Lecture Notes
in Geoinformation and Cartography

LNG&C

Karel Kriz
William Cartwright
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Editors

Mapping Different Geographies

Springer

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Preface

This book is the outcome of the work of contributors who participated in the workshop "Mapping Different Geographies (MDG)" in February 2010, held in Puchberg am Schneeberg, Austria. This meeting brought together cartographers, artists and geoscientists who research and practice in applications that focus on enhancing one-to-one communication or develop and evaluate methodologies that provide innovative methods for sharing information. The main intention of the workshop was to investigate how 'different' geographies are being mapped and the possibilities for developing new theories and techniques for information design and transfer based on place or location.

So as to communicate these concepts it was important to appreciate the many contrasting meanings of 'mapping' that were held by workshop participants. Also, the many (and varied) viewpoints of what different geographies are, were elaborated upon and discussed.

Therefore, as the focus on space and time was embedded within everyone's fields of investigation, this was addressed during the workshop. This resulted in very engaging discourse, which, in some cases, exposed the restrictions that certain approaches need to consider. For participants, this proved to be most useful, as this allowed them to appreciate the limits and restrictions of their own approach to understanding and representing different geographies. As well, the workshop also was most helpful as a vehicle for demonstrating the common ground of interest held by the very diverse areas of endeavour that the workshop participants work within.

The focus of this publication is to give the reader an overview on the topic of Mapping Different Geographies from a conceptual-theoretical, as well as practical cartographic perspective. The list of contributors to this book reflects the many disciplines that contributed to the workshop and their heterogeneous approach to the topic.

The relevance and significance of the workshop, and this subsequent publication is seen as a starting point for further research and development. It also provides the stimulus for organizing further events that will explore this extremely interesting topic.

The editors would like to acknowledge the work of Michaela Kinberger and Felix Ortag, who undertook the task of the design and layout of the book and its chapters.

Karel Kriz, Vienna, Austria
William Cartwright, Melbourne, Australia
Lorenz Hurni, Zurich, Switzerland

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Mapping Different Geographies

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Introduction

To providers of geographical information in the form of maps and map-related artefacts the development of product usually considers human or physical geography as the topic being represented. However, cartographic techniques are also used to map different geographies – those that are outside the usual cartographer's bailiwick. Maps are used to transmit information about not-real places using the same methodologies as applied to mapping real places. Can 'standard' cartographic processes be employed to produce these representations of different geographies and, how can designer/producers of these cartographic products be sure whether the 'not-real' is not confused or substituted for the real?

'Everyday consumers' experience the not-real almost every time they turn on a television or watch a movie. They are instantly taken to another world, which may well be the very reason that they use these devices – for 'escaping' their real reality. They may see this representation of a different geography as a way to escape reality, to explore and experience 'other' worlds and to participate in non-daily activities.

This book provides a record of the issues addressed by a number of disciplines that use the map metaphor to represent their different geographies. The common factor that underpins and links the applications covered in this book is location. Colleagues who have contributed to this work use location to place their work and their resultant representation – a map – to analyse and comprehend the intricacies of the geographies presented.

Exploring Disciplines Outside 'Standard' Geography and Cartography

Professional designers and cartographers use the non-real to make it easier to navigate the real using paper maps. Take for instance the London Underground map. Its designer, Beck, modified geography so that the artefact would communicate information better – and it worked! By replacing the strict geographically imposed demands that required that representations be placed exactly where they were located, within a regular pattern of generally horizontal, vertical or diagonal lines, his new 'diagram' showed more clearly the relative locations of the different lines and the sequence of stations. His original design moved away from the concept that the maps had to follow the actual geographical route of the lines. What were critical to Beck's design were connections: the interchanges between the various lines. It is these connections and the simple information graphics that make the map 'work', irrespective of whether the user is a seasoned London commuter or a tourist arriving at the capital for the first time. By representing a different geography – the underground geography of the London tube – Beck made the map more usable and an effective communicator about how the London Underground transportation system worked. Visitors to Britain's capital use it to enter hitherto unexplored territory using a map that made it easy to understand the system and to make connections.

This example illustrates how different geographies, if mapped in innovative ways, can be better understood through maps. Whilst these products might, at first, appear to be somewhat removed from conventional maps they are powerful tools to inform about the particular geography being studied.

In order to further develop the concept of mapping different geographies a workshop was held in 2009 that brought-together colleagues with a common research and development goal – to explore the potential of maps to represent geographies that were unique to various areas of research endeavour. This book provides a record of this workshop.

Mapping Different Geographies (MDG) Workshop

From 11th to the 15th of February 2009 the first workshop on "Mapping Different Geographies (MDG)" took place in the scenic mountainous village of "Puchberg am Schneeberg" in Austria. The leading theme of the workshop "Mapping Different Geographies" had the goal to enhance the communication between scientists as well as artists and to share information from current research that is investigating how "different" geographies might be mapped. Furthermore to develop a consensus about which methodologies and standards might be appropriate for integration into trans-disciplinary research programs that are exploring the application of map-

based information systems in non-traditional areas or using innovative applications. Additionally the application of map-based information systems in non-conventional areas and the usage of innovative applications and approaches were showcased. 24 participants from 7 countries used the opportunity to present and discuss the outcomes of various research projects in this diverse field of cartography and geo-communication.

In traditional mapping data is usually visualized with defined relationships to geographic space and time. Different Geographies often lack these clearly defined relationships of "geotagged" information. Therefore, before specified topics can be mapped, information has to be spatialised. Due to the fact that the resulting depictions lack traditional geographic information they are mostly not considered to be maps in a common way. These depictions do not represent geographies that map users are accustomed to, but "maps" of "other" geographies.

Questions and statements that arose during the workshop were manifold as well as to some extent provocative and are addressed in the contributions within this publication. They also show how diverse the topic is and where further investigation and research is located.

A selection of questions and statements that were addressed during the workshop:

- Do maps work?
- We should not reject subjectivness from maps.
- Hope to map the unmappable.
- Mapping into a new dimension.
- Mapping the imagined creates place space.
- Same space, different geographies.
- Let us turn to local human knowledge landscape (again).
- Let us rediscover all maps with new geographic technology.
- Why do we make everything so complicated?
- Overlay maps and animistic perception of space?
- How can GIS be used in numismatic?
- What to expect from a prototype literature atlas?
- How to help literature scholars become better researchers?
- It is possible to create maps with words!
- Literature geography – a way of integrating identity and geography.
- Does visualization need different methods and tech. for usability research?
- Cartographic applications depend on their user interface

The conclusion from this workshop was besides the fruitful discussions amongst scientists and artists a publication of reviewed papers.

