possible enhancement of icons and the limits resulting from the simplification of surrogates, a process of regression is set up that acknowledges nothing but denotative meaning. As a result, the outcome of denominative projection will have no influence on referential designators and will only be seen in symbolic or performative designators. I have already argued that the icon acts at the connotative level because it can cause a connotative metamorphosis in a designator; however, in one of these regressive phases, it has the opposite effect, and can actually *undermine* the existing connotative content of the designator. In this way, denominative projection becomes focused solely on aspects of material extension: a city covers a certain area, a road is a certain length, a mountain a certain height.

So Euclidean cartography is a discourse of heightened referentiality, which emphasises the denotative role of the designator. This should be underlined: by focusing attention on the visual perception of territorial features – and excluding all other associations or messages – it simplifies communication and offers itself as the surest instrument for orientation. It becomes the best means for moving through real space, for determining

not comply with the codified rules of cartography, or else by surrogates indicating "size," which has a symbolic or performative value (indicating "importance" of some sort). A significant example here might be colonialist Italian maps of Somalia. See: E. Casti Moreschi, "L'altrove negato nella cartografia coloniale italiana: il caso Somalia", in: E. Casti, A. Turco (eds.), *Culture dell'alterità. Il territorio africano e le sue rappresentazioni*, Unicopli, Milan, 1998, pp. 269-304.

  [8] R. Barthes, *L'obvie et l'obtus*, Ed. du Seuil, Paris, 1982. Reference is to the Italian edition: *L'ovvio e l'ottuso*, Einaudi, Turin, 1985, p. 11.

precise location. Here interpretation seems to be a simple operation: all you have to have is the key – the legend – and every sign on the map becomes clear. In other words, when connotation is excluded, knowledge – or membership – of the culture that has affected/generated the designator are no longer indispensable. In effect, connotation is necessarily a question of history and background, requiring a certain range of cultural knowledge if it is to be understood. Reduced to simple denotation, the map presents itself as a universally comprehensible object, which communicates only what it shows. But we know that communication is not such a linear straightforward affair, and that it generates self-referential processes. The final result here is that all sense of territory as the outcome of human action is obliterated. The compensation for this (if one may use the term here) is that territory is now rendered in terms of those – its most banal – features which make it possible to establish and identify location.

But now let's look at some examples which show how cartographical self-referentiality functions in those societies which have adopted Euclidean cartography as their main instrument for orientation.

5.2.1 *The Baratieri "Map"*[9]

The examples I have chosen will also help to illustrate how the use of Euclidean conventions in a self-referential map can lead to mistaken indications with regard to spatial orientation. The case I will analyse is that of the sketch map distributed by General Oreste Baratieri to his various brigade commanders before the battle of Adua in 1896 – a document that played a key role in the Italian defeat. However, this is not a veritable map – that is, the result of Euclidean surveying and re-constitution – but rather a representation that makes approximate use of the current trigonometric conventions to produce a result whose "map-like" appearance would ultimately have disastrous consequences at the level of communication.

The map used at the battle of Adua suits our purposes here for two main reasons. Firstly, the historical significance of the event means that there is enough extant documentation for us to follow all the phases in the production and use of the map, and thus understand the role played by both the creators and interpreters of the document. Secondly, the historical discussion of the event now spans a century, and thus enables us to chart the changes in attitudes to the role played by the map. On this latter point, it should not be forgotten that one of the criticisms historians make of General Baratieri is that he did not use existing maps. In effect, historians here can be divided into two schools of thought: whilst some complain

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[9] In part, this discussion is drawn from the analysis of the cartography dating from the early years of Italian colonialism which is to be found in: E. Casti Moreschi, "La mappa del Baratieri: la sconfitta di Adua e la vittoria dell'autoreferenza cartografica", in: *Terra d'Africa 1996*, Unicopli, Milan, 1996, pp. 17-79. The reader is referred to this article for cartographical and bibliographical references.

about his failure to consult exact maps in drawing up his battle-plan[10], others focus on the fact that the sketch he did use in outlining his orders to his brigade commanders was inexact and full of mistakes.

At this point, it is clear that before discussing the map itself, one should look at the approach to cartography adopted in the early days of Italian colonialism. Was colonial expansion accompanied by the use of adequate tools for spatial orientation and the description – and thence conquest – of territory? Obviously, this is a minimum requirement for that complex praxis of colonialism which necessarily rests on the conquest of the territory of the Other, of Elsewhere. We know, however, that this consideration of the presence or absence of technical instruments can be misleading if not considered within a particular social and political context. However, given that military conquest is first and foremost a question of the conquest of territory – and thus is part of a process of territorialisation – each act therein (from denomination to the imposition of structure) is of significance because it aims to establish the instruments necessary for the creation of relations with – and within – the newly-acquired territory. The intellectual premises for Italy's role in Africa fell so far short of this territorial awareness that the ultimate failure now seems inevitable from the start; Italian colonialism is a case-study of a nation which clearly enjoyed a technical and technological advantage over the land of colonisation (Africa) and yet was totally unequipped with the knowledge that was essential to the achievement of its objectives. And one such area where this knowledge was lacking was cartography.

Cartography Before 1896: the Absence of Topography

First of all, one should stress that the Italian forces possessed no topography of the area where the 1896 battle took place – that is, in preparing their military strategy they did not have at their disposal a large-scale map based on accurate trigonometric surveys. What they did have were a varied range of maps that might be divided into three main categories: overall maps, itineraries and reconnaissance sketches. From the point of view of scale, surveying techniques and type of cartographical representation, the first group was a rather homogeneous corpus of works. These were maps to a scale of approximately 1:1,000,000, that reproduced the Tigrai region (where the battle took place) in the overall context of Ethiopia and Eritrea[11]. The "itineraries" were, in fact, road charts showing

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[10] For example, R. Battaglia – taking up the work of Conti Rossini – argues that Baratieri is to blame for the confusion between the brigades and for the aborted rendezvous between them, precisely because he did not use the existing maps of the area (R. Battaglia, *La prima guerra d'Africa*, Einaudi, Turin, 1958, p. 788).

[11] Amongst the most important, one might mention those by T. von Heuglin, W. Munzinger, G. Rohlfs and A. Petermann, which serve as a model for Italian output in this area. Amongst the most widely used maps where those by M. Camperio and A. Cecchi or G. Dalla Vedova and A. Dardano. However, an overall study of Italian works in this area of "indicative"

the existing routes between two sites of interest (no other information was given, nor was there any attempt to represent the territory as a whole). Such maps were drawn up by officers during their exploratory trips to provide information that might be useful in moving troops. The third group – of reconnaissance sketches – were drawn up respecting current cartographical conventions but without any resort to the usual techniques and systems of topographical surveying. In short, these sketches were close to being topographical maps; however, the errors, omissions and approximations within them meant that they gave only a rule-of-thumb picture. It should also be added that though there were numerous such sketches they did not cover the entire territory of Eritrea (let alone Ethiopia)[12].

One interesting document from our point of view is a rather special itinerary chart: the geodetic map drawn up by Antoine d'Abbadie. In effect, this is not a real map but a collection of geodetic data on sheets which then, together with other tables of data, went to make up the contents of a book[13]. From the point of view of topographical information, the D'Abbadie map is not particularly important: it gives geometrical-mathematical information relating to the distance between locations and their longitude and latitude; all of the other information that one usually finds in maps is missing (denomination and numerical data are the central focus). However, the map is of interest to us not only because it is one of the first surveys that gives reliable information on the territory between Enticciò and Adua, but also because Conto Rossini and then Battaglia (two of the most important historians who studied the Battle of Adua) argued that it was an available document Baratieri might have used in drawing up his own sketch, but failed to do so. The title given in an insert at the top left-hand corner of the second map in the *Géodésie* reads *Aksum et Addi Abun*, whilst the map itself reproduces the routes from Adua eastwards. This itinerary runs to the north of the area where the battle would be fought; the map gives a summary depiction of the main hills in that zone – *Samayata, Rajo, Gusaso* and *Kidana mihrat* (designators that I will come back to later) – and next to their names gives their altitude and distance from the route depicted. There are various possible explanations for the fact that Baratieri did not use this map, even though he knew of its existence[14]. First of all, there is its summary representation of the area

cartography reveals that they do not make any important contribution to knowledge. Indeed, they tend to impoverish the genre, giving a banal rendition of information that might well have served as a solid base for reference and orientation.

[12] Given this apparently inexplicable lacuna, one wonders about the role of the I.G.M. (the institution responsible for mapping the colonies). However, although topographical surveying of Eritrea got underway after the occupation of Massaua in 1885, it only really concerned itself with the port and the areas surrounding the city. In 1897 – that is, after the defeat of Baratieri's army – Adua was still being charted with indicative outline maps.

[13] *Géodésie d'Éthiopie ou triangulation d'une partie de la Haute Éthiopie exécutée selon des méthodes nouvelles par Antoine D'Abbadie*, Gauthier-Villars, Paris, 1873.

[14] Conti Rossini tells us that the General Staff did possess a copy of the map – but left it behind in Massaua. See: C. Conti Rossini, *Italia ed Etiopia. Dal Trattato d'Uccialli alla battaglia di Adua*, Istituto per l'Oriente, Rome, 1935, pp. 331.

concerned (the fixed points given are only considered as points of reference for the itinerary charted, and the scale is a very approximate 1:280,000); secondly, there is the absence of denominative surrogates, which means that locations can only be identified through designators (which themselves cannot be sited with any great precision, and therefore cannot be taken as reliable points of reference). In short, the document does not offer authoritative information on the number or identity of the hills present, nor on the distance between them. So, whilst offering important geodetic information, the map cannot serve for precise spatial orientation; hence the rather widespread opinion that General Baratieri is to be criticised for failure to use the map is, in fact, ill-founded.

From Sauria to Adua: a Tactic Based on Several Routes

Before the advance upon Adua, Baratieri distributed to his brigade commanders a topographical sketch of the area between Enticciò and Adua, a stretch of land which the General aimed to use for a surprise approach upon Menelik's army. The tactic involved the three brigades advancing separately to then meet up at a point called Chidane Meret, from where they would launch their attack. However, this assembly point was given in the wrong place on the map, hence the three brigades did not meet up as planned and the element of surprise was nullified[15]; as a result, the enemy army was able to attack each brigade separately and thus win the day. This is obviously only an outline account of the Battle of Adua, which omits a number of other concomitant factors that contributed to the Italians' defeat; however, it is sufficient to show the important role played by cartography.

The Technical Back-up for the Battleplan: Sketches, Informers, Reconnaissance

The terrain that runs from Sauria to Adua – about 30 kilometres in length as the crow flies – is relatively flat at either end but in the middle is crossed by a jagged range of hills that runs north-east to south-west from Mount Esciascié to Mount Semaiata, and forms a series of sharp peaks and sheer valleys[16].

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[15] To avoid confuse, I too use the currently accepted term "hill" to refer to the slightly raised features indicated by the designators in the Adua area. However, these "hills" are really the product of a forking or opening between uplands.

[16] This body of raised uplands is part of the group which runs east-west and forms the watershed between the basins of Mareb-Belasa and Ueri-Ghevà, the remains of the original plateau (formed of sandstone topped by volcanic rock, primarily basalt and trachyte). However, the morphology changes noticeably as the range runs from east to west. Between Adua and Enticciò there are a number of sheer – mainly single – peaks above the uplands; which stand out from the truncated hills that are typical of these areas. These numerous pyramidal peaks are the distinctive features of the landscape between Adua and Enticciò. See: I.G.M., "Itinerari a Sud dell'Eritrea n.3 Adua -Enticciò- Adigrat 1935", in: I.G.M., *L'Istituto Geografico Militare in Africa Orientale* 1885-1937, Florence, 1939, all. 1.

Whilst this natural barrier might well serve to hide the first stage of the Italian advance towards Adua, it also formed an intricate labyrinth of narrow pathways that prevented the movement of troops en masse – hence military tactics dictated that the army move up along different routes. Baratieri divided his men (about 14,000 of them) into three columns: that on the right commanded by General Dabormida, that in the centre commanded by General Arimondi and that on the left commanded by General Albertone. These three columns were supposed to advance from their respective camps at 21.00 hours on 29 February, whilst the Reserve (led by General Ellena) was to leave an hour after the last members of the Central Column. General Headquarters for the whole operation would move at the head of the Reserves (Figure 23). As the troops advanced, one problem immediately became clear: the Arimondi and Albertone brigades found themselves following the same path and suddenly met up with each other. Due to a mistake in the written orders (which anyway differed from the route traced on the sketch), this encounter further delayed the advance. Then, when the Albertone brigade reached Mount Rajo, which was the meeting-point, it pressed on southwards towards Adua, in search of "Chidane Meret", which local scouts and informers said lay in that direction (even if the map showed it at the point at which they had arrived). For its part, the Dabormida brigade reached the Rebbi Arienni hill, near the established meeting-point, but then veered off northwards, in search of what on the sketch map was given as a wide valley: *Marian Sciavitù* (Marian Scioaitù). So, all the misunderstandings and mistakes seem to have arisen from the fact that one could not recognise the terrain from the information contained in the sketch; or, rather, the main problem seems to have been that incongruency between what the sketch map showed and what the actual territory revealed did not undermine the credibility of the document – even when contradicted by direct evidence. I will follow up this point later; for the moment, the main point I want to make is that the sketch was not intended as a representation of territory but simply as an indication of the co-ordinates for orientation. In other words, the map was intended to solve a key problem facing Baratieri: it was to make his orders clear by fixing upon a chart certain tactical locations that would be identified by name. Baratieri did not worry about the nature of the communicative system that the map would use in order to achieve this objective. In other words, he did not bother to check that the territory was known to his officers through exact and precise denomination of locations, or if those exact and precise denominations corresponded with those used in the map. Similarly, he did not pose himself the problem of whether orientation would be possible in the absence of designators (he trusted that a few essential fragments of information would be enough to identify even those features that were not named or depicted on the map). Why this focus on the problem of orientation? To answer one has to remember that a military manoeuvre that required different parts of an army to advance along different routes at the same time necessarily involved great attention to the identification of routes and of the final meeting-point for the various brigades. Knowledge of the terrain was an essential factor if the plan

Figure 23 - *Strategic advance of Baratieri's brigades (taken from: R. Ciasca, Storia Coloniale dell'Italia contemporanea).*
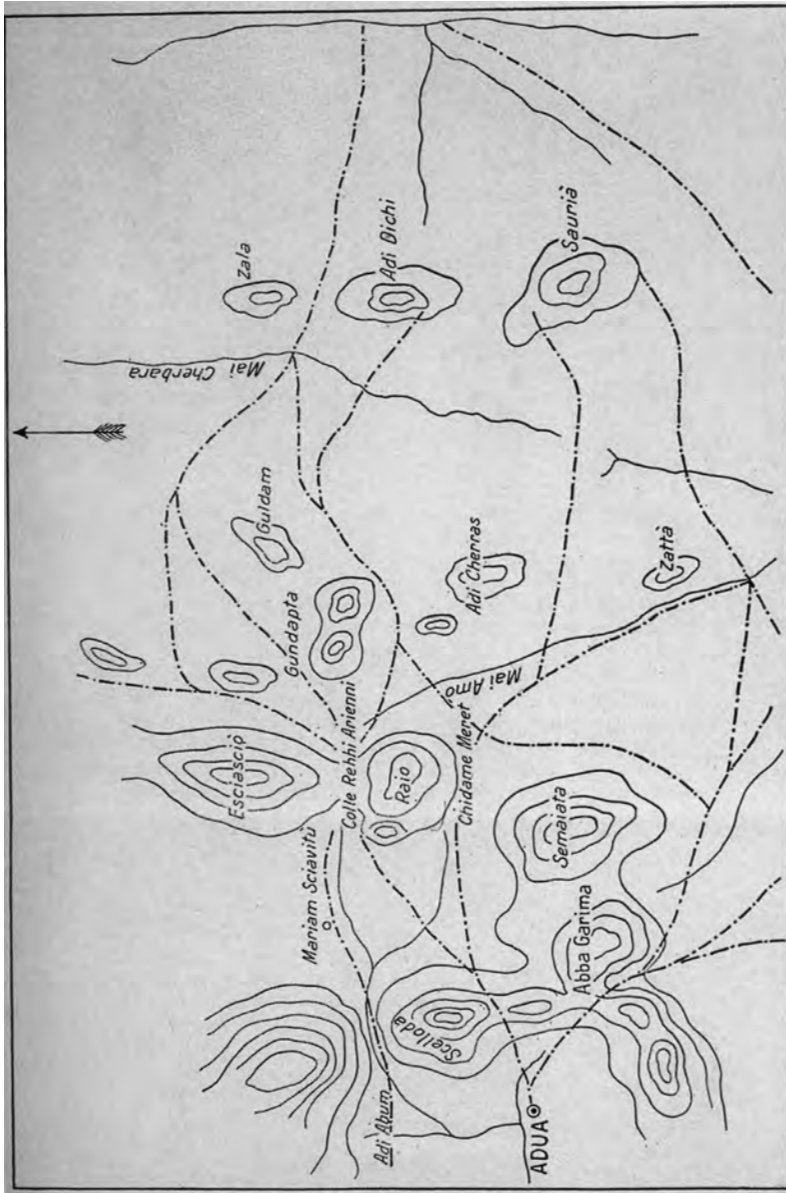
Figure 24 - *The sketch General Baratieri supplied to his brigade commanders before the battle.*

was to work. Baratieri realised this, but was wrong in thinking that this terrain could be adequately defined by establishing a small number of fixed points. The General assumed that once these points were recognised, one could use them to make up for what was missing from the cartographical representation. He failed to take into account that moving troops may well use fixed points in working out orientation, but they also need to have precise knowledge with regard to the direction they should take (and that precise knowledge is obtained from the relation between distant points and the territorial features that lie between them). Once one has identified direction, it is then important to establish the time necessary for the advance. This might be measured using data gleaned from reconnaissance or from the distance given on the map. But, unfortunately, here neither source of information was available. Once again, this was due to the type of terrain involved: given the lay of the land, uniform marching was out of the question – and a "rule-of-thumb" depiction of the landscape did not give any reliable information with regard to distances. To all of this one should add the particular conditions under which the advance took place: at night time along badly-signposted pathways. What is more, the terrain was practically unknown to most of the soldiers – who were marching across it for the first time – and the mountainous landscape was (for all its ups and downs) extremely regular and repetitive, thus making orientation all the more difficult. For its part, on-the-spot reconnaissance could not easily remedy these problems – not only because of difficulties in understanding and checking what local informants said, but also because of the incompleteness or incomprehensibility of the available referential designators.