This Book

The focus of the publication is to give the reader an overview on the topic of "Mapping Different Geographies (MDG)" from a conceptual-theoretical as well as practical cartographic perspective. The compendium is therefore divided into three categories and offers an overview on this fascinating new field within cartography and geo-communication.

The first section deals with conceptual and theoretical principles within the area of mapping different geographies and comprises six inspiring contributions. The second section with five entries focuses on structural and methodological topics that give an overview on various methods and approaches within the focused field. Finally the third section that contains five chapters emphasizes on use cases and examples that round up the theoretical discussion and describes various facets of mapping different geographies.

Conceptual and Theoretical Principles of Mapping Different Geographies

How maps are used to understand spatial relationships is a crucial issue within cartography and geo-communication. William Cartwright focuses on this issue and describes in his contribution "Media Creating Other (Geographical) Realities" the fact of experiencing "real" and "non-real" reality through cartography and postulates the question whether the way of "seeing" geography influences the way of knowing about "real reality".

Christina Ljungberg goes one step further in her submission on "Mapping Practices for Different Geographies" and charts various forms of mapping practices, ranging from basic concepts of maps and mapping to how these spatial strategies interact with various types of textual representations. She seeks answers to the question "What is a map and how does it function?"

Michaela Kinberger pursues in her contribution on "Spatial Metaphors for Mapping Informal Geographies" the communication of schemes and coherencies of complex data that seem to reside – according to her research – in the user interface, restricting the potential of up-to-date computational and communications technologies.

In Georg Gartner's chapter on "Emotional Responses to Space as an Additional Concept of Supporting Wayfinding in Ubiquitous Cartography" various methods of identifying emotional responses to spatial objects are discussed. Furthermore he postulates that the emotional relation and the degree of emotional response is structuring space and is used for human wayfinding.

Affective and Collaborative Cartography are areas of interest both currently being studied and explored by cartographers. Teresa Iturrioz and Monica Wachowicz

address these topics in the contribution "An Artistic Perspective for Collaborative and Affective Cartography". They discuss the issue that different artistic outcomes are demonstrating how contemporary, new media art and design projects can be used for investigating the relationship between people and space in order to discover new realities, perceptions and emotions that possibly could remain unknown under the objectivity of the conventional map representations.

Laurene Vaughan explores in her submission "Mapping the imagined" the relationship between the map and the imagination, the imagined and the act of representation and translation. She states that utilizing this approach the mapping of unknown geographies can help make the imagined real.

Structural and Methodological Issues of Mapping Different Geographies

The aim of the contribution "Now and Then, Here and There… on business: mapping social/trade networks on First Global Age" by Amélia Polónia, Miguel Nogueira and Amândio Barros is to address the question in what extent did territory conditioned commercial performances, contacts and the networks' organization in the First Global Age. Mapping historical data related to commercial networks implies spatial visualization in order to comprehend the nature of such networks, their design and topology, extension and intensity.

Alberto Fernández Wyttenbach, W. Siabato, M. Bernabé-Poveda and M. Wachowicz describe with their paper "Evolution of Digital Map Libraries towards Virtual Map Rooms: New Challenges for Historical Research" the state-of-the-art Digital Map Libraries (DML) initiatives carried out until now, emphasizing their technological evolution within the new institutional framework. From the results obtained, a new generation of Virtual Map Rooms is presented for the integrated access to the Spatial Data Infrastructures (SDI) thanks to the design of new crosswalks between geographic and bibliographic metadata profiles.

Alexander Pucher poses the question in his submission "Information Architecture of the Cultural History Information System of the Western Himalaya" to what extent can a Geographic Information System (GIS) be assembled to deliver an integrated cartographic decision-support tool for information collection and analysis visualization that stores data gathered from multiple resources and provide a communal internet-delivered repository of information and geo-located artifacts.

David Schobesberger also utilizes in his contribution "User-Centred Design of a Web-based Cartographic Information System for Cultural History" the thematic aspects of cultural history however focuses primarily on usability aspects of various interdisciplinary cartographic information systems in the proximity of cultural historic research. The systems analyzed have very clear communication goals and

can therefore be objectively evaluated. He aims to give impulses for discussing the necessity of evaluation in the context of mapping other geographies.

Markus Breier investigates in his paper "GIS for Numismatics – Methods of Analysis in the Interpretation of Coin Finds" the suitability and application of methods proprietary to Geographic Information Systems (GIS) in context with numismatics. Up to now this special field of cultural historic research is only rarely taking advantage of the strengths and opportunities that GIS can offer.

Use Cases and Examples of Mapping Different Geographies

The physical relationship between space and objects is certainly one of the key aspects for a correct understanding of historical, cultural and artistic phenomena. Anna Filigenzi elaborates in her contribution "Le vie dello Swat" that the Buddhist rock sculptures that flourished in Swat (ancient Uḍḍiyāna, North-West Pakistan) in the 7th-8th century AD not only revive pilgrimage routes leading to the ancient Buddhist sacred areas but are closely bound up with the sacred space.

Fani Gargova, Sarah Teetor, Daniel Terkl and Ulrike Unterweger present in their submission "DiFaB – A Databased Visual Archive of Byzantium and the Challenges of Indexing Historical Material Culture" on the one side the goals of the project DiFaB (Digitales Forschungsarchiv Byzanz/Digital Research Archive for Byzantium) to preserve documentation of monuments and to make this material available to the international scholarly community. On the other side they further discuss the usefulness of mapping for Byzantine art history with possible analogies to other cultural-historical sciences and the innovative potential of historical databases.

Mihailo Popovic presents in his paper "Mapping Byzantium – The project 'Macedonia, northern part' in the series Tabula Imperii Byzantini (TIB) of the Austrian Academy of Sciences" an outline of the history, development and current status of the project Tabula Imperii Byzantini (TIB) of the Austrian Academy of Sciences. This project that was founded in 1966 carries out systematic research of the historical geography of the Byzantine Empire, which existed from the beginning of the 4th century AD until the 15th century AD.

"The Mastery of Narratively Creating Mental Maps: Literary Cartography in Karl May's Œuvre" by Manfred Buchroithner describes the biographic background and the art of landscape description of Karl May, one of the most prominent European travel tellers and novelists. Based on meticulous studies of up-to-date atlases and geographic scientific publications he developed most realistic depictions of the settings of his novels.

Finally the contribution by Harriet Edquist "Ghosts of the Past: Mapping the Colonial in Eleanor Dark's Fiction" examines Eleanor Dark's fiction from the 1930s

and 1940s, for what it tells us about literature, history and place. By attending to where action takes place in the novels the reader finds a particular engagement with Sydney and its origins, as they are represented in the landscape, in urban form, in language and in maps.

Lessons Learnt

The workshop provided a venue for various projects to be explained, demonstrated and discussed. Whilst the applications 'mapped' many different geographies, it was apparent that the underlying need to map these geographies demanded innovative solutions. Solutions varied from project to project, and these are explained in the chapters that follow. Whilst new computer and communications technologies were employed to facilitate production and delivery, each project depended on researchers thinking differently about how they could better understand the problems that they were addressed if information was mapped. This lateral thinking resulted in applying the map metaphor to record, analyse and depict the various geographies of research.

Contemporary geographical information processes, methodologies and reporting/presentational artifacts have their origins in the geographic, surveying and mapping professions. It was therefore most interesting to see how the map metaphor already used by geospatial disciplines could be implemented by other disciplines as the most convenient (and, generally, the most understood) methods for data capture, access and display. The papers presented at the workshop allowed attendees to ascertain if the map was the most appropriate metaphor for the provision of information about non-physical and non-human geographies. A metaphor that has served well in the geospatial disciplines, and one that had been developed along with the 'rules' of usage, could be introduced immediately by other disciplines, but their effectiveness needs to be evaluated. As well, lessons learnt from mapping other geographies might prove to be appropriate for application into 'mainstream' cartography.

Applying the Results of Mapping Different Geographies to 'Mainstream' Cartography

Cartography is all about extraction of relevant information and thus creating clearness out of an excessive supply of geographical information representing the "real world". Thereby, data may be selected, aggregated and even geometrically and semantically altered before presenting them in a graphical manner according to a suitable set of cartographic symbols. After the definition by the International

Cartographic Association in 2003, Cartography is "a unique facility for the creation and manipulation of visual or virtual representations of geospace – maps – to permit the exploration, analysis, understanding and communication of information about that space". Cartography strives as much as possible for standardised workflows and representation rules. Nevertheless, to some degree, cartographers make use of 'fuzzy', 'subjective' methods in order to produce maps. During editorial work and designing of a map or a map-related representation, information can never be compiled, selected, modelled and represented in a complete, comprehensive and fully objective way. The Swiss cartographer Eduard Imhof even stated in a radio interview that maps are implemented virtual and therefore illusory worlds, which are up to a certain point independent from the 'real world', but should strongly correlate with it.

In this respect, the cartographic way of modelling spatial objects and phenomena is closely related to the mapping of different geographies: The depiction of landscapes and topics in classical maps may only differ in their degree of realism or abstraction from 'different geographies', but the main cartographic workflow or methodology is common to both worlds. But how might mainstream cartography then profit from the mapping of different geographies at all?

First, the different geographies or landscapes are new territories to be mapped. These territories might be rather closely correlated to our real world, but they might also differ significantly, for example, regarding their thematic properties or their dimensionality. This volume shows the great variety of possible landscapes, which in most cases rely on the human imagination. Cartography will never run short of work when offering its services for developing these geographies!

Speaking in terms of spatial sciences, different geographies created by cultural processes may be seen as a source or primary model. As in classical mapping processes this model then has to be transformed into a secondary model that is suitable for further processing, analysis, cartographic representation and interaction. Any of the steps in this workflow has to be carefully reconsidered and maybe even reinvented for the specific application. Cartography offers the knowledge and methodology to successfully apply, adapt and even newly design the necessary concepts and tools. The editors hope that this book helps to uncover and promote the power of cartography to the benefit of the exploration of different geographies!

Acknowledgments

The workshop was organised by Dr Karel Kriz and his team from the University of Vienna. This activity was developed under the general 'umbrella' of the International Cartographic Association's Working Group on Art and Cartography.

Section I

Conceptual and Theoretical Principles of MDG

Chapter 1

Mapping Other (Geographical) Realities

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Abstract

To 'everyday consumers' of information from a popular media the 'not-real' is experienced by almost every time they read a book or magazine, turn on a television, watch a movie or access information via the Web. They are instantly taken to another world, which may well be the very reason that they use these devices – for 'escaping' their real reality. They may see access to media as a way to escape reality, to explore and experience 'other' worlds and to participate in non-daily activities.

This is something that is just an attribute of main-stream media consumption. Professional designers and cartographers use different representations of geography to make it easier to navigate, like metro maps which depict the geography 'underground' with minimal links to what is happening above ground London Underground map. Also, maps of 'nowhere' – those that depict places made famous in popular media, and 'visited' via books, comics, film, television – been produced to represent these not-real geographies.

This paper addresses how 'other' geographies are represented, generally from outside 'main-stream' cartography. It begins by discussing maps and the representation of place and space. Then it looks at how maps are used to understand spatial relationships. This is followed by an overview about how maps are used or incorporated into popular media. The use of spatialisation and how other geographies are represented using the map metaphor is covered next. Finally, issues about extending cartographic representations to accord with the use of interactive and integrated media to visualise other geographies is addressed.

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1.1 Introduction

It is widely acknowledged that 80 percent of all decisions made by humans and all work undertaken in the public sector at national, regional or local level have a spatial or geographical aspect or application element (Albaredes 1998, Østensen 1996). Also, Frank, Raubal and van der Vlugt (2000) have stated that geographical information is used in making decisions that have a spatial element and consequently geographical information improves the decision making process. The multi- and interdisciplinary aspects of the depiction of spatial information prove that we are dealing with an area that forms part of the infrastructure of society. Spatial information needs to depict faithfully the aspects of information that effect the everyday lives of citizens. In order to represent phenomenon that have a spatial component we use maps, which represent these phenomena graphically.

To represent information that is spatially-dependent, defined or determined maps provide tools under the umbrella of what Balchin (1977) has called 'graphicacy'. He described graphicacy as "one of the four basic types of intelligence or modes of communication and their educated counterparts". Graphicacy involves the visual-spatial means of communication, as distinct from those that fall under the umbrella of articulacy, literacy and numeracy. Information graphics that illustrate information that has a spatial element – maps allow map readers to better comprehend the meaning 'behind the data'. Maps and map-related objects have historically been a powerful form of communication because they intersect the humans perceptual understanding of place with a conceptualisation of the reality (MacEachren 1995).

Mapping has at its core the requirement to accurately show spatial phenomena. The 'stuff' that comprises the discipline is measurement and depiction. Designers and producers of map products are concerned with whereness – something that can be formulated and depicted in quantitative terms, and whatness – dealing with qualitative information. The whyness element of mapping is a combination of a user's knowledge about the subject being depicted and the map producer's skill in choosing the appropriate data and designing the most effective portrayal medium.