As R. Battaglia points out, a night-time march is a very difficult military operation, even when carried out in peacetime over terrain with which troops are perfectly familiar[17]. Baratieri himself commented that although there was the advantage that the terrain they had to negotiate had just recently been crossed by enemy soldiers (and hence the thorns and stinging grasses had been flattened or cleared), the routes they had to follow still had all the disadvantages of African pathways: "sometimes cut across by rock faces, sometimes opening out into an interminable plain or blocked off by some cliff face – and the nature of the terrain was consistently difficult, especially for those wearing large and heavy boots". He also commented on the "so-called roads ... [which] are really paths cluttered with rubble and scrub that wind their way up and down..."[18]. The terrain, in fact, was a series of slight rises and inclines: for although the height of the main hills is substantial (Mount Semaiata is 3,024 metres above sea level and Mount Rajo 2,785), they do, in fact, stand on a upland plateau that is at an altitude of some 2,000 metres[19]. So, what one has is not a series of isolated peaks but a jumbled sequence of small hills that generally have rounded summits and no particular distinguishing characteristics (apart from Mount Rajo with its clearly

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17 R. Battaglia, *La prima guerra...,* p. 739.
18 O. Baratieri, *Memorie d'Africa (1892-1896)*, Bocca, Turin, 1898, p. 388 and p. 403.
19 The city of Adua stands at an altitude of 1,907 metres above sea level.

identifiable "tooth"). All of which makes it difficult to recognise one hill as opposed to another. But the very homogeneity of these hills also causes other problems in territorial identification. Any attempt to give a profile of their appearance is, of course, rendered vain when the point of view of the observer shifts even slightly: some will seem to form part of a single valley, others will disappear altogether, and some will blend together as forming a single mass. One can see this when one looks at the panoramic photographs that Pollena includes in his book[20]: a mere cursory examination of those pictures reveals that if the reading of the landscape were not facilitated by the use of denomination, it would be impossible to pick out one hill from another. One should also add that the very nature of the terrain meant that one was denied a wide open horizon within which to pick one's points of reference – and thus the (nearby) points one could choose shifted in relation to one's own movements. However, all of this disorientation resulting from an unrecognisable – and, therefore, unmastered – terrain, could have been drastically reduced (if not eliminated altogether), thanks to direct first-hand knowledge of the territory. However, this knowledge was never assembled – or even given due importance: as Conti Rossini points out[21], not only did General Headquarters fail to take advantage of the opportunities it had to put together a reliable cartographical representation of the terrain, it also appointed as commanding officer of one of the three columns a general (Albertone) who had never even set foot in the area before. Obviously, such problems of unfamiliar terrain can arise during military campaigns; but generally in such cases armies resort to reconnaissance. There is no doubt that Baratieri recognised the importance of such sources of information, commenting that "an elementary rule of war is that before any sort of manoeuvre or military action, one uses the resources of exploration and local information in order to be able to see clearly and advance directly upon one's objective"[22]. However, his own *Memoirs* reveal that, on this occasion, reconnaissance was neglected: "... information came into our camp through the informers we had sent out, through the local people and through deserters from the enemy forces. The informers we set out were of three sorts: "zaptiè" (local police officers) in disguise, trusty Ascari who had already served us as scouts during the campaign against Mangascià and local peasants (who were well paid and already hostile to the Scioans because they had

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[20] A. Pollera, *La battaglia di Adua del 1° marzo 1896 narrata nei luoghi ove fu combattuta*, Carpigiani e Zipoli, Florence, 1928.

[21] He writes: "one cannot but deplore the fact that after being masters of Adua three times, after having held a battalion garrisoned there for eight months, after Baratieri and his General Staff had themselves twice explored the paths and roads that run eastwards towards Adua, after the Operations Section of the army had been at work in Saurià for sixteen days, after a whole fourteen battalions had on the 24th day of the month spent several hours at Gandabtà – after all this, the command of the army still did not have even a quick survey map of the terrain" (C. Conti Rossini, *Italia ed Etiopia. Dal Trattato d'Uccialli...*, p. 331).

[22] O. Baratieri, "Di fronte agli abissini. Da Massaua a Ghinda. Loro forze e modi di guerra. La tattica degli italiani", in: *Nuova Antologia*, 1888, p. 407.

pillaged and plundered their land). One group knew nothing about the work of the others"[23]. Each was then interrogated separately and the information they provided was submitted directly to Baratieri. Nevertheless, no one noticed the mistakes incorporated in the sketch map. And when we look at the subsequent accounts by eye-witnesses, one can see that uncertainty with regard to the name and identification of locations persisted some thirty years after the battle[24]. Baratieri himself refers to hills and mounts using names that had been adopted in the period since the battle, or uses the same names to identify different geographical features[25]. Obviously, a key difficulty here was the impossibility of transcoding the original denominators: the difficulty in understanding the true reference of a designator led to the names of hills being applied to valleys, or the names of rivers being applied to hills – a confusion which obviously did not exist in the local system of denomination.

The Notorious Sketch Map

Major Tommaso Salsa was appointed to draw up a sketch map of the area, working in collaboration with officers Sapelli, Lucca and Partini – who were considered "experts" on the region[26]. The rough drawing they produced is without scale, indication of compass orientation, a legend or any other form of cartographical reference. The scarce information given is solely concerned with the various hills (indicated with rough contour lines) and watercourses (indicated with designators, which thus distinguish them from the routes to

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[23] *Ibid*., pp. 374-375.

[24] Pollera not only carried out a topographical survey of the territory, he also rewrote the place-names of a number of sites that had been erroneously identified in various reports and sketches (A. Pollera, *La battaglia di Adua del 1° marzo 1896...*, pp. 135-137).

[25] He writes: "Mount Scellodà, which is a fairly distinctive feature that stands in contrast to the Adua basin – and is fairly well-known in the area – was marked on the General Command's sketch. In effect, the main peak of Scellodà is rather more to the west and stands to the north-east of Adua. But the ridge that extends eatswards is also called Mount Scellodà – as one can see in the 1:50,000 sketch of the area from Enticciò to Adua that is included with this book" (O. Baratieri, *Memorie...*, p. 373, note 1).

[26] It is difficult to undertsand why Salsa never appeared on a charge for his work. In fact, neither the documents relating to Baratieri's trial, nor the declarations made by the general himself seem to lay any blame at his door for having produced a sketch map that was so full of mistakes. In fact, after Adua, Salsa went on to hold various important positions in other parts of Africa and to recive various decorations. See: E. Canevari and G. Comisso, *Il generale Tommaso Salsa e le sue campagne coloniali. Lettere e documenti*, Mondadori, Milan, 1935. Given his educational background, he should have been capable of producing a map without such glaring technical errors (after two years of Law at Padua University, Salsa had, in 1878, gone direct to the Military Academy at Modena). To get an idea of the man which goes beyond the usual praise of his merits, one might quote these lines from Conti Rossini: "With regard to Major Salsa there is this 1895 profile which is unsigned (but was undoubtedly drawn up by Dr. Nerazzini): "He is the most hated and feared of officers. Intelligent and cunning, he seems to dominate everyone, including Baratieri and Arinoldi. Brusque and abrupt with everyone, he adopts airs of superiority even with his equals. Vendicative, jealous and powerful..."" (C. Conti Rossini, *Italia ed Etiopia…*, pp. 232-233).

be followed) (Figure 24)[27]. The sketch map has received all sorts of abuse, and even been blamed for causing the loss of the battle. With regard to the mistakes in it, Aldo Valori rhetorically laments: "... so many mistaken names, so many misplaced signs, so many omissions! An entire series of massive uplands is simply ignored, the course of the mountain torrents radically altered, the mountain passes located at random, the roads shifted to the right or left in a purely arbitrary network"[28]. When first shown it, General Albertone described it as "*formless*", whilst for Captain Bellavita it was "*a bit of scrawl*". One might summarise the criticism of the sketch as follows:

– it puts the designator "Chidane Meret" between Mount Semaiata and Mount Rajo, when in fact that first hill is 7-8 kilometres to the south-west, near the basin occupied by Adua. As a result, the hill Erarà, which does stand between, is incorrectly named[29].
– the route it gives for the Dabormida brigade is not the same as that outlined in the written orders.
– It omits a whole series of uplands and hills (Diram, Belah, Monoxeitò, Gosossò, Zebàn, Darò, etc.).

What is noteworthy here is that both the fierce critics of the map (who argue its inaccuracies were responsible for the Italian defeat) and those who tend to ignore its importance, all make a crude error of evaluation: they take this sketch to be a geographical map and expect from it the exactitude and selectivity that are characteristic of such documents. The fact that this is a sheet of paper that aims to give a reproduction of territory seems enough for it to be a-critically accepted as a document that uses trustworthy methods of depiction to convey trustworthy information regarding the distribution of geographical features.

This is the same mistake as that committed by the generals involved in the battle. The true responsibility of the sketch map cannot be assessed merely by considering the real or probable inaccuracies in it; one must also look at the fact that the commanding officers responsible for planning the battle took it as a document enjoying the status of exactitude that is a characteristic of a topographical map. In other words, it was assumed that the intention behind and the techniques used in creating the sketch gave it all the reliability of a work of cartography.

All of this happened not only because those concerned were incapable of evaluating and analysing the map, but also because – as I have argued

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[27] Two copies of the sketch are included amongst the Baratieri papers now at the Army General Staff Headquarters. However, like the reproductions that accompany publications on the Battle of Adua, these two sketches differ slightly from each other. What is more, the sketch that Baratieri himself includes in his Memoirs, is oriented with East at the top. Nevertheless, despite these differences – involving the presence of an extra designator or two – the general layout of each sketch is the same.

[28] A. Valori, "Preface", in: A. Pollera, *La battaglia di Adua...*, p. XV.

[29] In fact, the area between Mount Semaiata and Mount Rajo is not occupied by the hill Chidane Meret but by a chain of hills – the main peaks of which are named Mount Enda Cauloz, Mount Magdanalik, Mount Erarà.

throughout this book – in reading such a document a number of complex mechanisms of communication come into play. Here, it is important to analyse two important aspects of the sketch which, more than any others, led to the misunderstandings: the first is the way in which names are used (the relation between denominators and denominative surrogates), the second is the degree of selectivity applied in deciding which territorial features to represent.

Denomination and Denominative Surrogates

The intellectual appropriation that was part of the European territorialisation of Africa involved the assignation of names to things – a process that was, in part, performed by means of geographical maps. With regard the role of the map as archives of designators, Salvatore Crotta – in a discussion of the denomination imposed by Italian colonialism – argues that when names take their place on a map they take on topological associations and significance[30]. The interpreter of the document notes this transformation thanks to the denominative surrogates – which make the name take on the status and "appearance" of certain geographical features. The codes referring to one and the same object function in relation to each other by indicating – and, at the same time, producing – a metamorphosis that transforms a "name" into a "place". When this pairing does not take place then the communication fails to function. *Chidane meret*, placed at a certain point in the sketch without any other accompanying indication, is considered unreliable because it is not underlined/backed up by any figurative surrogate (for example, the contour lines that would have indicated that the geographical feature it refers to is a hill). The fact that it is shown in a simple area of white paper – which in the schematic simplification of the sketch would seem to indicate flat plainland – means that the user/interpreter does not recognise its specific characteristics – and hence, the guide's claim that the hill was much further forward than it was shown in the sketch became credible. In short, in this case, the information conveyed cartographically was inefficient and unconvincing because the designator was not accompanied by denominative surrogates that would have served to establish reference.

One should also add that until a triumphant New Rationality had imposed its own metrics over territory as a whole (re-defining territory on

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[30] "In effect, a geographical name is more than a symbol for topological identification by means of one or more words – words which originally expressed some summary judgement with regard to the place or some material/moral relation that humankind believed to exist – or wanted to exist – between that location and themselves. [...] Being transcribed by means of visual signs, the name acquires durability – and therefore becomes universal and univocal". As a result, it can serve as a means of "topological identification" (S. Crotta, *La trascrizione dei nomi di luogo ne' suoi rapporti con la geografia e colla scienza del linguaggio*, Longatti, Como, 1899, pp. 49-50 and p. 58.

the basis of canons – and denominations – originating in its own culture), it used existing denominations, those originating "elsewhere". R. Battaglia argues that the Italian army "again on this decisive occasion, arrived in Africa as the expression of a half-grown and still backward 'civilisation'"; its methods of organisation were "no longer based on instinct, but were yet to be based wholly on rationality and reason", with fragile schema that were "destined time and time again to fall apart when submitted to the harsh and unpredictable conditions of battle"[31]. In effect, the Italians recouped the names that had originally been applied to the territory by the Ethiopians and then established their reference to the terrain on the basis of half-understood explanations and indications. Sure proof of this state of affairs is to be found in the fact that even *post hoc* it was difficult to reconstruct all the various phases of the battle because of the lack of denominators with sure unequivocal reference. In his *Memoirs*, Baratieri himself has to resort to designators that do not figure in either the map or written orders in his attempts to make his meaning clear. Very often, mistakes were made in fixing the reference of the designators to particular geographical features[32]. In the existing maps, for example, the few designators within the area were often distorted translations that were applied to heterogeneous geographical features. Bellavita, for example, claims that none of the officers knew that there was a *Enda Chidane Meret* close to the hill *Chidane Meret*, and none were aware that *Marian Sciavitù* was intended to refer to a valley and not a hill[33]; the misunderstanding arose from the fact that an attributive designator was being used in the referential role of a fixed designator. This is even more serious when one thinks that such an error in comprehension is what one might call "first level" – i.e. an error with regard to denotation not connotation. As well as not understanding what the words meant in the original culture, the users of the sketch did not even understand what they referred to when used as designators.

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[31] R. Battaglia, *La prima guerra…*, p. 770.

[32] With regard to this uncertainty of names, he writes: "In Ethiopia, single names – particularly in wild, scarcely-populated mountain regions – are often used to indicate a watercourse, a hill, a gully, an area of terrain and a region. Given this indeterminacy – which is often to be found in even our most accurate European maps – it is possible that, like the local people, the officers who knew the country indicated the hill with the name of the whole district; and it is also possible that they used the name Enda Chidane Meret to refer to the passage between Mounts Semajata and Rajo". At which point, one wonders if the general actually knew that the word *ende* refers to a "hill" – especially when we read "… he was forced to pass back through the saddle of Enda Chidane Meret", pp. 378-379 and p. 397. One should also note how the general uses the indeterminacy of designators to "cheat", arguing a point that is contradicted by the actual morphology of the terrain as indicated in the sketch. He writes: "... beyond the undulations of the hills, one could see in the basin of Mariam Sciautù – some one and a half or two kilometres beyond the opening – a fairly large enemy encampment near the water, in part hidden by the ridges of Mount Nasraui (which we were at the time referring to as *Mount* Mariam Sciautù)" (my italics). In fact, in the sketch that designator refers to an otherwise undefined basin. See: O. Baratieri, *Memorie d'Africa...,* p. 417.

[33] E. Bellavita, *Adua, i precedenti – la battaglia – le conseguenze (1881 – 1931)*, "Rivista di Roma" ed., Genoa, 1931, p. 402.