But, what is the most effective method for portraying different geographies? Can 'standard' mapping practices just be applied to produce usable representations? Investigations are needed to explore techniques that might be appropriate for mapping other geographies. The following sections explore how these different geographies have been mapped to provide some insight into what is being mapped and to illustrate how the representation of this information through maps can make more sense than just looking at myriads of textual or numerical information.

1.2 Maps and the Representation of Place and Space

Maps use small-scale space to represent large-scale (geographic) space. How they are designed, developed and produced vary and the 'rules' used to guide design and the 'foundations' upon which they are built can vary. There are a number of ways for visualising / expressing the world and a number of them have been adopted by sectors of the mapping industry. The most common method is the Mathematical (or Surveyor's) view that can be seen to be near-Euclidean. Maps that are produced under this 'umbrella' provide the basis for mapping geography and representing the elements of the physical world. However, not just physical geography that needs to be mapped, 'other' geographies – 'different geographies – can also be represented using maps.

This next section of this paper provides an overview about the use of maps to represent place and space. It reports on where maps have been used to illustrate a selected number of other, different geographies and where maps have been used to support other media, like books and television.

1.2.1 Maps of Well-Being

This first example looks at a more traditional mapping theme – well-being, or health. Historically, maps of a population's well being (physical or mental) have been produced to support the reporting and analysis of health information gathered as part of a census or a specific study. Historically, the beginnings of using maps for health analysis was that used by Dr John Snow *(Figure 1.1)* to ascertain the source of drinking water that caused the spread of cholera in London. By mapping the data – by spatialising it – Snow isolated one supply of water – the Broad Street pump (at the centre of the map in *Figure 1.1)* – which was at the centre of where the biggest number of deaths were located as being a potential source of the disease.

Looking at a more recent example of mapping physical well-being, the map shown in *Figure 1.2, Spatial patterns of natural hazards mortality in the United States,* illustrates death from natural hazards in the United States. The map illustrates the results of reporting and clearly shows (in red) areas of the United States where the likelihood of death from natural hazards is more prevalent.

Also, maps do not only focus on physical well-being. Relatively recently, mapping emotional health or well-being (actual or perceived, collective or personal) has occurred. An Atlas of Emotion was produced by Giuliana Bruno – the San Francisco emotion map *(Figure 1.3).* It illustrates recordings of changes in emotions as the data collector (and I assume mapmaker as well) walks through San Francisco.

Fig. 1.1. Snow's cholera map showing the locations of deaths from cholera. Source: http://clareverse.files.wordpress.com/2006/12/613px-snow-cholera-map.jpg

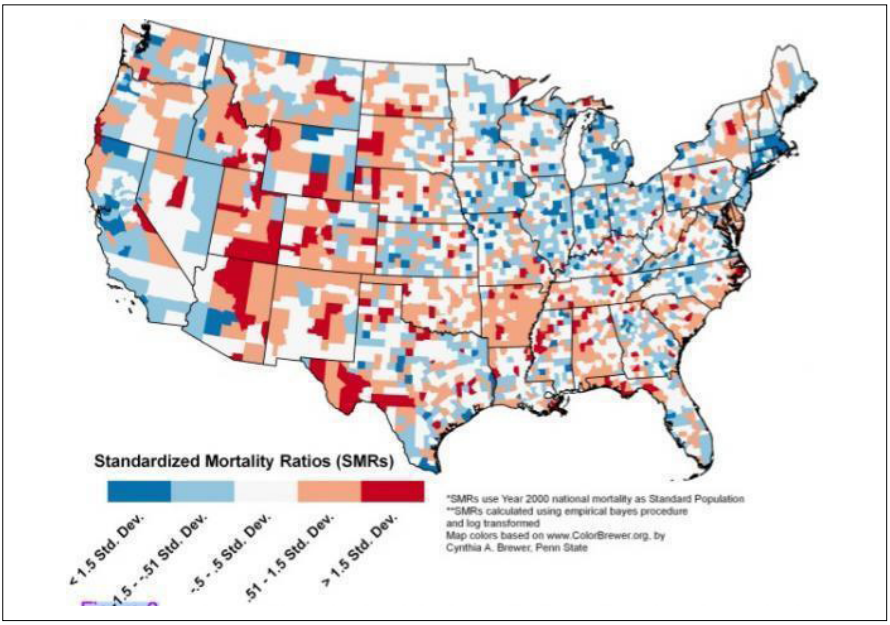

Fig. 1.2. Map of natural hazard mortality in the United States. University of South Carolina Department of Geography. Source: Science News, 2008. http://www.sciencedaily.com/releases/2008/12/081216201408.htm

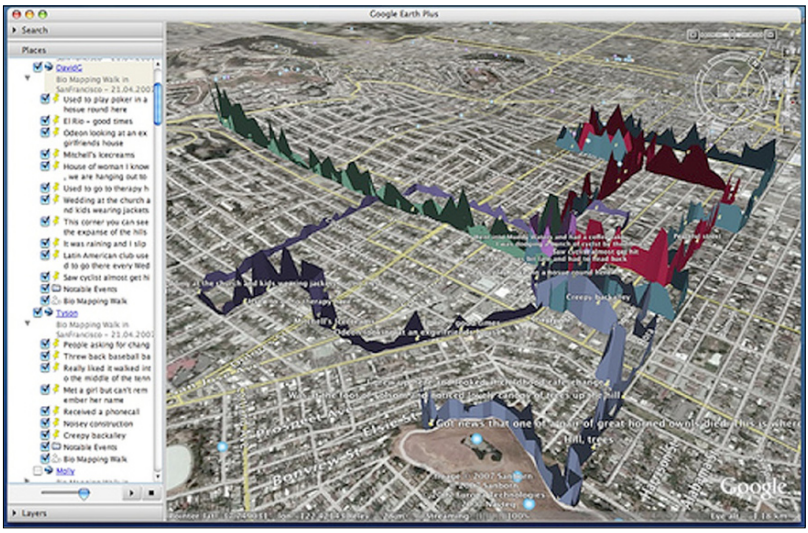

Fig. 1.3. San Francisco emotion map. Source: Science News, 2008. http://farm2.static.flickr.com/1163/1054418074_64c7f09026.jpg

1.2.2 Maps of Works of Fiction

Many maps have been produced that depict worlds of fantasy or worlds created by books, film and television. Book readers have created their own mental maps of places that have never existed. Images of fictitious locations are built as mental maps and they become real 'places' in our minds. Maps of these imaginary places have been produced to evoke 'naturalness' or to facilitate a 'realness' factor that does not exist. We can use these images to study the small details of the area or region, like maps of the Middle Earth *(Figure 1.4)*.

In a book of humorous drawings by Jiz, *Really, Miss Henderson* (1946) a map *(Figure 1.5)* illustrates the adventures of Miss Henderson during WWII.

Works of fiction have also included maps that depict a two-dimensional world. In *Flatland: A Romance of Many Dimensions,* Edwin Abbott (1884) looked at the geometry of higher dimensions and outlined a two-dimensional earth that was inhabited by 'flat beings' (Banchoff 1990). Banchoff (1990) described Abbott's perspective of flatland by referring to Abbott's drawing of his own house (a 2D structure) *(Figure 1.6)*:

> *'A Square', which summarizes the social structure of Flatland. A Square's wife and daughter are drawn as single lines, and, in ascending social order, the male servants, butler, footman and page, are triangles. The owner is A Square, and as each future generation adds a further angle, the Square's sons are the four pentagons and his two grandsons the two hexagons. The entrance doors to the house are of an appropriate width for the two sexes."*

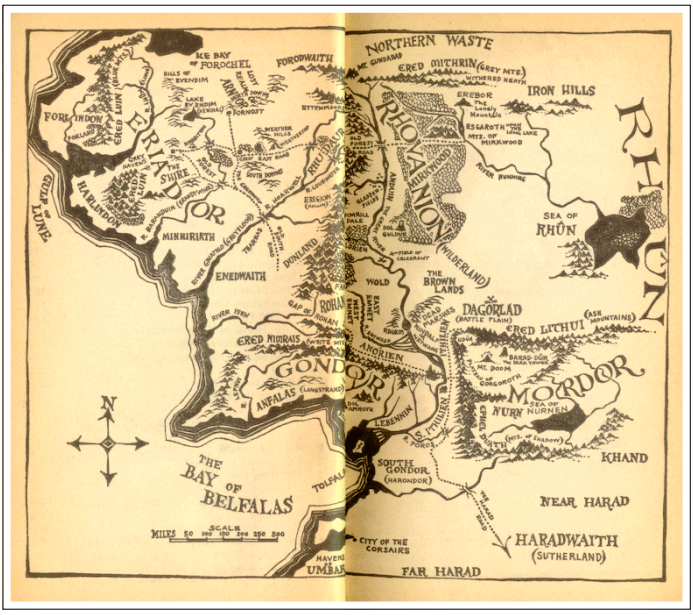

Fig. 1.4. Map of the Middle Earth. Source: The Fellowship of the Ring, Ace Books. http://www.isildur.com/tolkien/maps/fullmap.gif

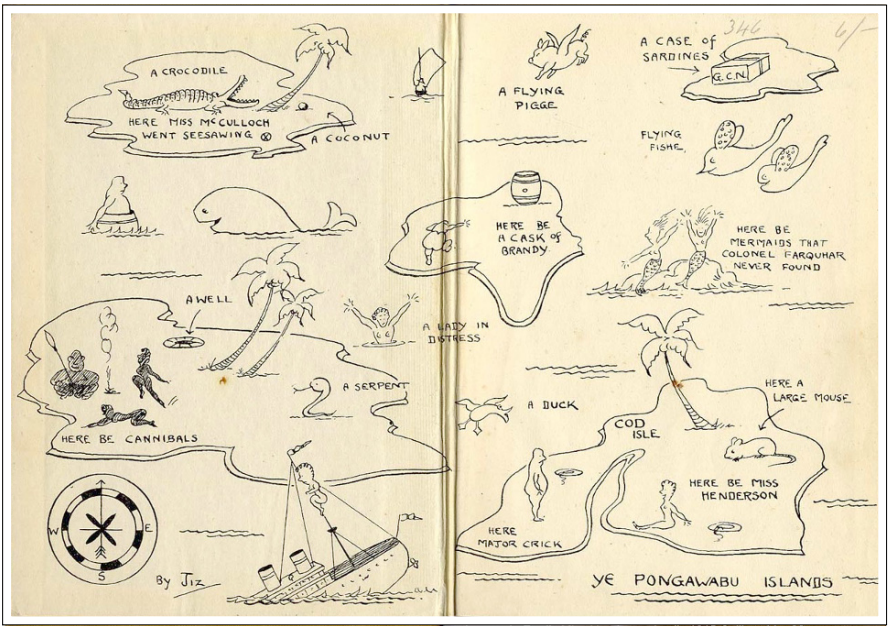

Fig. 1.5. Map from the book Really, Miss Henderson. The map provides an overview of the content via this playful graphic drawn by the author. Source: http://www.fulltable.com/VTS/b/bc/bbb/06.jpg

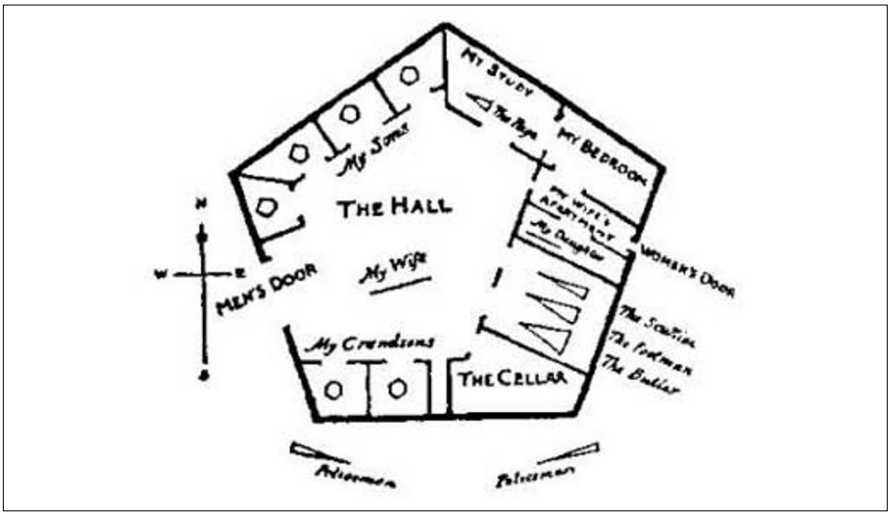

Fig. 1.6. Abbott's house depicted in his book Flatland: A Romance of Many Dimensions, Edwin Abbott (1884).

Maps in books can also show nothing at all. The map by Henry Holiday *(Figure 1.7)* illustrates – nothing at all' – the blank map referred to in the poem by Lewis Carroll**,** *The Hunting of the Snark (1876).*

He had brought a large map representing the sea,
Without the least vestige of land:
And the crew were much pleased when they found it to be
A map they could all understand.
"What's the good of Mercator's North Poles and Equators,
Tropics, Zones, and Meridian Lines?"
So the Bellman would cry: and the crew would reply
"They are merely conventional signs!
Other maps are such shapes, with their islands and capes!
But we've got our brave Captain to thank"
(So the crew would protest) "that he's bought us the best—
A perfect and absolute blank!"