This leads us to consider how denomination functions within the sketch. Baratieri did not check that his officers used the same name to refer to the same location; nor was he actually in a position to master the reference of the various names – when some expressed perplexity upon receiving the sketch, he answered that any shortfalls in information would be made good by the guides[34]. For the terrain which was familiar to the officers, it was clear that the sketch offered only approximate information; however, with regard to the terrain that was unknown to them, the sketch was taken as being reliable. Whilst one may consider this reaction surprising, it does in fact reflect the way any of us responds to a geographical map: we critically evaluate its representation of what we know, and a-critically accept its representation of what we do not know, cannot "recky" for ourselves[35]. The criticisms made by the officers before the battle all concern the designators within the territory that was known to them (the first part of the terrain over which they had to advance). In fact, General Albertone did not follow the route indicated by the sketch – which entailed moving forward with the hill Adi Chieras to his right – but that indicated in his written orders (Sauria - Adi Chieras - Chidane Meret). In doing so, he followed the route charted by reconnaissance a week earlier, leaving the hill to his left and thus moving further north – with the result that he encountered the head of the Arimondi column just beyond Adi Cheiras itself. And the same general would, when he arrived at an unknown spot which was marked on the sketch as *Chidane Meret*, first of all decide that he had reached the established rendezvous point, but then – on the basis of a number of factors – decide that he was in the wrong place. Not being able to resolve the incongruency between what was shown on the map and what was before his eyes, he decided to no longer trust in the former but in the guides who told him that the rendezvous-point was further ahead.

In short, not only was the location not specifically identified – due to the failings I have already mentioned – but there was also another problem: the sketch's omissions of some hills, whose actual physical existence thus made orientation impossible. As we have seen, this case shows that if there are no denominative surrogates that establish the territory with precision then designators alone are not convincing; but it also reveals that excessive simplification in the rendering of territory will by itself generate false information. This highlights another aspect of cartographical language and communication: selectivity.

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[34] When General Albertone commented on the roughness of the sketch, he replied that each brigade commander would have an adequate number of expert local guides. See: R. Battaglia, *La prima guerra…*, p. 738.

[35] As we have already pointed out, the acquistion of cartographical information involves the reception/memorisation of the names and forms given within a recognised object (the map). It is thanks to memory that one can pass from the real to the symbolic and vice versa. See: C. Jacob, *L'empire des cartes. Approche théorique de la cartographie à travers l'histoire*, Albin Michel, Paris, 1992, pp. 226-227.

An Excess of Selectivity

Let us compare Baratieri's sketch with another sketch of the same area that comes from a topographical map covering the same features: hills, hydrography, roads and names (Figure 25). This is a rough sketch constructed to meet a specific purpose, in which information is selected according to the same criteria as apply in a topographical survey[36]. The comparison brings out the clear differences in the criteria applied here and those which would seem to have been applied in the Baratieri sketch, which highlights the fact that there are different degrees of selectivity – and that the degree of selectivity chosen in constructing a representation can actually influence interpretation. However, in all cases – and one does well to bear this in mind – selectivity is a question of convention: the practical and ideological establishment of what is to be selected is always determined by the same purpose: the efficient communication of information necessary for the completion or performance of a particular action[37]. Yet once this convention has been accepted, one must hold to it. If one does not, then one runs the risk of conveying equivocal information[38]. For example, the few hills shown in the first sketch give the impression of a rather flat landscape dotted with hills – a deduction that based on the cartographical convention that absence of contours = flat terrain. In the second sketch, however, the density of the contours leaves one in no doubt that this is very uneven territory indeed. Thus the two documents produce very different information: the few clear references in the first map offer the illusion that this is territory that is easy to master, whilst the rendition in the second map is a complex picture within which one can easily become disoriented. However, when one compares each map and the real world, one sees that it is the second sketch – with its proliferation of information – that gives the right impression, and its representation of all the hills means that the user/interpreter can make an independent choice of his points of reference. In the first sketch, what we have is not a "neutralisation" of information (through the coherent application of criteria of selection) but rather the "destruction" of information: the arbitrary depiction of only those hills which are of immediate interest in plotting one particular plan of action means that the map generates false information. In the Baratieri sketch the simplification is arbitrary and therefore gives a false overall impression of the landscape, whilst in the second sketch the excessive complexity of the

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[36] The sketch – which was originally published in E. Bellavita's book to offer a term of comparison with the Baratieri sketch – also occurs (with slight modifications) in: R. Battaglia, *La prima guerra…*

[37] Conventions imply that the participant in the act of communication accepts certain signs, certain ways of representing reality. What distinguishes such conventions from the merely arbitrary is the fact that they are accepted by a number of agents, who all see them as serving the same ends and purposes.

[38] Once a convention has been accepted, it actually serves to indicate the presence/absence of specific objects or phenomena.

real terrain is neutralised by the coherent delineation of only a few territorial features. Here coherence means that once the features for inclusion have been selected then they are shown in their entirety: by depicting all the hills of the area, the map becomes an efficient instrument of orientation because it enables users to make their own independent choice of points of reference.

I have stressed the point of selectivity because in the case of this map certain misunderstandings have arisen precisely because this aspect has been neglected[39]. General Albertone was convinced he was in the wrong place because the designator "Chidane Meret" as placed in an area of blank paper seemed to indicate a hollow rather than a hill: however, upon advancing, given that the map shows another area of blank paper, he should therefore have expected to encounter another valley or plain, but actually encountered another series of hills. What is more, General Dabormida, a leader of one of the three columns, also made an error in orientation: having reached mount Rebbi Arienni, he found himself facing a range of hills (Diram, Bellah, Monoxeitò, Gosossò, Zebàn, Darò), where the map showed a large valley named *Marian Schiavitù*. Thus, he tried to reach this "valley" by moving north, to get beyond that chain of hills. This interpretation of his actions – which differs from those that have so far been advanced – seems to me the only one that accounts for what would otherwise be incomprehensible behaviour. The cause, therefore, of this inexplicable swerve northwards is the interpretation that the general put upon the discrepancy between the rendition in the sketch map and what he actually saw in front of his eyes.

The only position that remains incomprehensible is that of General Baratieri himself: the commanding officers who received the sketch were denied that exercise of initiative which should be guaranteed to anyone responsible for implementing a broadly-defined plan of action; and at the same time they seem to have been expected to guess the purposes of the advance (since he gave them no explanation of his ultimate objective). Baratieri seems to have taken for granted collective involvement in the implementation of an (unknown) project, with each component acting towards the achievement of a single aim that he himself had established (and incorporated in a sketch map of supposedly univocal interpretation). Before the advance, Baratieri did not explain his plan to anyone: he simply handed out orders, the performance of which depended upon his subordinates not encountering things he himself had not foreseen[40].

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[39] On this point, see the discussion of the elementary structure of maps in chap. 3 and what is said there about selection.

[40] It has already been pointed out how Baratieri's written and spoken orders left the whole purpose of the operation vague. After having laid down that "the corps will move from its position at Saurià in the direction of Adua", the order then gives as first objective the position comprising the hills Chidane Meret and Rebbi Arienni between Mount Semaiata and Mount Esciasciò. There is no reference to further objectives, and thus the brigade commanders responsible for carrying out the plan were left in some uncertainty (R. Battaglia, *La prima guerra…*, pp. 733-735).

The Victory of Cartographical Self-reference

One might, therefore, argue that the sketch, by the mere fact of its existence, becomes inseparable from action: the decision to use it is implicit in its creation, and the information such a document contains – even if incorrect information – necessarily becomes the background knowledge upon which one has to draw in deciding courses of action.

No one asked if this drawing was a geographical map. It was enough that it had been drawn up using the codes that are characteristic of modern cartography: contours are used to indicate elevation, denomination indicates points of reference and the layout of objects on the map is presented as an analogous reproduction of their distribution in the real world. The "facts" as featured trigger off a mechanism of self-referentiality: one recalls that a geographical map has certain characteristics and that, as a result, the signs within it are to be interpreted in a certain way. Both the interpreters of the document (Baratieri and his generals) and those who created it (Salsa and his collaborators) operated within a historically consolidated code. As we have already seen, even when incorrect, the information given in the map entered the circuit of communication and affected the behaviour of those consulting the sketch. General Baratieri does not ever seem to have wondered if the names and geographical features given in the map would be enough to represent the territory as it really was. And while he expressed some doubts as to the accuracy of the map, General Albertone was in fact helpless against the self-referential mechanisms of cartography: he does not interpret what the map depicts as being a mere arbitrary rendition but assumes that the document has such authority that it can be taken as "having priority" in the inevitable comparison between territory and map – or, better, map and territory. He takes it that the territory must conform to what is shown on the map, and when this is not the case, his actions are motivated by an attempt to correct the incongruency whilst holding the "truth" of the map as valid. General Dabormida, in his turn, does not even think the map is wrong when he encounters a range of hills where the map shows a valley; he simply looks elsewhere for what is depicted in the map.

The affair, therefore, provides significant empirical proof of cartographic self-referentiality. One might argue that simply because it was created by members of a society who had taken maps as being the prime means of communication relating to spatial orientation, Baratieri's map takes on all the authority of a cartographic document. The presentation of signs within the map gives rise to a semantics and syntax that effects the pragmatics of those interpreting it (in this case, troop commanders, with all the authority their position entails). In fact, our analysis up to this point has revealed a constant feature in the mechanisms of communication within geographical maps, which influences the behaviour and actions of those who use such documents: what the map shows is trusted and referred to in decision-making, even when it has been shown to be imprecise or even wrong. Quite

Figure 25 - *The topographic sketch of Adua's battle area (R. Battaglia, La prima guerra d'Africa).*

Segni aggiuntivi e speciali per le vecchie carte delle colonie   Tav.ª XIII

Strade a fondo naturale

———————— Camionabile buona

    "   mediocre

    "   nella sola
stagione asciutta

———————— Carovaniera principale

    "   secondaria

———————— Ferrovia leggera (T.ª Décauville)

Linea telegrafica o
telefonica stabile

Villaggi regolari
di capanne

Villaggi irregolari di
capanne permanenti

Villaggi irregolari di capanne tempo
ranee o luogo di accamp.to periodico

Abitazioni trogloditiche
in terreno piano

Abitazioni trogloditiche e
caverne in pendio ripido

Castello (Gasr, Garesa, ecc.)

Torrente

con pozze d'acqua   normalmente asciutto

Farta o
defluente

Indicazioni per i pozzi:

○S Pozzo con acqua salmastra

○$\frac{7}{15}$ il numeratore indica il dislivello
fra il suolo e il pelo medio dell'acqua;
il denominatore dà la profondità
totale

Cimiteri: ⊠   ✕   ✕
            Cristiano Musulmano Ebraico

Moschea   Marabutto con fabbricato

Marabutto senza fabbricato   Tomba

Sinagoga

Località ove avvennero combattimenti
(data)

Termitai

Dune mobili

Bassura spesso allag.ta

Coltiv.ni indigene erbacee

Bosco fitto spin.so imperc.le

Grossi alb.ri carat.ci isol.ti

B.co rado di palme o sicom.ri

♨ Cedui

♀ Olivi

♂ Eucalipti

♃ Gaggie

♀ Sicomori

♔ Baobab

♈ Palme dum

♈ Palme dattifere

Ψ Acacie ombrellifere

Ψ Euforbie candelabro

♀ Ginepri arborei

♀ Garas

♋ Besser o agar

♒ Tamerici

Ψ Bambù

Figure 28 - *Additional signs to be used in colonial maps,* Istituto Geografico Militare
(1936).

apart from the use one makes of cartographical information, it is clear that the acceptance of this information as information is in some way binding.

So it would be inexact to argue that Baratieri *et al.* were unaware of the role cartography played in the defeat at Adua. All those who have investigated the affair – the members of the Tribunal who tried General Baratieri, the Foreign Ministry (which after the defeat set higher standards for the maps drawn up by the Institute of Military Cartography) and the historians who have studied the extant source material – have all recognised that the sketch map played an important role. But whilst one cannot say that they denied the usefulness of maps, one can argue that they did undervalue the real power of geographical maps. There is no doubt that such maps were considered a useful tool, and when they were lacking it was thought important to produce some sort of surrogate (the sketch map). However, there was no awareness that a map is an act of symbolic mediation, which produces specific territorial knowledge that is the expression of a particular social project at a particular point in history.

The very aim of this book is to identify the role cartographical representation plays in territorialisation, to establish to what extent the presence of cartography determines certain mechanisms of territorial behaviour. Certainly, at the time of the Adua defeat, such an objective would have been incomprehensible: it would have meant "inventing" the ability to see the problem as such, developing requirements in the use of cartography which would have reduced the misunderstandings – and the expectations – implicit in the consultation of maps.

At the time, it was not suspected that cartographical representation was a special type of distortion in our view of the world; maps were considered to be an instrument capable of offering an "objective" picture of reality. This is what is meant by saying that cartographical representations became reality itself, took the place of direct experience. Map-reading was an apparently simple experience, which did not require any conceptual frame of reference or intermediation. At most, one had to know the meaning of the symbols used – but then these were explained in the legend. Hence, maps were considered as a simple, clear and reliable instruments of expression, referred to in the way one might refer to a photographic image. This idea of maps as a "faithful photograph" of the world – a reproduction of reality based on the application of clear, well-known criteria – meant that not only did people tend to forget that the information provided was partial, they also overlooked the fact that a map is the result of an elaboration of information that presupposes – and proposes – a particular vision of the world.

On the other hand, a consideration of the extent to which geographical maps function as a symbolic mediation which contributes to the production of territorial knowledge, leads us to consider how, in the Modern Age, it was the intellectual and mathematical conquest of space that stimulated the growth of a cartography which, at one and the same time, implemented and proposed territorial strategies. The drawing-up of a geographical map is always the expression of the appropriation of territory by some form of power – something which is particularly clear in the period we are discussing,

when the European powers set about colonising other areas of the world. The map provides a specific image of territory – an image that is suited to the aims and purposes of an "external" rationality; the map is a strategic instrument in a social project, with the State as the main territorial agent.

At this point in our discussion of official cartography, I will pass on to look at the topographies drawn up by the Military Institute of Geography, and attempt to bring out how those documents communicated at a connotative level.

5.3 *Connotation in the Cartography of the Military Institute of Geography*

In an article of a few years ago, F. Farinelli showed how the maps of rural Italy drawn up by the Military Institute of Geography (hereafter referred to by the Italian initials I.G.M.) gave a weak and standardised picture of the specific characteristics of agricultural life in the various regions if Italy. The *cascina* of Lombardy and the *masseria* of Puglia were both represented by the same abstract icon as individual nuclei of rural activity. Borders were just depicted generically – whereas the type of field division could tell us something about crop rotation and whether land was used for livestock or crops, just as the existence of fences, walls or hedges could tell us something about how a farm was owned and run[41]. Farinelli thus argues that the loss of awareness of the specific characteristics of our territorial/rural heritage is due to cartography. However, the cartographical institute that drew up these maps is not to be considered as sharing in this responsibility: its brief was to draw up maps that could be referred to in planning and executing troop movements (maps which necessarily omitted any information superfluous to that specific purpose). The mistake was that of using military topographical maps as the official state instrument for understanding the connotative aspects of territory.

Inherent within the process of territorialisation that began after the Unification of Italy was a loss in the symbolic-performative value of denomination: it was established that there was to be extensive renaming, re-signifying, of locations and places, and this process was to be carried out by means of maps. Necessarily, the new designators were less rich in connotations, and this loss initiated a banalisation of the function of names[42].

There would be little point in reiterating this point today, if we were not trying to bring out the pragmatic implications of maps, to reveal how the loss of awareness of the strategic function of territory results from the mistaken assumption that the Euclidean map can be taken as a connotative representation of territory. In looking at the reasons why Euclidean

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[41] F. Farinelli, "La cartografia della campagna nel Novecento", in: *Storia d'Italia*, Einaudi, Turin, 1976, pp. 626-654.

[42] In recent years, the practical – and theoretical – consideration of toponomy that has occupied geographers is largely concerned with recovering what has been or is being lost with regard to the cultural significance of territory.
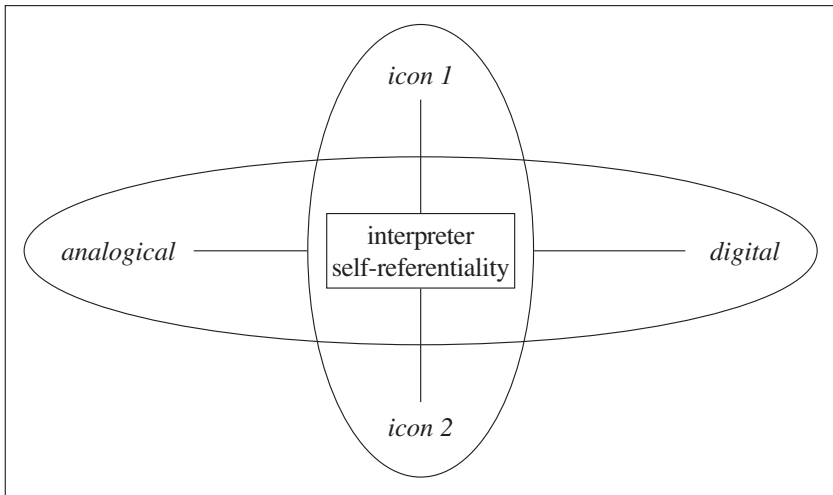
Figure 26 - *The analysis of cartographical pragmatics.*

cartography did usurp such a connotative function one has to look at certain pre-suppositions in the pragmatics of cartography. An analysis of these pragmatics comprises an analysis of how the creators of maps apply the semantics and syntax of cartography. The semantics of a map is a question of codification, of the (analogical or digital) systems of communication that are brought into play in order to create a body of possible interpretations (that is, the mechanisms whereby signs take on meaning and significance for an interpreter). The syntax, on the other hand, comprises all the relations established between icons – relations which may be disjunctive (emphasising difference) or conjunctive (emphasising their interplay with each other), and thence create that play of syntagmas within which a cartographer/recipient identifies a specific coherence and thus constructs a discourse. The cartographer/recipient are the "motor" of the whole process. However, the outline of the analysis of the pragmatics of cartography given in Figure 26 (the operation of syntax and semantics being shown within one of the elliptical spaces) would not be complete if one omitted to point out that while the cartographer/recipient is always at the centre of these dynamics he must always allow for the self-referentiality of the map. As the agent that initiates the whole process, the "interpreter" of cartography has no range of choices where the mechanisms of self-referentiality are concerned – to use a theatrical metaphor one might say the "interpreter" in an actor on the "stage of pragmatics", whilst the self-referentiality of the map is the director. It is the latter which lays down how the interpretation is to be performed.

The pragmatics I have just outlined are clearly borne out by maps of the Modern Age; however, things become more difficult when one looks at Euclidean cartography. There, given the adoption of the most common and
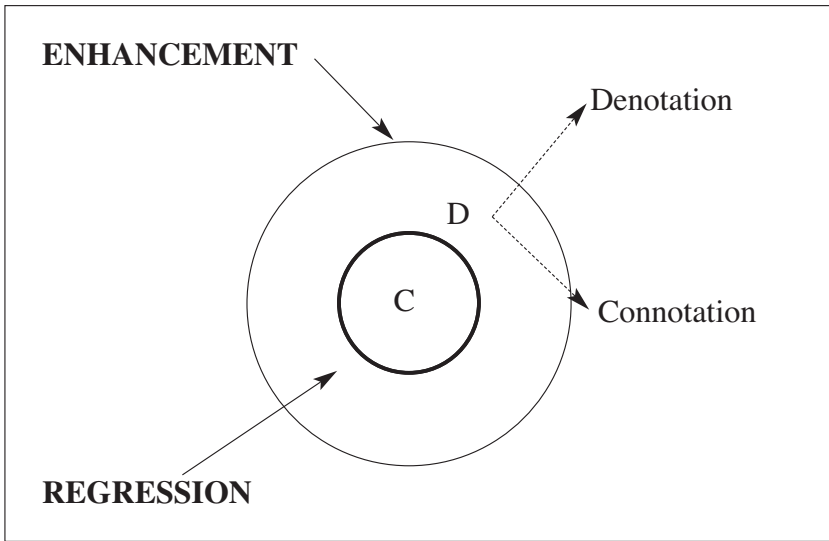
Figure 27 - *The production of connotations by the icon.*

standard features of territory as the information focus, the reading of signs would seem to take place entirely at a denotative level. And if we considered that the pragmatics of cartography is centred on the "interpreter" – a representative of social expectations and requirements – then it becomes difficult to see how such a figure can properly perform his role in simply receiving information relating to the physical location of places. Can one argue that, in such Euclidean maps, semiotic pragmatics is entirely a question of reference and nothing else? Such a claim is untenable. As we have already seen through our empirical analysis of examples, the very presence of self-referential systems within a map means that such documents generate information rather than simply storing the information included within it by the cartographer.

Once again, the answer to our problem comes from the domain of theory. Within the semantics of cartography we were able to identify an enhancement/regressive mechanism, and the argument we used there can also throw light on another aspect of Euclidean cartography[43]: the fact that what is actually a product of the metrics of cartography can be presented – and accepted – as a socially-generated product over which there is no disagreement (Figure 27).

Let us imagine an icon that contains the connotative values associated with the designator © and an outer ringer indicating the denotative value of that designator. By creating a barrier around the core, the process of

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[43] See part 2 of this chapter.

regression prevents the exit – and hence communication – of the meanings that might be present within it, whilst the action of enhancement works upon the outer ring of the designator, causing the exit not only of the denotative meaning but also of the connotative meaning that is thus generated. We have already seen that enhancement is always capable of generating connotations, even in strictly referential designators; and in the case of the Euclidean map the presence of mechanisms of regression inhibits the exit of the actual connotation of the designator, whose place is taken by those generated "ex novo" by the icon itself. This is backed up by the fact that the impoverishment within the codification and the weakening of the connections between an icon and what it represents does not prevent certain connotative aspects being taken as denotative parameters: the size of a city may depend on the number of its inhabitants, its political role or its religious importance; the icon of a wood echoes the economic importance of this natural resource; the importance of a road is deduced from its width, etc. In this case, however, connotation has a denotative significance – yet due to the mechanisms of enhancement/regression, this denotation is transformed into a connotative association generated by the outer ring rather than by the core of the icon. All of this opens the way to aspects that go beyond mere reference and give rise to a connotative vision of territory – a vision which is a product of cartography itself.

So it is clear that for the creation of an instrument for efficient orientation within physical space one pays a decidedly high price: there is a loss of awareness of the connotational import conveyed by the designator (that is, of information which might be useful in the satisfaction of various subjective needs) and an emphasis on those values and meanings that are simply the product of cartographical self-referentiality. In short, the Euclidean map does not transmit knowledge that draws on the socially-consolidated meanings of the designator but on those that are constituted by the semiotic dynamics of the map itself. As a result, action based on the map is not necessarily integrated with the action that is an expression of the metaphysics of a particular society. The end result is that the map inhibits the vitality of territorial praxis[44]; the cartographical agent – be they the producer or recipient of the map – cannot act on the basis of the socially- and historically-consolidated associations of the designator.

However, while the Euclidean map seems to exclude cultural background, the very conventions it uses do communicate information of cultural import. For example, the size of the icon used to depict a church does inevitably communicate something about that church's "importance"; the message conveyed could be said to be "understood" by the cartographical conventions used. What counts is neither the cartographer's intentions nor the aims and purposes of the person using it. All that matters

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[44] I will return to this point. On communication as part of territorial praxis, see: A. Turco, "L'ordine infinito: simboli territoriali e dispositivi sociali presso i Senoufo della Costa d'Avorio", in: *Terra d'Africa 1993*, Unicopli, Milan, 1993, pp. 15-72, espec. pp. 52-53.

is the self-referential message. This is one of the reasons why I would argue that with the advent of the Euclidean map there is an increase in the importance of such self-referential action. And it is also why I would argue that such maps contain a narration of territory: the map tells a story that is inspired and held together by the mechanisms of cartography. Even at its most banal, the map/story offers a persuasive account of a particular situation. So, to further bring out the hidden rhetoric at work in such documents, it will now be useful to apply to them the results of recent studies of narrative structures and devices.

5.4 *Euclidean Narration*

That old cartographical documents tell a story is a fact that has already been made clear through our consideration of parchment and other maps, which "narrate" environment and territory within the framework of the particular interest such areas might have for a particular society. A map's use of code and symbol thus reveals the basis of a process of territorialisation which can follow various different courses. However, whilst it appears superfluous to turn to these documents for further proof of such maps' "narrative" nature, a doubt still remains about Euclidean cartography: given that we have argued that such maps are inhibited in reproducing the connotations of the designator (apart, that is, from the connotations generated by cartography itself), can we really argue that what they offer is a narration of territory?

To answer this question, I will apply notions that come from the study of narratology and of the various rhetorical devices that serve as "engines" for narration. Here, narratology is understood as the explication of a series of situations in which events unfold and characters act in specific environments and settings. Some also distinguish between "narration" and "description" in terms of a contrast between the "static" and "dynamic": the story may contain both facts and action, whereas description is characterised by the absence of movement[45]. However, others – such as G. Genette – argue that there is no semiological difference between description and narration: describing a scene or recounting an event are two similar operations that draw on the same linguistic resources[46]. U. Eco goes even further and claims that description necessarily contains a component of narration, given that it necessarily involves the dynamics of communication. So, whilst the temporal dimension of the tale is not the same as the temporal dimension of the events recounted, there is a temporal dimension to discourse that is closely bound

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[45] G. Genette, *Figures II*, Ed. du Seuil, Paris, 1969. Reference is to the Italian edition: *Figure II*, Einaudi, Turin, 1976; *Id.*, *Seuils,* Ed. du Seuil, Paris, 1987. Reference is to the Italian edition: *Soglie*, Einaudi, Turin, 1987.

[46] G. Genette, "Frontiere del racconto", in: *L'analisi del racconto. Le strutture della narratività nella prospettiva semiologica che riprende le classiche ricerche di Propp*, Bompiani, Milan, 1979, pp. 279-283.

up with the actual time of reading. Thus one can see the importance here of the various modes of discourses – that is, the body of techniques – used in the various forms of communication in which rhetoric plays a central role. From this we can see that the spatial arts (architecture, painting, etc.) – together with cartography – do themselves require a process of reading that takes time; Eco calls this their "circumnavigation time" (the more details there are, the longer it takes to circumnavigate the whole)[47].

Hence, one might describe the specific nature of the cartographical tale in these terms: it is a *description* of territorial features carried out using *modes of cartographical discourse*, in which the narrative component emerges at the *level of communication*. Furthermore, continuing along the lines of semiotic analysis that we have followed so far in this discussion, one should also point out that all maps can employ different procedures to recount their tale – that is, they can function as text and as image. R. Barthes argued that it was precisely those systems that made use of various levels and types of communication which might employ rhetorical devises to effect a shift of connotation into denotation. In his discussion of photography, he points out that all forms of communication require that everyone involved in transmitting or receiving the message applies the same interpretative key – this latter being understood as a body of culturally-inherited rules which make it possible for all members of a society to understand a linguistic product in the same way[48]. For example, at a connotative level, an image is an architecture of signs that complies to a code of reference which has been established by society. However, that code can also work at a denotative level as well. The concept of "interpretative key" serves to support the argument that it is denotation that is the basis for the generation of connotations; the connotative "meta-language" is generated within the body of denotative signs used. However, Barthes argues, not all linguistic signs can have a connotative function, which is generally reserved for those signs which communicate via metonymy (that is, which draw upon digital systems of communication). What is more, the presence of digital and analogical systems in the same means of communication – as happens in maps, with their use of text and image – does facilitate the shift from one level of communication to another, opening up possibilities that are not available in other means of communication.

Barthes then goes on to show at what point in the communication the social values conveyed become explicit, and how this happens: connotation is generated by ideology (that body of consolidated values which in geographical studies is also referred to as the "metaphysical reservoir" of a society), and it is always conveyed by means of rhetoric – even if there are obvious characteristic features that depend upon whether we are talking about communication through images, text, objects or behaviour. Rhetoric, therefore, is the "meaningful" face of ideology; and in Euclidean

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[47] U. Eco, *Sei passeggiate nei boschi narrativi,* Bompiani, Milan, 1994, pp. 72-75.
[48] R. Barthes, *Eléments de Sémiologie,* Ed. du Seuil, Paris, 1964. Reference is to the Italian edition: *Elementi di semiologia*, Einaudi, Turin, 1966, pp. 23-24.

cartography one can see the rhetoric of the map serving to communicate (as inherent to the designator) associations and meanings that are really only generated by the map itself. One might also add that as a manifestation of ideology, such rhetoric also acts as an "informer" upon the apparently neutral geometrical-mathematical rules used in creating the map[49]. So, we can argue that the Euclidean map communicates rhetorically at a denotative level; the narration it offers reveals that such a map is the expression of the ideology of the society which produced it.

Obviously, this idea of the use of rhetoric in the narrative of a Euclidean map brings us back once more to the question of self-referentiality. In effect, it is this self-reference which functions as the rhetorical "engine" that powers the unfolding of the narrative. The map does not only function as a means of symbolic mediation, but offers a referentially-based narration, which implies that this territorial "basis" of the map is the feature that takes precedence over all other features. So, in a Euclidean map *narration is a rhetorical means that draws upon self-reference (that is, self-identification qua "map") and actually changes the usual relation between denotation and connotation*: though such a map aims to exclude connotations, it fails to do so; the symbols themselves communicate map-generated information: to repeat the example given above, the size of an icon communicates something about importance which may not reflect the real state of affairs (for instance, a very small church can be a very important one).

This outline of the narrative processes at work in a map leads us to two conclusions: i) self-referentiality is the real engine behind all cartographical communication; ii) even at a denotative level, a map is an instrument of communication that is anchored in social conventions and mechanisms. So, quite apart from all the other comments one might make here, one must underline one of the most important practical considerations of this state of affairs: a map is only fully efficient and effective within the society that produced it.

5.5 *The Map and Elsewhere*

Now let's look at the relations between maps and contexts different to those in which they were produced. In our case, this means the relation between maps and non-Western cultures. A consideration of this relation reveals why and how it is possible to establish a rhetoric of "Otherness" that compensates for the impossibility of transmitting a geography of "the Other" or "Elsewhere"[50].

The West used the map to give expression to that self-affirmation which was a constantly recurring need during the process of expansion. Quite apart

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[49] R. Barthes, *L'ovvio e l'ottuso...*, pp. 22-41, and particularly p. 37.
[50] A. Turco, "Delacroix in Marocco: indagine sull'altrove", in: *Terra d'Africa 1995*, Unicopli, Milan, 1995, pp. 315-353.

from the other results of this expansion, the West therefore carried the metrics and method of its Euclidean geography throughout most of the world; and in the period that went from the era of the great geographical explorations to the establishment of colonialist power, it seemed to win out against all those other "geographies" which claimed to embody knowledge in a representation and ordering of the world[51]. As it explored and discovered, the West took itself to be acquiring objective – and therefore universal – knowledge, which it then composed into a geography, legitimated and expressed through maps which were offered as providing the sole possible representation of the world. In imposing its geography, the West qualified that which was territorially "other", that which was "elsewhere", as something different from itself. This meant that it could offer no adequate representation of the identity of *the place of the other* because such locations were seen in terms of *difference* rather than *substance*. What was ignored was the disarmingly obvious assumption that *place* is nothing other than the consolidation – on the ground – of human praxis, which models a point on the globe until its appearance reflects the values that society has attributed to it[52]. Consequently, if one is to discover the authentic physiognomy of a place one must explore it within the symbolic practices that make themselves felt therein. And we know that designation and naming play a most fundamental role among these practices[53].

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[51] *Ibid.*, p. 324.

[52] Failure to recognise this meant failure to investigate the praxis which produces a specific "place"; as various writers have pointed out, this effectively ruled out any chance of identifying the specific features of that determine landscape and terrain as such. P. Gourou, for example, points out that *civilisation* – that is, the ways in which humankind inhabits territory – has two key meanings. It can be understood as providing the linguistic key to our interchange with territory, as well as being a question of the historic events that have modelled territory. He argues that there is, in effect, a (de)forming prism between humankind and the environment: language conditions the way we think and the way we establish relations with the world. The natural environment is filtered through the idea humankind forms thereof, by the way it is pictured through symbols. This concept of *civilisation* is to be found in all the French geographer's works, amongst the most important of which one might mention: P. Gourou, *Leçons de géographie tropicale*, Mouton, Paris, 1971; *Id.*, *Terres de bonne espérance. Le monde tropical*, Plon, Paris, 1982; *Id.*, *L'Afrique tropicale. Nain ou géant agricole?*, Flammarion, Paris, 1991.

[53] This is how A. Turco puts it: "... humankind creates territory by interpreting the phenomena they observe and then organising them in configurations that are neither "natural" nor "self-evident". On the contrary, these arrangements of phenomena are the result of a choice between more or less competitive possible interpretations". Humankind "[...] draws up designs, indicates points, areas and lines – and thus makes places, according to descriptive, enumerative and taxological criteria. Hence, denomination renders land semantic; however self-supporting, this operation is not an end unto itself. In effect, what initially appears to be the *lexicalisation of space* eventually reveals itself for what it is – the *grammaticalisation of territory*. Single designators can be placed in relation to each other – or to groups of other designators- on the basis of correspondence or contrast. The end result is that territory is enclosed in a system of relations which serves as the basis for the rules of geographical behaviour. Organised in this network, the various semantic nuclei give rise to a veritable syntax, which not only guarantees that territory is symbolically coherent but also establishes the limits and requirements of territorial action, has an effect on vital praxis" A. Turco, "Pensiero mitico e pensiero razionale nella territorialità baulé (Costa d'Avorio)", in: *Id.* (ed.), *Declinazioni d'Africa*, Rubbettino, Catanzaro, 1997, pp. 219-277, see p. 236).