From Lewis Carroll**,** *The Hunting of the Snark,* Fit the Second (1876).

1.2.3 Mapping Literature

As well as maps in Works of Fiction there have been academic studies about the location of settings in books. One excellent example of this type of endeavour is the *Literary Atlas of Europe* prototype, a project funded by the Gebert Rüf Foundation,

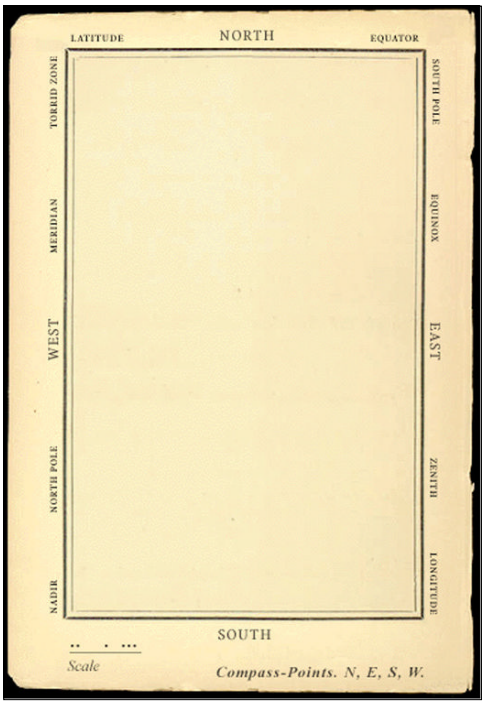

Fig. 1.7. Map by Henry Holiday depicting the map noted in Lewis Carroll's poem The Hunting of the Snark – "A perfect and absolute blank." Source: http://www.sscnet.ucla.edu/geog/gessler/167-2000/bellmans-map.gif

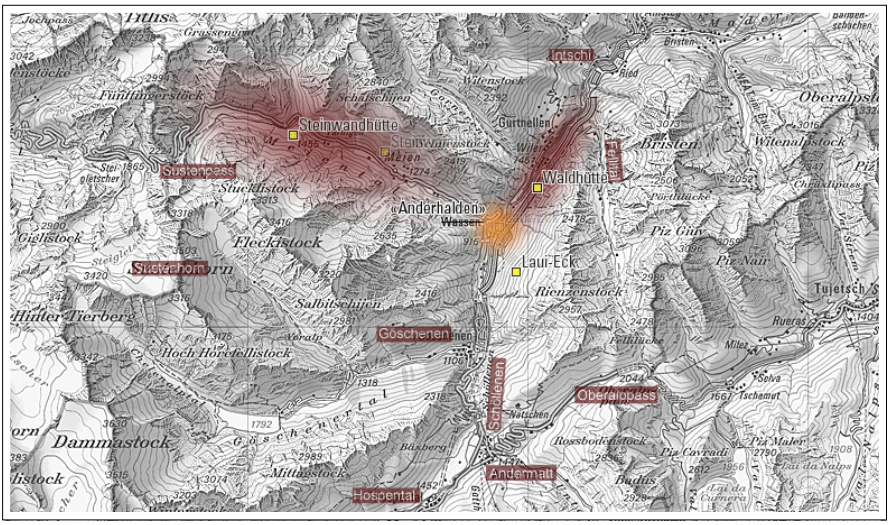

Fig. 1.8. Map from the Literary Atlas of Europe prototype. Source: https://www.ethlife.ethz.ch/archive_articles/071005_Literaturatlas/literaturatlas-l?hires

Basel, Switzerland (Piatti and Hurni 2007) and managed by ETH Zurich. It is based on the pioneering work of Franco Moretti (1998) and Barbara Piatti (2008). The Literary Atlas of Europe focuses on three model regions: an alpine landscape (Lake Lucerne/Gotthard in Switzerland), a coastal border area (North Friesland in Germany), and an urban space (Prague, Czech Republic). A time frame of about 250 years, from ca.1750 to the present is being used for the study. A map from the project is shown in *Figure 1.8*.

Whilst not undertaken to the same degree of academic rigour as the previous example of mapping literature, there are a number of Web sites that provide alternative maps representing literature. *Figures 1.9* and *1.10* show examples of some of these sites. In *Figure 1.9* the connections between key literatures related to screen-based media is provided. *Figure 1.10* shows the Tag Cloud produced at Many Eyes, part of IBM's Collaborative User Experience Visual Communication Lab research group. It tags and visualizes 600+ poems of Yeates.

1.2.4 Locating Literature

William Wordsworth's poem 'I Wandered Lonely As A Cloud' (or 'Tintern Abbey', the ruin of a mediaeval monastery on the Welsh-English border). Its longer name

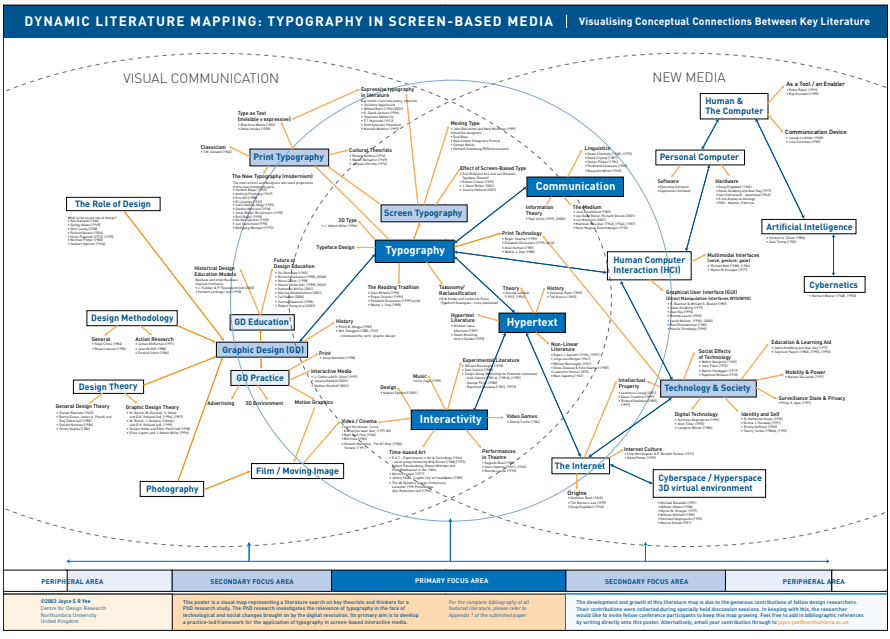

Fig. 1.9. Dynamic literature mapping Web site. Source: Yee, 2003, pp. 4–5. http://www.designdictator.com/publications/eadpaper.pdf

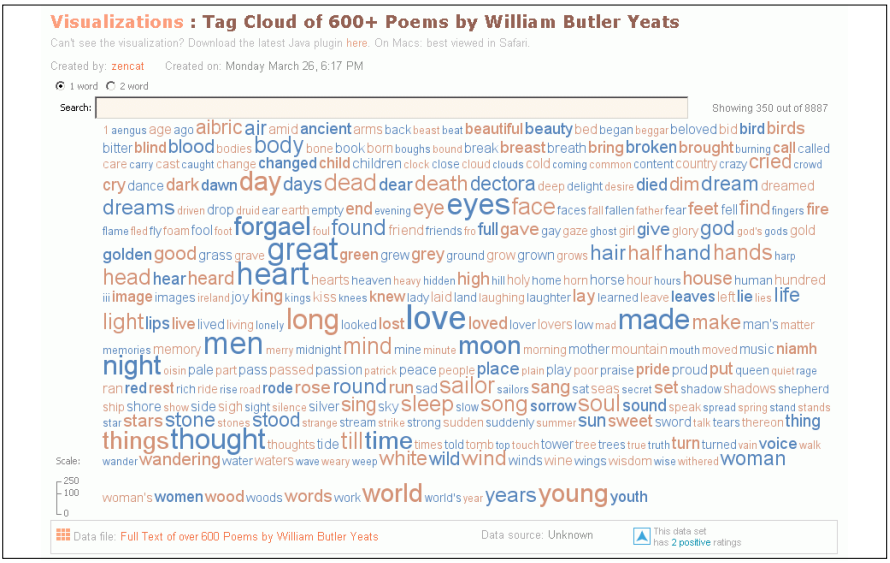

Fig. 1.10. Tag Cloud depicting over 600 poems by William Butler Yeats. The 'map' shows the relative importance of words used by Yeates and their proximity to other words. The larger the font size the greater the number of times this word was used by Yeates. Source: http://manyeyes.alphaworks.ibm.com/manyeyes/visualizations/tag-cloud-of-600-poems-by-william-bu

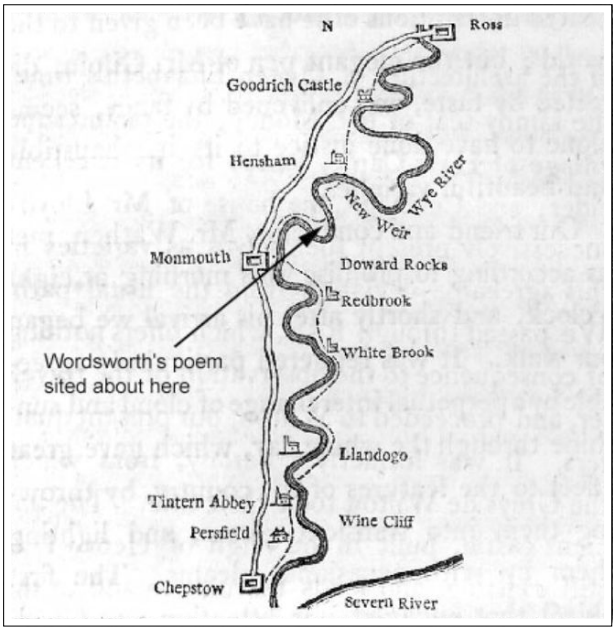

Fig. 1.11. Map showing the possible location of Where Wordsworth penned the poem 'I Wandered Lonely As A Cloud'. Source: Warner (1798, p. 221) http://www.ualberta.ca/~dmiall/Tintern-Warner.jpg

is 'Lines Composed A Few Miles Above Tintern Abbey, on Revisiting the Banks on the Wye during a Tour July 13, 1798'. The map shown in *Figure 1.11* shows where he might have penned this poem.

1.3 Mapping the Soap Opera

The British Broadcasting Commission (BBC) radio soap opera The Archers has been broadcast in the United Kingdom since May 1950. 15,000 episodes have been produced. A research project at the BBC created a data model to represent the plays. Daily podcasts were tagged and a Web interface built. Users can access MP3 files and view elements including timelines and the geography of the soap opera (BBC 2008). What is relevant to this paper is that maps were produced, to illustrate the geography *(Figure 1.12* (Ambridge village)). (A similar project also produced hyperlinked Web pages related to the UK soap opera EastEnders (Romaniuk 2003)).

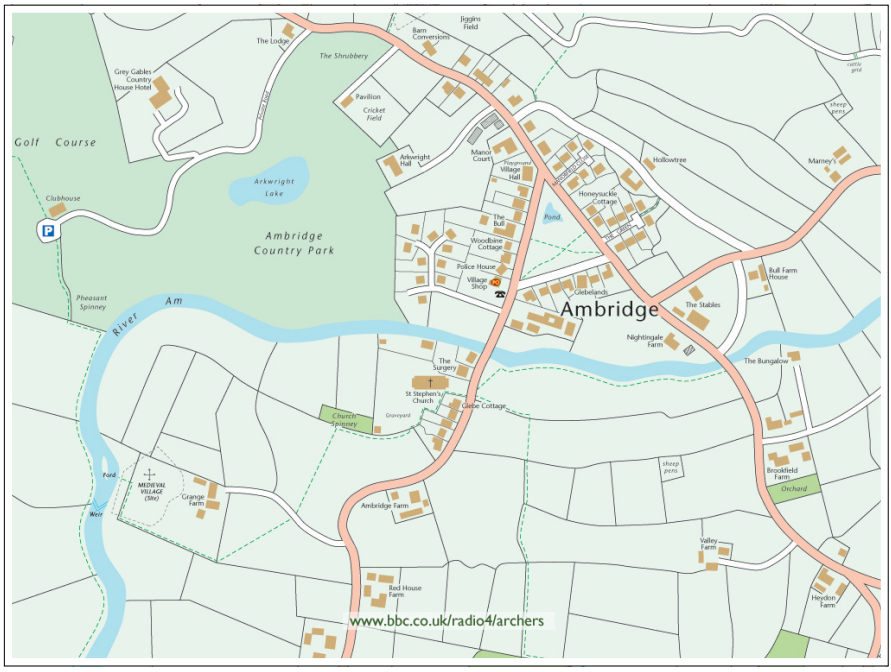

Fig. 1.12. Ambridge Village – the location for the BBC radio play The Archers. Source: www.bbc.co.uk/radio4/archers/wallpaper/ambridge_1024.shtml Accessed October 13, 2008