These considerations arise from an analysis of the "deep" meaning of territory, which sees that an understanding of territory is strictly conditioned by cultural background. From the nineteenth century onwards, every time Europe was engaged in deciphering the place of "the other", its first attempt to do so was always based on an interpretation in terms of European culture and values. Based on a comparison with the already-known, this method involved an identification of differences, perceived in terms of what was "missing" or what was "extraneous", and was then catalogued as a manifestation of the exotic, the picturesque or the barbaric[54]. In the relations established with Africa during the period of colonialism one finds a shift from a purely theoretical appropriation of territory to what was effectively occupation of the land, with facts being adapted to suit theory (thus setting up a vicious circle in the European perception – and thence knowledge – of "the Other")[55]. Explorers, travellers, soldiers, journalists, photographers and cartographers all offered the public limited representations of that world. They were incapable of achieving full mastery of Elsewhere as more than merely *different* to the world they knew[56]; indeed, as recent studies have shown, the entire process of colonisation was legitimated by the expedient of "difference"[57].

Thus one can understand why the role of the map was so important during this period. We have already seen that a map is the perfect example of a system of classification based on difference: the objects shown are identified by means of the difference between them and other objects. However, maps also adopt this selective criterion of difference when they depict unknown territory: they offer a description of an unknown land which is not open to empirical verification, inherent features of "the Other" are indicated by means of the differences between them and those of known territory closer to hand. The map tends to standardise difference:

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[54] In effect, unlike today, there was then no realisation that a place might have a meaning, might be the "depository" of values which are the basis of social praxis and the mediator that serves to confirm the legitimacy of these selfsame values. This role of "place" can be seen in the social "earmarking" of certain spaces as public or private, as restricted to men or women, as destined for secular or religious use, etc. See: A. Turco, "Delacroix in Marocco...". With regard to the Arab city and its social/territorial role, see also: M. Lussault, "Città degli altri/luoghi dell'altrove: qualche rappresentazione di città dell'Africa del Nord nell'immaginario francese"; and: R. Cattedra, "Il paradosso orientalista: mitologie e patrimonialità della 'città arabo-islamica' nella lettura della Grande Moschea di Casablanca", both in: E. Casti, A. Turco (ed.), *Culture dell'alterità. Il territorio africano e le sue rappresentazioni*, Unicopli, Milan, 1998, pp. 61-81 and 467-492.

[55] E. Said, *Orientalism*, Routledge & Kegan Paul, London, 1978. Reference is to the Italian edition: *L'orientalismo*, Bollati Boringhieri, Turin, 1991, pp. 101-102.

[56] On this topic, see: F. Surdich (ed.), *L'esplorazione italiana dell'Africa*, Il Saggiatore, Milan, 1982.

[57] As well as the acute analysis by E. Said already mentioned, see: G. Rochat, *Il colonialismo italiano. Documenti*, Loescher, Turin, 1973; A. Del Boca, *Gli italiani in Africa Orientale. I. Dall'Unità alla marcia su Roma*, Laterza, Rome-Bari, 1976; N. Labanca, *La marcia verso Adua*, Einaudi, Turin, 1993. On the importance of visual representations, see: G. Gresleri, P. G. Massaretti, S. Zagnoni (eds.), *Architettura italiana d'oltremare 1870-1940*, Marsilio, Venice, 1993.

the nearby is depicted with a high degree of fidelity, whilst the "distant" loses its identity. Paradoxically, the map – which might be defined as a simulacrum of the "remote" (given it serves in determining strategy for the conquest of such territory) – actually inhibits all possibility of seizing the true significance of Elsewhere. It has the same paradigmatic relationship to the "elsewhere" as it has to the "exotic": it aims to offer a model and at the same time define itself as providing an unquestionable approach to the world, whilst what it actually does is "show" without helping us to "understand"[58].

As A. Turco has argued, the history of Elsewhere-seen-as-Difference is primarily the history of a geography incapable of grasping the *topomorphosis* operated by symbolic systems – incapable, that is, of understanding the process whereby beliefs and knowledge are rooted in a location (become location as such) and thence have an effect on human praxis and on the mechanisms of social control. Obviously, it is easier to perceive material transformations, but even here we have to draw a distinction between a holistic and a differentialist view of Elsewhere. The material transformation of the earth's surface (reification) takes place in different ways and at different rates. Sometimes, it occurs through such fragile and apparently insignificant works of man that an observer used solely to the geography of his own world might simply considered the location before him as open space. Unaware of the symbolic appropriation of territory in front of him, he judges it to be practically unchanged by the presence of humankind, to be more or less wild. Unlike the ideology which sees the rest of the world as difference, the holistic approach embodies the principle that analogies do not necessarily require standardisation. Man-made products may be made with the same materials and using the same techniques – they may even be designed to serve the same practical purpose – nevertheless a bridge, a field or a settlement in Africa cannot be understood as the same as a bridge, a field or a settlement in Europe: each is part of its own organisation of territory, each "functions" in its own way[59].

And even when we consider maps solely as referential instruments, they do not really seem to be an adequate tool for spatial orientation when used outside the European civilisation that produced them. This does not mean that Africans do not use points of reference in moving around the territory, but simply that their system of reference is not based on the signs which Europeans include in their maps. Territory is read not as a body of fixed features but as a process; Africans have learnt to read the signs of this continual flux and thus uses those dynamic phases in deciphering orientation. A flock of birds, the course of a river, the direction of the wind or the motion of the sun are all equally valid bases for determining

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[58] F. Affergan, *Exotisme et altérité*, Presses Univ. De France, Paris, 1987. Reference is to the Italian edition: *Esotismo e alterità*, Mursia, Milan, 1991, pp. 28-32.
[59] A. Turco, "Delacroix in Marocco...", pp. 326-327.

orientation, even if they do not require one to use a frame of reference built around fixed territorial features (which in any case, are often lacking altogether or practically unnoticeable). The Europeans in Africa, however, based orientation solely upon those territorial features that could be identified, named and mapped – features that had to be permanent characteristics of the terrain and which were clearly connoted as different from each other[60]. This is the reason why the mapping of Africa presented such difficulties to European cartographers. The nature and type of the features used by cartographers were not comparable to those found "back home": if one is going to map a savannah or a desert, clearly one's map will have to have a new type of legend. Indeed, what in Europe were fixed features of the landscape could actually be deceptive in Africa: raised relief in the landscape, if it existed at all, often took the form of a uniform, undulating series of rises and depressions; plains were vast and monotonous; rivers appeared and disappeared. The conventional signs adopted to master the "different nature" of Africa were not the same as those used in mapping Italy or the other countries of Europe (as one can see from the legend in Figure 28). The presence of physical features that changed – or even disappeared – according to season (for example, some rivers and lakes, or sand dunes) led to the adoption of signs that were supposed to take this possibility of formation/disappearance into account. But the very organisation of territory and location changed because villages themselves periodically moved from one site to another – just as the boundaries of fields were not marked and the limits of woodland altered due to the joint actions of fire and subsequent re-growth. The "reification" of territory performed by the Africans themselves, struck the Europeans as merely stop-gap and insignificant. And it took solid, European "reification" to lay the bases for genuine cartography: that is, maps became possible when the route of a road had become fixed, when there were bridges and other road infrastructures, when there were houses, offices and warehouses. Maps were constructed on the basis of fixed territorial features; and given that such features were rare, then any fixed object was precious, to be identified and named with precision.

This operation was made necessary because the new rationale being imposed on territory was not compatible with that which preceded it. The Africans themselves had already named their territories, but their denomination was not based on a metrics of recognised fixed points but on a recognition of the shifting dynamics of the physical landscape. Pre-colonial denomination was centred on a close rapport between man and his natural environment – a relationship with powerful sacred and symbolic connotations. The traditional notion of reference as embodied in a map did not exist as such. Proof of this is to be found in the fact that when it

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[60] A significant case is analysed in: L. Gaffuri, "Africa orientale, colonialismo e universi simbolici: geografia di un romanzo", in: A. Ioli Gigante (ed), *Uno sguardo dall'isola. Saggi geografici su Europa, Sicilia, Africa*, Marsilio, Venice, 1991, pp. 53-80.

became clear that cartography risked providing information which would not even be sufficient for simple physical orientation, it was decided to create maps that totally excluded denomination altogether, with reference based solely on the determination of certain geodetic points. For example, as a result of a 1908 agreement between the Italian Government and the Negus, a special Commission was set up to chart the boundaries between Ethiopia and the Italian dominions in Somalia[61]. Their task was to physical trace the border, adapting it to the variations imposed by local conditions. Begun in December 1910 and concluded in October 1911, the project did not cover the whole of the border (right up to the junction with British Somalia), but only the stretch as far as Uebi Scebeli – the area that borders on territory under Ethiopian sovereignty[62]). The work began with the astronomical measurement of the geographical position of Dolo and the measurement of a basis for a network of triangulation readings along the border (with the calculation of the azimuth of orientation for the whole network)[63]. The process of demarcation was carried out from Dolo to Ato, but the rest of the border was never traced out[64]. This partial survey was then used to draw up six route maps of the area between Hara and Baidoa (to a scale of 1:500,000) and two maps of the region around Dolo (to a scale of 1.100,000)[65].

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[61] The Italian section of the Committee was headed by Capt. Carlo Citerni, an explorer who had been on Bottego's 1897 expedition, and also included two IGM topographers – E. Grupelli and A. Venturi – who were responsible for astronomical and geodetic readings and for the drawing up of the relative maps. The Abyssinian delegation consisted of a representative of the government, the head of the region involved and a German expert in topographical surveying (C. Citerni, *Ai confini meridionali dell'Etiopia*, Hoepli, Milan, 1913).

[62] On this cartographical project, see: A. Mori, *La cartografia ufficiale in Italia e l'Istituto Geografico Militare*, Poligrafico dello Stato/Amministrazione della Guerra, Rome, 1922, pp. 369-379. On technical questions: *L'Istituto Geografico Militare in Africa Orientale, 1885-1937*, I.G.M., Florence, 1939, pp. 20-70. For a review of the maps on Somalia, see: C. Traversi, *L'Italia in Africa, serie scientifico-culturale. Storia della cartografia coloniale italiana*, Ministero degli Affari Esteri, Poligrafico dello Stato, Rome, 1965, pp. 47-86 and pp. 143-162.

[63] The chain of triangles establishes the position of 36 vertices that serve as points of reference for the drawing up of maps (scale – 1:100,000) covering a total area of 1,600 sq. kms. The altitude was calculated on the basis of the altitude of Dolo, established by barometric readings. Unending quibbles and delays made the work difficult and arduous, and finally the Ethiopian delegation had to be replaced; but even when work started up again, there were problems which prevented completion of the project (the Abyssinian government recalled its representatives after armed clashes between the Somalis and the troops of the-then *Degiac*, Tafari, the future Negus) (C. Traversi, *L'Italia in Africa…*, p. 148).

[64] New work on the delineation/demarcation of borders took place between 1924 and 1927. The aim was to establish the frontier between Italian Somalia and Kenya, following upon an agreement with the British government. In 1929 another special IGM delegation set off to chart the border between Italian Somalia and British Somaliland – a project that was completed in 1931.

[65] A compass was used to chart the entire route from Diré Daua to Brava (2,000 kms). This involved fixing the position of Harar, Addis Abeba, Dolo and Brava astronomically. Other readings were taken using a theodolite and chronometer to determine the elevation of the sun and selected stars at 100-km intervals along the route. See: A. Mori, *La cartografia ufficiale in Italia…*, pp. 376-378.

One should note here that this was a very peculiar type of cartographical operation: it was not based on a topographical survey but merely on geodetic measurements, which, as we know, produce a single type of information (that based on points of reference). However, here the referential nature of the information was very strange, given that it was based solely on the identification of points of reference by means of astronomical co-ordinates: once the position a point was established using longitude and latitude, it was then identified by reference to some territorial feature and then marked on the map (using a dot, an abbreviation, a number and, in some rare cases, a designator). The information thus produced leads to only limited intellectual appropriation of territory because the process of cartographical referentiality is not followed through to the end: the geographical features of the points chosen is not included, all that matters is their identification through geodetic location[66]. Thus all territorial features are of equal importance, given that importance depends solely on definition-through-location. Of course, this on-site survey of the terrain was intended to check that the border did not cut across pre-existing organisations of territory (for example, did not run right through the middle of a village); however, when this was the case, all that happened was that the new border was traced out by reference to other territorial features, without any indication of their territorial importance. It is necessary to point this out because geodetic maps, even when – as here – they have the characteristics of reconnaissance maps, do not give a very meaningful geographical representation of territory as they do not recognise the results of the social action of territorialisation. If these documents are important, it is because they reproduce unexplored regions, which thus find a place in an international system of reference (even if the knowledge given in the maps is of a totally abstract nature).

What is more, orientation was not felt to be the only purpose colonial maps were to serve: cartography was to be a compendium of all possible knowledge about distant and unknown lands. However, this desire for abundance of information might well conflict with the recognised criteria of selectivity, which we have seen is one of the characteristics of maps. If we look at the maps of Libya, for example, we see that maps cover such information as the depth of the water surface within wells (important in understanding the depth of the water-table), or might include tables listing local uses of territory[67]. To illustrate this more clearly, I will now look at a map of the Cufra oasis deep in the Libyan desert.

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[66] The institution of reference starts from a number of "equal" features – given that there is no "objective" or "natural" reason why a particular mount, lake or river should be taken as points of reference. However, once they become objects of recognition, these features are stored away as "attributes" of the landscape; they acquire the status of territorial knowledge from the very moment that they are given a name (A. Turco, *Verso una teoria geografica...*, p. 87).

[67] C. Cavicchi, "Sulla opportunità di un riordinamento nella determinazione dei segni convenzionali delle carte topografiche, specialmente per quelle coloniali", in: *Atti del VIII Congresso Geografico Italiano*, Florence, v.2, 1923, pp. 449-456, see p. 452.

A Map of the Cufra Oasis[68]

To a scale of 1:400,000, this sketch map was published in 1923 by the Office for Studies of Cyrenaica, and contains a larger-scale inset (1:300,000) dedicated solely to the oasis of Cufra. In fact, the name was used to refer to an entire area of oases in the eastern section of the Libyan desert (which – along with Cufra (or Chebabo) – contained the oasis of Bzema, Tazerbo and Rebiana) (Figure 29).

Before the military occupation of the area in 1931, the zone would subsequently be surveyed in a map entitled *Tummo, Cufra ed oasi del 24° paralello*, which was to a scale 1:100,000. As the location of a holy city, the oasis was particularly important because of its links with the rebel movement in Libya, and as a result was the object of numerous exploratory expeditions[69]. The first of these (led by A. Desio) was organised under the auspices of the Reale Accademia d'Italia and was intended to study the morphology, anthropology and geology of the area[70]. A subsequent – 1932 – mission was organised by the Military Institute of Geography and led by O. Marchesi; this completed the topographical survey of the zone and was followed in 1934 by yet another mission (organised by the Italian Geographical Society and led by U. Monterin), which was intended to complete the study of the geography, geology and climate of the southern part of the region[71]. The area was of great strategic interest – particularly when the Italians decided to push much further inland into Libya – and the abundant water and fertile land of the oasis meant it had a particularly important place in the Italian government's plan for developing agriculture within the country. One should also add that it was located at a strategic point along the route the Italians had in mind for a road link between the Mediterranean and the French and Belgian colonies of Central Africa[72].

This is not a map drawn up on the basis of new surveys but is constructed

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[68] This analysis is taken from: E. Casti Moreschi, "La Libia nella cartografia coloniale italiana: Tripoli e Cufra": in: C. Cerreti (ed.), *Colonie africane e cultura italiana fra Ottocento e Novecento, le esplorazioni e la geografia*, CISU, Rome, 1995, pp. 99-122.

[69] On the 1930 bombing of the oasis and the indignation at the civilian casualities, see: A. Del Boca, *Gli italiani in Libia. Dal fascismo a Gheddafi*, Laterza, Bari, 1987, pp. 191-227.

[70] A. Desio, *La spedizione della R. Accademia d'Italia nel deserto libico*, Treves-Treccani, Rome, 1932; *Id.*, *Missione della Reale Accademia d'Italia a Cufra*, Accademia d'Italia, Rome, 1937. Previously, in 1926, Desio had already undertaken an expedition to the Giarabub oasis under the auspices of the Società Geografica Italiana: *Id.*, "Notizie geologiche e geografiche sull'Oasi di Giarabub e sul deserto libico", Soc. Geogr. It., Rome, 1931; *Id.*, *Risultati scientifici della missione all'Oasi di Giarabub*, Soc. Geogr. It., Rome, 1938.

[71] U. Monterin, "Missione della Reale Società Geografica Italiana nel deserto libico e nel Tibesti", in: *Bollettino Geografico dell'Ufficio Studi del Governo della Libia*, 7, 1934 (republished in: A. V. Cerutti (ed.), *Dal monte Rosa al Tibesti*, Lib. Valdotaine, Aosta, 1986, pp. 319-342; *Id.* "Attraverso il deserto libico fino al Tibesti", in: *L'Universo*, 10, 1935 (republished in: A. V. Cerutti (ed.), *Dal monte Rosa...*, pp. 343-384).

[72] U. Monterin, "Cufra e la via più diretta e più economica tra l'Europa e l'Africa equatoriale", in: *Atti del Secondo Congresso di Studi Coloniali*, Naples, 1934, (republished in: A. V. Cerutti (ed.), *Dal monte Rosa...*, pp. 385-399).

using the information to be gleaned from previous reconnaissance expeditions[73]. However, what is interesting about maps of this kind is that, in spite of the limits within which they were drawn up, they do depict and annotate all the features that are of interest. The picture that emerges is detailed and varied – even if one should not forget that here again one has a representation that shows Europe trying to appropriate an "elsewhere".

The settlements and agricultural organisation of the oasis are shown, with a few symbols being used to distinguish between vegetable gardens and clusters of palm trees, whilst there is also a subdivision of the various places of religious worship (*zauia*, mosque, place of prayer). The picture is completed with a depiction of the salt pans and the borders of the land available for cultivation. All the other information is given without resort to symbols: each feature is identified by a number that is then explained in a legend, and a separate table also gives the size and ethnic composition of the local population (the most numerous being the Zueia (Berber Arabs), the Tebu and the Sudanese)[74]. All this information together reveals that the oasis is divided into distinct settlements. The old Tebu settlement (el Giof) is identified, along with the later Berber and Sudanese settlements (all indicated by the use of different words for the unit of habitation: *capanna* [hut], *casa* [house] and *zeriba*). Dotted lines are used to indicate the various routes leading away from the oasis, and the work is completed with the information (placed under the legend): *good and abundant water in all the wells, fine for Europeans as well.*

The use of conventional signs and information rendered through written text, reveals a certain tentativeness, a belief that a symbolic-figurative system would not be adequate for rendering what was still "unknown". The combination of different systems is intended to avoid all possible misunderstandings. One should also add that, given the absence of a codified classification for the African features of the site (signs with

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[73] The first European to visit the oasis was F. G. Rohlfs in 1879. He was followed in 1896 by the Tunisian Mohammed ben Otman el-Hasciaisci. Thereafter come the expeditions by the English explorer Rosita Forbes (1920-21) and the Egyptian Hassanein béi together with the Frenchman Bruneau De Laborie (1923). See: A. Del Boca, *Gli italiani in Libia. I, Tripoli bel suol d'amore (1860-1922)*, Bari, Laterza, 1986, p. 8; and the Touring Club Italiano's *Guida della Libia*, Milan, 1937. During the First World War, various Italian and French soldiers were inprisoned there; their experiences were subsequently recounted in: *Rivista delle Colonie Italiane* (S. Maschio, "Prigionia di un soldato italiano a Cufra, Memorie", in: *Rivista delle colonie italiane*, 1, 1927, pp. 15-24; 1, 1928, pp. 129-145).

[74] It was during this period that awareness was dawning of how important it was to understand local traditions and customs. For example, consider this passage written by C. A. Nallino in 1930: "If we want to implement good policy; if we want to attract the Muslim populations in our colonies over to our side; if we want to establish a spiritual contact with them – and failure to do so has so far gravely hindered all our efforts – then we must begin by knowing them, deep-down. We must not settle for that superficial knowledge which our administration tended to – and perhaps, still tends to – be satisfied with. For those who govern native populations there is nothing worse than a failure to understand their soul, to draw up a fair and just evaluation of their past, their traditions, their beliefs and aspirations". Taken from: A. Del Boca, *Gli italiani in Libia. II, Dal Fascismo a Gheddafi*, Laterza, Bari, 1988, p. 232.
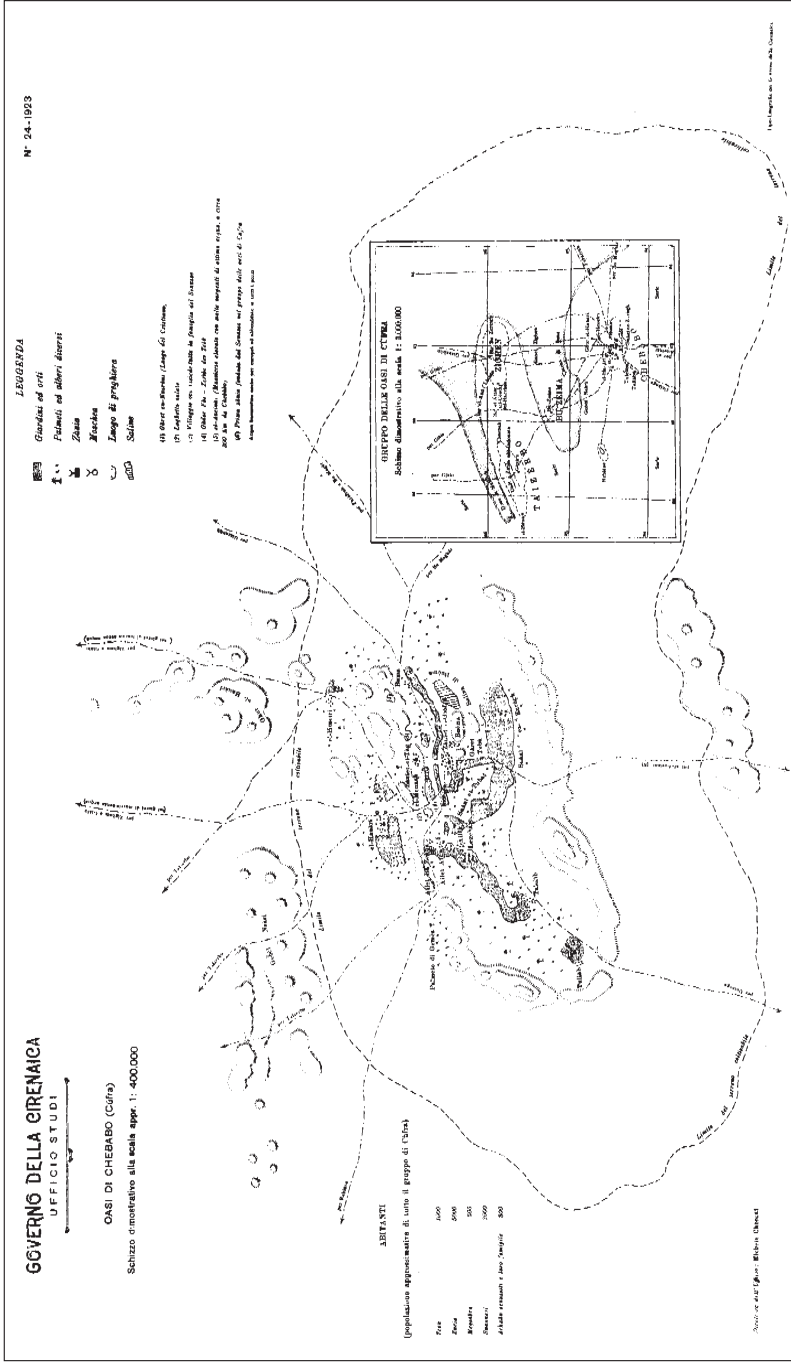
Figure 29 - *Indicative sketch map of the Cufra Oasis to a scale 1:400,000*, Ufficio studi della Cirenaica (1923).
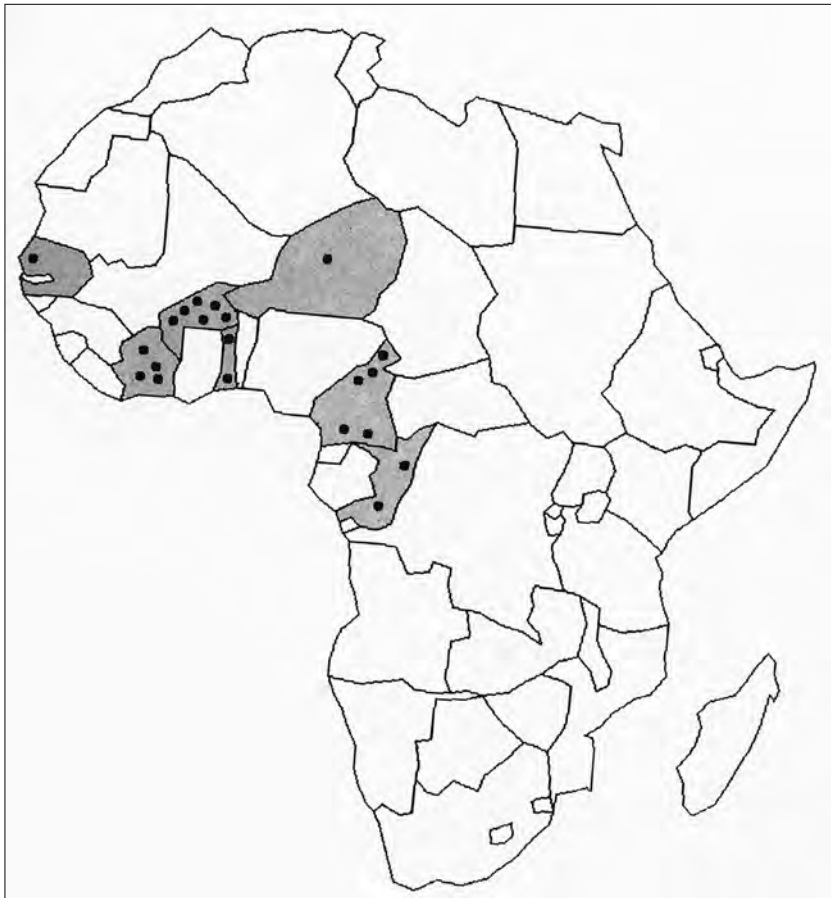
Figure 31 - *Distribution of "terroir" studied in:* Atlas des structures agraires au Sud du Sahara.

established uses and meanings), the map adopts an ad hoc choice of specific characteristic features to give a rendition of the difference of the place and thus make an interpretation and "reconstruction" possible.

The maps the IGM produced after military occupation are very different, showing a town rendered according to the same parameters as those applied in depicting the coastal cities. Denomination is given in a Latin-script transcription of Arab. Nevertheless, we can see that at this point the Italian role in the territory was still not consolidated, and the identification of reference was of key importance. In an area that could not be defined by natural boundaries, clear denomination of frontier outposts was essential. The overall image that emerges is of a complex and variegated area which offers important human and natural resources – observed from the point of view of the economic interests which will serve to consolidate the Italian presence. I have already referred to the economic reasons for the strategic importance of Cufra, but it is also true that the place was chosen as a nerve-centre for the exercise of military control over the entire hinterland of Cyrenaica: the Italian authorities were convinced that "only by occupying [the area] totally and effectively was it possible to affirm our dominion over those lands"[75]. However, the whole Libyan project was based on the idea of a "peaceful occupation" and therefore shunned explicit recognition of the Italians' aggressive assertion of control[76]. As a result, the entire process was justified as part of a process of development and "civilisation". By disguising some features and revealing others, the map serves to back up the alibi that the real interest in the area was solely its possible economic and political role.

5.6 *Geography and Cartography*

At this point it is legitimate to wonder if the state of affairs that held in the days of colonialism still holds today. The question appears all the more relevant when one considers various official cartographical projects undertaken in various ex-colonial states – for example, the French mapping of West Africa. One might also wonder if nowadays there are still cartographical systems – such as the G.I.S. – which are capable of making up for the real limits in the information contained within a map. I will try to answer these questions in the following sections of this chapter.

In arguing above that Euclidean cartography rules out the possibility of a "vital [territorial] praxis", I was clearly drawing on Habermas's notion of

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[75] U. Monterin, "Cufra e la via più diretta e più economica...", pp. 385-386.

[76] It is perhaps needless to point out that the occupation of Libya took place during the "mature" phase of Italian colonialism, when the conquest of a "fourth shore" was seen as resolving the problems that had been caused by Italian immigration into Africa. In response to Italian pressure, international opinion – which was generally wary of Italy's requests – declared its support for the idea of Libya as an extension of Italian territory overseas (A. Del Boca, *Gli italiani in Libia*. I..., pp. 11 *et seq.*).

"communicative action" and applying it to map-making and map-using. A. Turco takes up this notion in his discussion of the interpretation of symbols and how action and territorial "expression" might reveal their efficacy. In other words, interpretation – as the key moment in the pragmatics of the sign – is not simply a question of the creation of systematically-ordered and semantically-significant nexus of symbols. Its very *raison d'être* finds expression in territorial action[77].

So, interpretation is not a purely "neutral" cognitive operation. From a pragmatic point of view, the interpretation of a map is a moment of territorial praxis, that envisages strategies for the "production", use and "mediation" of territory. The above pages have given several examples of this. However, it should be pointed out that when we talk of the "production" of territory as a concept we are referring to the cognitive result of the map (that is, of the creation and interpretation of cartographic documents): what before did not exist becomes part of a body of social knowledge once it is included or read within a map. I am thinking, for example, of what happens when a recipient refers to a map before undertaking projects of discovery or of territorial modification and then acts upon the prescriptions laid down by that document. Or again, think of what happens when such a recipient acknowledges the existence of territory in the form in which it is presented within a map – what he/she is in fact doing is accepting the map as a mediator.

So, one has to underline that at a pragmatic level the map is not only an important instrument in the intellectual appropriate of territory but an integral part of that process itself. It is worthy reiterating the social action of a map: it links up with the cognitive background of a specific society in order to enrich that society's territorial knowledge; it sets itself up as an autonomous means of communication; it establishes itself as a innovative interpretation of the world (incorporated within the mechanisms of control created by the society that produces it) (Figure 30).

Let's now look at what is involved in using a map to act upon territory. Our focus here is upon a basic yet fundamental aspect of such praxis: the intellectual appropriation of territory performed by authoritative users of a map – that is, by those who employ such documents in territorial study or territorial planning. The following takes the specific context of Africa as a framework for its discussion of the opportunities offered by – and the limits implicit within – cartography as a means for communicating information.

A Cartographical Observatory for Africa

For some years now, French geographical studies of Africa have been concerned not only with the production of textbook "on-the-ground" surveys but also with theoretical discussions of the scientific praxis behind such

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[77] A. Turco, "L'ordine infinito...", p. 53.
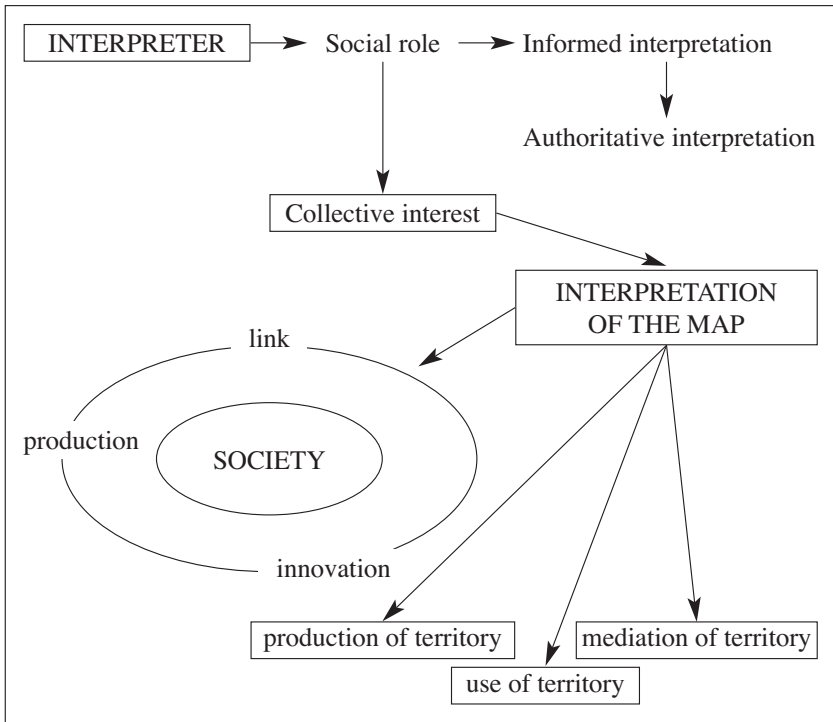
Figure 30 - *The action of cartographical communication.*

works[78], epistemological investigations of the "tropical" tradition which could be said to provide the basis for them[79]. One result of this is the *Atlas des structures agraires au Sud du Sahara*, one of the most ambitious research projects that has so far been drawn up (and largely carried out) by the geographers of the ORSTOM, France's largest organisation for tropical research. Plans for this series of publications were drawn up in 1964, with the first of the twenty-two volumes appearing in 1964 and the last in 1987[80].

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[78] See: M. Bruneau and D. Dory (eds.), *Les enjeux de la tropicalité*, Masson, Paris, 1989.

[79] Particularly worthy of note is the work by O. Soubeyran, "La géographie coloniale. Un élément structurant dans la naissance de l'Ecole française de géographie", in: M. Bruneau and D. Dory (ed.), *Les enjeux de la tropicalité…*, pp. 52-90; *Id.*, "La géographie coloniale au risque de la modernité?", in: M. Bruneau and D. Dory (eds.), *Géographies des colonisations*, L'Harmattan, Paris, 1994, pp. 193-213; *Id.*, "Alle origini del paradigma possibilista: geografia e colonialismo nella "battaglia delle Annales", in: *Terra d'Africa 1995*, Unicopli, Milan, 1995, pp. 59-93; *Id.*, *Imaginaire, science et discipline*, L'Harmattan, Paris, 1997.

[80] The same project comprised another series of works under the umbrella title *Atlas des structures agraires à Madagascar*, of which three parts have been published so far. For the genesis of this research project and its importance within the study of tropical geography, see:

Gilles Sautter and Paul Pélissier[81] (two former students of Pierre Gourou) were in charge of this project, which aimed to co-ordinate the results of a series of – methodologically-homogeneous – research projects carried out in tropical areas of limited size (Figure 31). However, the final aim went beyond a simply collection of information relating to agrarian geography; what the project wanted to propose was a veritable model for research – based on the practical application of theories which, to a large extent, were derived from the work of Pierre Gourou and his school.

Most of the large *quarto* volumes of the *Atlas* are hundreds of pages long, and are often accompanied by maps collected together in a separate folder (hence justifying the use of the world *Atlas*). The methodological unity of the series results in rich and detailed maps, which reveal the enormous care dedicated not only to the collection of data but also to its rendition in graphics. The work therefore is very useful to my purposes here, given that this posing of cartography as the starting- and finishing-point of research reveals an awareness of the role maps play in geographical praxis. However, we must look at the theory behind the project if we are to understand the type of cartographical operation it entailed.

The keystone to the entire collection is the notion of *civilisation*. Gourou's study of *geographical systems* – that is, of the relation between humankind and nature – was predicated on the need to understand the ways in which humans react with and to their environment without merely suffering its influence in a passive way. This means that external conditions cannot be defined objectively – such a definition must depend on the types of "techniques and technologies" which society can draw upon to overcome the constrictions and limits the environment imposes. Almost disarmingly obvious, this pre-supposition conceals extremely important problems and, at the same time, imposes a stance of great methodological and theoretical rigour. *Civilisation,* the framework that determines our relation to territory, is a historical product which functions through "accumulated derivatives" that are the result of the consolidation over time of the relation between humankind and environment – a process for which there are no pre-

E. Casti Moreschi, "Un osservatorio sull'Africa: l'Atlas des structures agraires au sud du Sahara", in: *Terra d'Africa 1995*, Unicopli, Milan, 1995, pp. 267-300.

[81] The project is part of the wide range of activities that ORSTOM has been engaged in since the 1960s. The Human Science projects involve the creation of various series of works dedicated to specific themes – and the *Atlas* is one such series. The work on this was headed by G. Sautter and P. Pélissier (who took over the sole running of the project in the 1970s). Both of these Paris university professors had collaborated on earlier ORSTOM projects. Sautter had been seconded to the ORSTOM agency in Brassaville from 1948 to 1953, whilst Péllisier had run the Dakar agency. In 1982 the *Office pour la Recerche Scientifique et Technique Outre-Mer* became the *Istitut Français de Recherche Scientifique pour le Développement en Coopération* (whilst still being known by the same initials), and this redefinition of its aims also led to the creation of a Technical Committee comprising administrators and researchers – with the latter obviously being responsible for directing the scientific work of the Institute. See: J-L. Boutillier and Y. Goudineau (eds.), *Trente ans, table 1963-1992, Cahiers des Sciences Humaines, hors série*, ORSTOM, Paris, 1993.
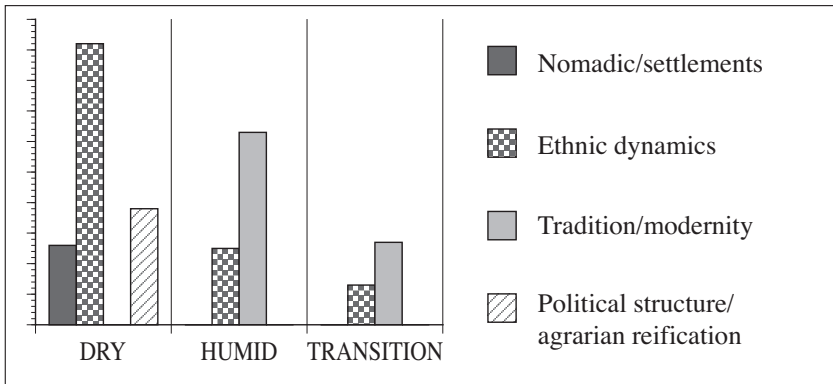
Figure 32 - *Central problems and regional divisions within Africa.*

established laws or general models[82]. So any analysis must bear in mind the particular characteristics of the historical process that has moulded the territory – not because it needs to outline the various phases of that history but because it needs to identify the various features that have played a key role in territorialisation at different periods in history. Hence, with regard to tropical countries, the geographer must consider the question of underdevelopment (the result of an imbalance in the territorial process) and propose a comprehensive analysis that will explain its causes and effects[83].

Gourou does not limit himself to outlining this need; he also proposes a model of large-scale research which will throw light on the various dynamics at work in agrarian structures. And thus G. Sautter and P. Pélissier take the question of "agrarian reification" in tropical nations as a key concept in their *Atlas* – that is, they take the analysis of agrarian structures as the best way for understanding African society and, at the same time, for identifying the origins and social effects of the discrepancies between what Gourou calls "techniques of production" and "techniques of organisation". What is more, the project is also significant at operational level: by explaining innovative action within territorial process, it creates

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[82] The concept of *civilisation* is discussed above in note 52. The importance of this notion in Gourou's life and work is discussed in the interview with L. Gaffuri, "Uno sguardo sui tropici, intervistando Pierre Gourou", in: *Terra d'Africa 1996*, Unicopli, Milan, 1996, pp. 251-306.

[83] In fact, Gourou rejects the term "underdeveloped", just as he rejects a determinist explanation of tropical poverty based on the physical features of territory alone. However, he equally eschews any sort of explanation based on racial determinism. He argues that that it is *civilisation* that plays the fundamental role in development, leading to varying relations between environment and society. With regard to tropical nations, he speaks of "poverty" rather than "underdevelopment" because this latter term necessarily involves some sort of comparison with developed nations (a study of which might well tell us something about the causes of their own development but little about the reasons for the absence of similar development elsewhere). See: P. Gourou, *Leçon de géographie...*, p. 193.

instruments of research from the investigation of certain crucial problems in the world of black Africa, which are briefly summarised in Figure 32.

A fine interweave of themes emerges. The area of the tropics is distinguished by its climate, but alongside this one can identify the operation of certain key factors, ultimately producing an outline of the dynamics at work in the process of territorialisation. Once it has become clear that these dynamics are linked to environmental conditions – but do not mechanically follow on from them – one must look at the nature of the human groups involved – that is, at those specific aspects that define the nature of a social formation and how it evolves. First of all, a society is to be seen in terms of the nature of settlements it occupies (though one should bear in mind that though nomadic and permanent modes of settlement are contrasted, they can interact at a physical, cultural and economic level). Secondly, one has to consider the group that the territorial agent belongs to: the presence of different ethnic groups in a single territory can generate different dynamics of evolution specific to each group. On a wider scale, there is also the question of the dynamics of trade, which decides the impact of the modern world upon the traditional; similarly, the political structure of the new African states has direct effect upon agrarian reification. All these factors within the research findings can be combined together to form different binary pairs that reveal significant connections. Low-rainfall Africa is the area in which one can find all the factors present in the various cases examined; the impact of the modern world is mainly felt in humid Africa and in that transitional area where crops are grown for export (and the imbalance of the policies of modernisation has had a clear effect on the agricultural system).

The unity of the series is based on two main principles: i) knowledge of the African systems is to be obtained through detailed research focused on small areas, which are defined by the social "cells" which inhabit them (the *terroir*, which P. Gourou saw as providing an "environmental framework"[84]); ii) the research is to result in a full cartography of the areas examined, accompanied by a back-up text.

I will not discuss the first principle here but rather the second, focusing on its important conceptual implications (for all that it seems designed solely to avoid the problems that may arise during the course of empirical analysis). The first of such conceptual considerations is that of the "scale" of the area under investigation. The territory under analysis must be identified by a photographic or cartographical representation. At the end of the 1950s various African states undertook projects of aerial photography of terrain,

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[84] The term *terroir* is used to refer to a relatively small unit of territory, chosen as representative of the various problems raised by the changing nature of countryside. Usually attributed to Sautter, the term is widely used by geographers who study tropical regions. G. Sautter, "A propos de quelques terroirs d'Afrique Occidentale. Essai comparatif", in: *Études Rurales*, 1962, 4, pp. 24-86, and: P. Pélissier and G. Sautter, "Bilan et perspectives d'une recherche sur les terroirs africains et malgaches (1962-1969)", in: *Études Rurales*, 37-38-39, 1970, pp. 7-45.

and this provided the starting-point for the *Atlas* project. However, when it came to actual work on that series itself, the geographers remembered the maps (to a scale 1:50,000) covering almost all of the former French colonies in sub-Saharan Africa which, for the most part, had been drawn up by the *Institut Géographique National*. According to the authors, the advantage of looking at an "image" was that it made it possible to "see" the unity of the territory and, at the same time, use the representation to establish an identity for the individual areas under analysis. This first step would be followed by on-the-ground research. This would consist of two phases – a first for the actual collection of survey data, the second to check the results and the validity of the conclusions drawn[85]. Direct surveying was an essential phase, given that the methodology adopted envisaged the production of very detailed maps covering: i) physical-natural characteristics; ii) fixed features of landscape (housing, paths, wild vegetation, permanent plantations); iii) soil use (seasonal crops, fallow land); iv) the division of land (rights of land use, *de facto* divisions, ownership)[86].

Cartography could thus illustrate the distribution of farm land and how it was organised in relation to villages – along with all the various combinations of features that make up an agrarian system and the ways in which the environment is interpreted by the inhabitants themselves[87]. In short, it was thought that a body of maps would be capable of offering a comprehensive picture of a world made up of innumerable interdependent features[88]. The prime importance given to the dossier of maps arose from the conviction that comparison of maps relating to a single area (divided according to different criteria) would bring out the relations and problems closely bound up with that specific organisation of territory. However, here a contradiction emerges: if it is true that each representation is a (de)forming prism generated by a specific society or civilisation, then – for all the intentions of objectivity – the use of maps runs the risk of granting priority to a European point of view (given that they introduce a whole host of values and interpretative techniques that are specific to that particular means of communication). By using maps as the starting-point and end-

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[85] Observation of the *terroir* is supposed to continue over a long period of time – not only during the actual research phase, but also afterwards (to test the validity of theories put forward and to see how the area might have changed). The need for a permanent "observatory" in Africa is reiterated in: C. Blanc-Pamard *et alii* (eds.), *Le développement rural en question. Paysages, espaces ruraux, systèmes agraires. Maghreb – Afrique noire – Mélanésie*, ORSTOM, Paris, 1984.

[86] One should perhaps recall that it is not unusual in tropical countries for the rights to land to be determined by various different systems – hierarchical rights (resulting from social structures), individual rights (associated with collective rights) and the customary rights associated with the seasonal turn-over in land use.

[87] For these to be meaningful they have to be recorded at a scale that does not exceed 1:10,000. Hence, one can see that drawing up such a planimetrical map is a long and costly operation that requires skill and resources.

[88] This claim is also supported by the results of historical study of the development of agrarian systems within Europe. See: G. Sautter, "A propos de quelques...", pp. 24-86.

result of the research, one declares one's intention of proceeding according to geometrical parameters (thus obscuring the much more complex territorial dynamics that cannot be perceived by that particular "lens").

For example, E. Bernus' analysis of the movement of herds and flocks and the particular features of territorialisation associated with it, assumes that it can map the topography of water supply by the identification of fixed points[89]: the presence of underground or surface water supply – available at different times of the year – determines the course of nomadic movement. However, the maps reveals the difficulty of defining this *terroir* (in the sense understood by Sautter and Pélissier): visualising "water points" as an area of study does make it possible to produce a detailed study of sections of "cells" or human groups belonging to different ethnic groups; but the main characteristic of a *terroir* is that is defined by a single agent, a sole social "cell". However, if one takes the sole social group as one's basic unit of study, then one has to extend the area under analysis to include all the various water points used by that single group (and thus one loses that detailed focus necessary to the identification of nomadic modes of territorialisation). What is more, one cannot ignore the special role environment plays in this very territorialisation[90]. The particular seasonal variations in rainfall and temperature in the various areas of the north Sahel region lead to a rather wide-ranging circuit of movement[91]. What is more, the availability of water depends not only on rainfall but also on the rate of evaporation and, therefore, on the nature of the terrain itself.

Thus the cartographical distinctions incorporated within G. Savonnet's study of the *terroir* of Pina (Burkina Faso) do not bring out how the premises for the decision to move from an old village to set up a new is related to the clearing of an area of savannah woodland for crop plantations (parcels of land that are used for one year and then abandoned as fallow land)[92]. Given that the cartographic rendition does not bring together questions of soil quality and modes of land use, not enough focus is put on the *jachère* system of long-term fallow land. In short, the question of mobility in agriculture is not adequately covered. Naturally, soil type (sandy/clayey soil in the lowlands, and laterite crusts in the uplands) effects the type of crops cultivated: in the former, there are *cuvettes* for garden produce and rice, whilst on the sandy slopes crops are much less water-dependent (millet, peanuts, beans). These latter cultivations last for a relatively short period – one or two years – until the terrain has been

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[89] E. Bernus, *Touaregs nigériens, unité culturelle et diversité régionale d'un peuple pasteur*, ORSTOM, Paris, 1981.

[90] On the relation between the geography of nomadic lands and the state-driven process of territorialization, see: P. Faggi, E. Turri, M. Verrina, "Tra ihinane e Stato: per una cooperazione con la territorialità pastorale Kel Tamacheq", *Terra d'Africa 1994*, Unicopli, Milan, 1994, pp. 95-139.

[91] It covers an area measuring 150 kms (east-west) by 80 kms (north-south), which comprises three morphologically-distinct regions: *Tadarast*, (dunes of the Cretaceous fossils), Tigiit (cliffs) and Eghazer wan Agadez.

[92] F. Savonnet, *Pina (Haute-Volta)*, ORSTOM, Paris, 1970.

exhausted; and this fact in itself contributes to the territorial "advance" of agriculture. All of this is data that is not covered by cartography.

Finally, in the case of Terre Enkou (Congo), which is studied by D. Guillot, the deforestation carried out to create space for a growing population results in a mixed geo-system of savannah and forest land[93]. The maps give a summary account (to varying scales) of the different agricultural entities occupying the vast territory of forest and savannah, but they do not show how the expansion of the forest is contained by certain agriculture practices on the land both within and around forestland. This latter, for example, houses cultivation of market crops (tobacco and coffee), whilst the savannah produces the local subsistence crops (manioc and maize). The map does not bring out the creation of this mixed economy based on a subdivision of crops (and a subdivision of the agricultural labour).

One must be aware of the fact that a map is not an adequate means for a fully analytical rendering of the process of territorialisation. Certainly, it can identify and indicate particular organisational and technical aspects of territory, but what it then offers us is a puzzle made up of pieces – which can only be put together when we make out the main components at the basis of the process of territorialisation itself. Breaking up an agrarian structure into component parts and then describing the relations between these parts is only the first phase in an analysis. Full understanding of how all these components work together can only be achieved if one moves beyond this phase. Territory is a complex system that can only be analysed by a theory which moves beyond cartography to reveal all the salient features of territory-as-process.

This is an important point to bear in mind when offering a critical evaluation of the contribution to knowledge made by the *Atlas*. In effect, if it is legitimate to use topographical cartography as a source of referential data, the construction of maps to depict social dynamics – or, better, the use of maps to explain the results of one's analysis of such dynamics – is a highly debatable procedure (the result of an automatic consideration for what can emerge from the use of maps). However, as often happens with such documents, the facts can take directions unforeseen by the cartographers themselves; in effect, what the authors actually construct are thematic maps that show the topographical distribution of a particular feature or aspect of territory. However, the operation cannot be considered a total failure, given that the on-site research which preceded the drawing-up of the maps produced data of such quantity and quality that it can be used in the proposal and discussion of projects relating to the region.

The *Atlas* therefore reveals that, even in projects of the highest professional competence, maps are a very delicate and equivocal instrument for the production – and rendition – of territorial knowledge. This is all the more evident these days, when developments in computer cartography and theoretical reflections upon scientific method have highlighted the need for a thorough re-thinking of their role.

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[93] D. Guillot, *La Terre Enkou (Congo)*, ORSTOM, Paris, 1973.

Conclusions

CARTOGRAPHY: THE CRISIS OF AN EMPIRE?

The "Crisis of Method" resulted in a new image of scientific truth and progress – an image inspired by what has been defined as a "new rhetoric". Science is now seen as a three-sided activity, bringing together research, the natural world and a community within which results and conclusions are debated; what counts is the ability of propositions to be persuasive, to obtain consensus. However, while such persuasion takes the place of methodological rules, it does not transform science into nothing better than "social exchange" or mere talk. The most important consequence of the above-described change is that the chances of mastering the complexities of reality have been enhanced: the limits upon scientific enquiry are no longer laid down by the nature of the objects themselves or by the terms in which science must be posited, but simply by the arguments one can draw on to support a thesis, by the rhetorical means at one's disposal.

This new approach naturally invites one to reflect upon the methods and roles of each single discipline within the panorama of science. As far as Geography itself is concerned, one can see that for more than a decade now studies of the various aspects of territorialisation have highlighted the importance of paradigms drawn from theories of complexity. The use of models that envisage the world as a complex system in a constant state of change clearly helps us to understand the profound significance of territory as not only the result of humankind's action upon the existing world but also as an important mediator of social action. From this point of view, those theories (both Euclidean and otherwise) which give a simplified and static view of the world appear to be fatally flawed[1].

This is all the more important at a time when it is technology itself that serves as a filter between that which is produced in the domain of science and that which finds actual use in the domain of practical applications. In effect, it is the existing system of information that serves to establish some link-up between the results of scientific research and the requirements of society itself. More than ever, it is the disciplines of "know-how" that are of strategic importance, offering society the technical means to create a representation that establishes a link between the real and the virtual. Hence the great interest of computerised geographical systems for territorial planning.

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[1] On the crisis in the use of Euclidean representation within Geography, see: G. Dematteis, *Le metafore della Terra. La geografia umana tra mito e scienza*, Feltrinelli, Milan, 1985 and his *Progetto implicito. Il contributo della geografia umana nelle scienze del territorio*, F. Angeli, Milan, 1995.

So it is very important to understand the skills and abilities required in the use of such systems, to see the principles upon which they are based and – of particular importance to us here – thence recognise if they really are a substitute for the traditional geographical map. In other words, is computer cartography – whatever its level of sophistication – an evolution of traditional geographical cartography or does it radically undermine the very principles upon which that was based? The answer to such a question enables us to settle a issue of particular relevance to the social role of our discipline: does the GIS require specific geographical expertise or not?

As is well known the Geographic Information System is a database in which software serves to incorporate, organise, analyse and retrieve data. To a superficial eye, the final product of this database looks identical to a traditional work of cartography: the geographical position of a defined feature is given in relation to a number of other features. However, more careful examination reveals two essential differences: the quantity of information handled is vastly superior, and the very quality of the information organised into "entities" means that it is possible to offer a cartographical rendition of both the visible and "invisible" worlds.

From a technical point of view, the vast increase in the amount of data handled[2] is due to the shift from a probabilistic to an algorithmical definition of information[3]. This latter excludes the possibility of variations within the system (there is no charge between data-at-input and data-at-retrieved), and this – together with the development of cybernetic-cognitivist models – has led to the production of systems that can handle much vaster quantities of information than the human brain.

However, the quantity of information made available by such an innovation had to be simplified in some way if it was to be manageable. In fact, the most basic purpose of the GIS was to handle a vast amount of information in order to construct a visual representation on a digital computer screen – just as traditional cartography produced images using pen and paper. Nevertheless, there is an essential difference: the digital rendition of information via the computer rests on the rendition of special "entities", which are to be understood as logical "constructions" made using the original data relating to a particular object, feature or relation. In fact,

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[2] From the end of the 60s onwards, cybernetics was applied to the elaboration of territorial data thanks to software and programmes that were intended to organise data spatially, in a framework of geographical reference. One should not forget that the research carried out by Norbert Wiener and Claude Shannon – associates of von Neumann and Morgenstein – still supplies the theoretical basis for such cybernetics. See: N. Wiener, *The human use of human beings: cybernetics and society*, Da Capo, New York, 1954. Reference is to the Italian edition: *Introduzione alla cibernetica. L'uso umano degli esseri umani*, Boringheri, Turin, 1982. A series of considerations regarding the theoretical and technical aspects of the application of such systems to geography can be found in: D. Pontazin and J.P. Domay, *La conception de SIG*, Hermes, Paris, 1996.

[3] Developed by A. N. Kolmogorov and the group of mathemeticians who, in the 1960s, worked on the ideas put forward by Shannon and Wiener.

each database proceeds by mastering not an object but an "entity"[4]: having recognised a *distinct* quality in a group of objects, attributes or relations, this quality is then treated "in isolation" and serves as one component in the construction of the entity. In this way, it is not the material nature of objects that serves as the basis for their representation. True, the "entities" do refer to the material world, but also to the world of relations, functions, etc.

Naturally, the investigation of the implications of this state of affairs is still in progress, but here we can underline some of the more startling aspects of such systems: i) their ability to survey and analyse spatial relations; ii) their ability to collect and examine an unlimited number of aspects of each phenomenon; iii) the aptitude for analysis rather than for the mere management and application of data; iv) the ability to integrate data of different types and scales, using more than one mode of representation[5].

Given their potential, the success of the GIS was predictable. In effect, the extension of the system to sectors which had previously used numerical data only in the most rudimentary fashion is due to the fact that the machine offers an opportunity for the autonomous handling of large quantities of data[6]. The result is that GIS are used in various ways in the social sciences: at an elementary level (with physical space seen as a framework of reference for organising information in a manageable form) and at a more sophisticated level (where GIS serve to prepare data prior to the actual construction of models or analyses)[7]. A significant example of this latter use is recent geographical research relating to the problems of environmental protection and the management of territorial conflicts within Africa. The use of a GIS in that project meant it was possible to consider the physical properties of space and territorial relations as forming a single whole of variables that might generate conflicts but which also generated the various points of contact and common interest between the agents concerned. In this case, the computerised management of the data threw up new connections that stimulated thoughts on possible strategies for the control of conflict[8].

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[4] The model is based on three main components: the whole groups of entities (that is, the objects considered relevant); their characteristic attributes (chosen from among a number of possible variables) and the relations between the whole groups of entities. These relations form sub-groups known as "mappings".

[5] M. Goodchild, "I GIS e la ricerca geografica", in: *Geotema*, Patron, Boulogne, 1996, pp. 8-18 (espec. p. 10).

[6] This has led to a consideration of the juridical implications of their use. See: R. Côté *et al.*, *La géomatique. Ses enjeux juridiques*, Les Publications du Québec, 1993.

[7] On the possible applications of GIS, see: J. Denègre and F. Salgé, *Les systèmes d'information géographique*, Presses Universitaires de France, Paris, 1996, pp. 90-110.

[8] I am referring to a research project in Guinea led by A. Turco, which uses GIS to define two protected areas (Parc Niokolo-Badiar and Parc Haut Niger). This is part of an EU project entitled: *Bassins Versants du Haut Niger et de la Haute Gambie*, which takes conservation and environmental protection as the first priority for subsequent development. See: E. Casti Moreschi and P. Marino, "Protezione ambientale e svilluppo sostenibile nella politica della Comunità Europea: il programma Bassins Versant in Guinea" in: *Terra d'Africa 1997*, Unicopli, Milan, 1997, pp. 41-84.

However, the GIS also presents various problems relating to the handling and organisation of data. Of particular interest to us here is the inevitable simplification that results from the algorithmic treatment of information – something which might well lead to a loss of important topographical data and the inherent unreliability of any subsequent model of territory based upon it. In effect, the GIS must use a mathematical visualisation of territory; however, this can be misleading because reference is not rendered thanks to a hierarchy of importance (that is, through the recognition of those features which "stand out"), but rather through a uniform system of entities (and visualisation does not distinguish between phenomena and features, between what is a material object and what is not). This means that there is no system of order that renders the information intelligible. We know that in traditional cartography it was the creation of a hierarchy – an ordering of relevant features – which served as the basis for the management of complexity (with a subsequent reduction in the information included). However, in computerised cartography, there can be no ordering of relevance because the entities cannot be identified with any specific object and therefore cannot be organised hierarchically. I have already mentioned how what is shown on such a map are not the attributes of an object but the result of one or more organised wholes of qualities that are broken down and then recombined in various multiple entities. Let me give an example. If the salient quality recognised in a river is its length, then that will serve as the basis for the various logical operations for the construction of an "entity". However, that entity might well apply to any object or feature that develops over length (for example, a route, a road or a vector). The entity incorporating this data refers to each object or phenomenon that contains that quality. The result is that it becomes impossible to distinguish a road from a river, a route from a relation of distance, etc. And, as if that were not enough, if the size of the riverbed is not recorded as a significant quality – and therefore not treated as the basis for a data entity – then each watercourse of whatever size, will be represented by the same sign, a line of the same characteristics. Clearly, this is a limit of the system: the machine cannot supply an interpretation of the nature of what it shows. This is something the person using it has to do, drawing on other sources of information. However, one cannot deny the enormous potential of the procedure behind the GIS. It can set up multiple connections and supply greater creative possibilities than any other means for rendering information (given that the innumerable entities are composed of one or more qualities and can be put together in infinite combinations).

So, on the one hand, the GIS makes it possible to obtain a representation of complex phenomena, whilst on the other, it can generate multiple distortions. Amongst these one should also mention another of great significance: the degree of approximation in the algorithmic rendition of information due to the deformations resulting from "map overlay". This degree of approximation is a very important aspect, and the choices to be

made to guarantee an accurate representation are made more successfully by those who know the phenomenon and the processes at the basis of a certain pattern of distribution. It is significant that the digital representation of an area is based, more or less, on information resulting from exact knowledge and interpretation of the phenomenon concerned (recorded thanks to a skilful choice of the variables to be measured, the points at which to measure them and the symbolic systems to use in the process). Hence it is clear that the traditional competence of the geographer – that is, the ability to recognise and classify phenomena – is also important in using/constructing the new system. Often, however, the exercise of this expertise is hampered not only by the fact that the person using the system is unaware of the existence of these problems, but by the very fact that the software itself is designed to rule out any margin for interpretation. Hence, for little known areas (for example, regions of Africa), it is not uncommon for maps produced by GIS systems to be totally surreal in appearance: rivers suddenly come to an abrupt stop, roads float on top of water, expanses of territory seem totally destitute of any sort of designator, etc.).

In fact, a number of problems in the computer management of cartographical information are yet to be settled: the large quantity of the data and its intrinsic vagueness, the subjectivity inherent in models and methods of analysis, and the limits imposed by high costs, all mean that it is difficult to handle applications that relate to different scales, difficult to verify the quality of the data and difficult to distinguish between the different types of information that might be mixed together. It should also be pointed out that, for all their potential, these systems can often face another problem: the machines on which they rely are incapable of working efficiently when information is lacking or incomplete. When this is the case, new algorithms have to be used that in some way reconcile the need for simplicity and for completeness; but these must be backed up by a large number of comparative studies of the terrain and the application of other analytical methods.

But hope for the solution of these problems is offered by the wide-ranging contemporary debate involving computer specialists and those who, from various points of view, study the theoretical bases of symbolic systems[9]. There is general recognition of the inherent problem of the GIS as a symbolic system which is being used without any real attempt to understand its nature as such. This shortfall can also be seen in the formal aspects of the system overall. We know that behind every theory (and, therefore, behind the GIS itself) there is some project, a model that is the basis of operation – and in this case, that project in some way involves the cartographical self-reference which is at the basis of what our society

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[9] Amongst the problems raised is that of whether the GIS should be considered as a system, a "technology", a means of communication, or as something else altogether. For an overview of this discussion, see: A. Ludovisi, "Geographic Information System (GIS): machine à gouverner" in: *Geotema*, 1, 1995, AGEI, pp. 65-74.

commonly understands as territorial images. So, the problems raised cannot be solved by technical means alone; there must be higher level reflection upon the consequences of a particular means of communication upon the information conveyed.

Returning to my initial question (Are GIS a simple continuation of traditional maps?), one should analyse two products now produced using those systems: computerised topographical maps and "thematic" maps. The former is produced from the digital treatment of data produced by satellite surveys, which is then rendered in accordance with the pre-suppositions at the basis of Euclidean cartography. In other words, the data on which the system works is still organised according to the focus and codified symbolism of traditional cartography. Because of distortions and inexactitudes in the identification of objects, the information as produced by the machine must then be checked against the terrain itself; nevertheless, with a few careful and attentive alterations, this does seem to be a product that can successfully replace traditional topographical cartography – even if it should be pointed out that a large number of those now involved in drawing up maps have no particular expertise in the identification of geographical features and phenomena, and often use Euclidean codification in an arbitrary way (sometimes the information is illegible because unaccompanied by any precise key of interpretation). This is all the more serious because the advent of the GIS has meant that an institution designed to control the output of such systems has no real effect: given that GIS can be used by anyone capable of operating the equipment involved, there are now any number of autonomous sites producing cartography. This does not mean one should abandon the use of computer technology in drawing up maps. Far from it. Once the above-mentioned problems have been faced, it is clear that the future of topography lies with GIS, which will generate far-ranging innovations in the sector.

It is a different matter, however, when one comes to look at the more sophisticated products of GIS: thematic maps. They cover dynamic aspects of territory related to a whole range of variables, and thus appears to be much more highly-evolved than the traditional map. Computerised thematic cartography is innovative not only because of the quantity of data it can handle but also because of the type of phenomena it can focus upon and, above all, because of the connections it can establish between them.

Nevertheless, these aspects are marginal compared to the real core innovation produced by these systems – that is, the particular scission they introduce between the collection and visualisation of data. Whilst designed to represent the real world, through the transformation of data, the system has actually revealed itself capable of creating new worlds. However, there is one new features of GIS that distinguishes them from traditional means of communication: they can *elaborate* data *without selecting* it. By this I mean that the order which is at the basis of the management of information in a computer map is not obtained by a choice of what information to include but is actually created directly by the work upon and the

presentation of that data. At in-put there is no quantitative assessment of data, but rather the application of a process of abstraction that makes the data compatible with the virtual context within which it will figure. In other words, the complexity of the environment is handled by means of a *procedural* "neutralisation": the territorial data conserved can in the future be combined in any number of ways – some of which reflect the real world, some of which do not. And it is at this point that one should look at the role of the person interpreting the document. First of all, one should note that the binary pair cartographer/recipient cannot be considered separately from the machine. When the constructor of a map (who can longer be called a cartographer because he/she does not necessarily have the associated expertise) uses a GIS, what they have before them is a vast field of informational possibilities which the machine will then handle automatically once the "constructor" has posed it the question which interests him/her. In effect, the machine takes the place of the agent, carrying out the selection from within the reservoir of information that it contains. *Procedure* takes the role of cartography, and all the agent has to do is ask an initial question. Of course, for the outcome to be communicable, the question must be posed in a adequate and pertinent way (failure to do so can result in maps that are top-heavy in information, to inadequate scale, or use visually-inappropriate symbols, etc.). The role of the recipient/interpreter of the map is even more problematic: very often he/she cannot understand the information because the system does not provide the necessary codes for the interpretation thereof. For example, in a thematic map, the maximum and minimum limits for the depiction of a particular phenomenon are not always given. However, even where the visualisation follows clearly-declared criteria, these criteria answer to the logic of the various "entities" used, and therefore produce abstract information.

Nevertheless, a dismissal of the success of GIS as due to the fact that they offer "those who have no specialist knowledge of cartography the chance to create maps, and those who have scant geographical knowledge the chance to analyse geographical distributions"[10] is rather unconvincing. Similarly, it seems rather superfluous to start asking oneself what effects these systems might have in the future. The answer is already present; and computer technology's constant expansion into new areas of application – new markets – means that we will inevitably become more and more dependent on the products that technology offers us[11]. A discussion that restricts itself to this level, refuses to see the innovations introduced by

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[10] M. Goodchild, "I GIS e la ricerca geografica"…, p. 17.

[11] There are already various national and international bodies dedicated to research with (and reflection upon) these information systems – for example, the Association française pour l'information géographique (AFIGEO) in France, and the European "extension" of that association (EUROGI). See: J. Denègre and F. Salgé, *Les systèmes d'information géographique…,* pp. 119-123.

these systems in other than technical terms; it does not face their ideological implications. Representing territory as an unbroken space-time continuum, these are the new means of communication and enquiry that all researchers will have to use as scientific instruments.

Whilst it is true that in the present state of affairs, the system may produce representations that show but do not always help us to understand, it should be pointed out that this may just be a technical question, relating to the cross-over from an old to a new system. However, one thing is certain: the problems relating to the GIS will not be resolved by technical advances alone. One has to look at the very idea and theory of the system itself. I am referring here to the importance of a discussion of the semiotic implications of this new means of communication which seems potentially capable of rendering territory *and* its connotative significance. Traditional maps may be abandoned not simply because the GIS mark a further stage in their development, but because such systems overcome the technical limit of the Euclidean model and thus offer the possibility of visualising a new theory of geography. Hence, if the products of the GIS are not only different to traditional maps but actually go beyond them, then a semiotic analysis of their implications might well highlight the steps to be taken if we are to realise the full potential of the new instrument. In other words, this is an innovation that marks some sort of "paradigm shift" when compared to what preceded it.

So, is this some sort of "crisis of empire"? Are we seeing the end of the traditional map? An adequate answer can only come from a consideration of the role computerised maps play in the process of territorialisation – that is, the role they play in the intellectual appropriation of territory through denominative projection. If the GIS are to become the instruments of a geography of complexity, then their full potential can only be realised and applied through a focus on the management of names and denomination. Once again, the name seems to have the last word.

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