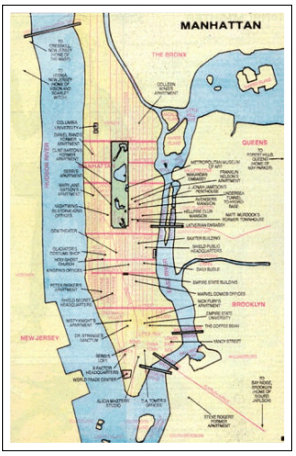

Fig. 1.13a. Marvel Comics map of Manhattan. Source: www.paratime.ca/v_and_v/pics/manhattan_mu01.jpg

Fig. 1.13b. DC Comics Atlas of its cities of the Eastern US Seaboard. Source: www.paratime.ca/dclegends/pics/dcl/dcu_atlas.jpg

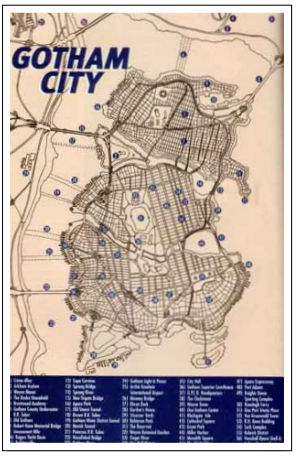

Fig. 1.13c. Gotham City. Source: www.paratime.ca/v_and_v/pics/gotham_city.jpg

1.3.1 Mapping Comics

Comic publishers have also produced maps that depict features of their worlds. Marvel comics published *The Official Handbook of the Marvel Comics map of Manhattan* (c. 1986) *(Figure 1.13a),* DC Comics *Atlas of its cities of the Eastern US Seaboard (Figure 1.13b)* and locations in Batman's Gotham City have been pinpointed on maps by readers *(Figure 1.13c).*

1.3.2 Mapping Music

The cover of Neil Young's album *'Greendale'* (2003) is a map of the fictional Californian coastal town of Greendale. It shows the elements of life of the Green family relevant to the songs on the album: Captain John Green's boat; Jed's seafish apartment; scene of the crime; Carmichael's house; etc. The map *(Figure 1.14)* is used to 'hang together' Young's songs.

1.3.3 Mapping the News

City of News, from the MIT Media lab is an immersive, interactive 3D web browser. It was developed to allow interactive access to news articles. The map metaphor and the city metaphor are used to display the available information. According to

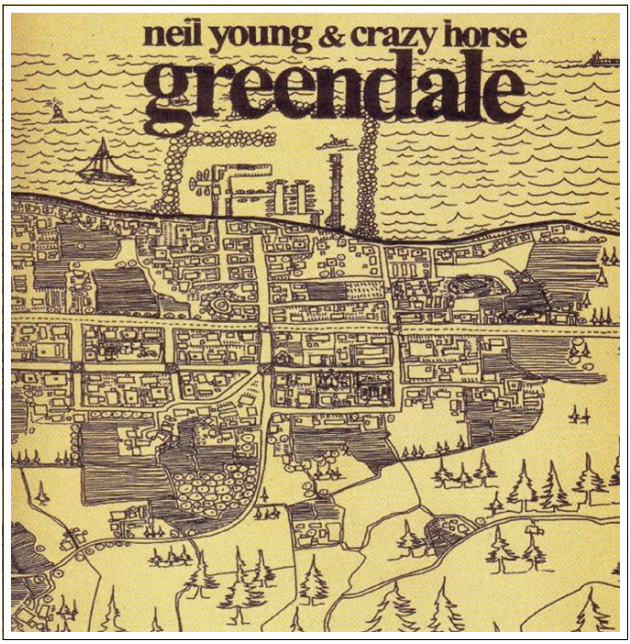

Fig. 1.14. Record cover – Greendale. Source: http://strangemaps.wordpress.com/

Fig. 1.15a. City of News.
Source: Sparciano et al., 1997.

Fig. 1.15b. City of News.
Source: Sparciano et al., 1997.

Sparacino *et al,* (1997) it is *"... an information browser that organizes information as it fetches it, in real-time, in a virtual three-dimensional space which anchors our perceptual flow of data to a cognitive map of a (virtual) place. This place is a city"*. Images from the project are provided in *Figures 1.15a* and *1.15b.*

A similar project is by André Skupin's, where he spatialises information from large databases and then represents this information in a map. One of his maps is provided in *Figure 1.16,* which shows the relative proximity of key words from academic papers on geography.

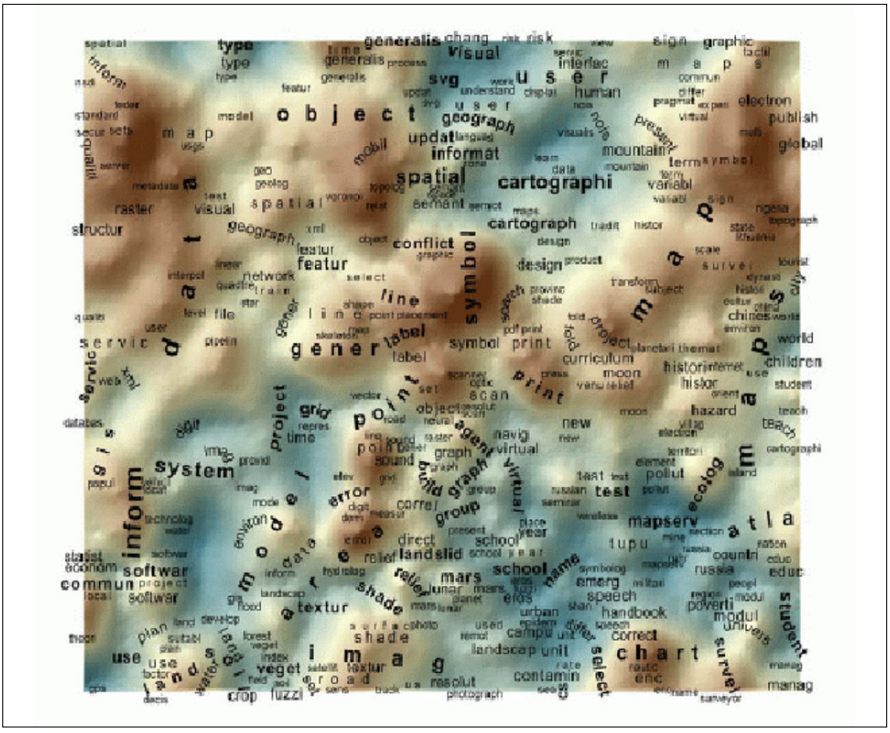

Fig. 1.16. Skupin's map of key geography topics. Source: http://geography.sdsu.edu/People/Pages/skupin/CVText.htm#Publications

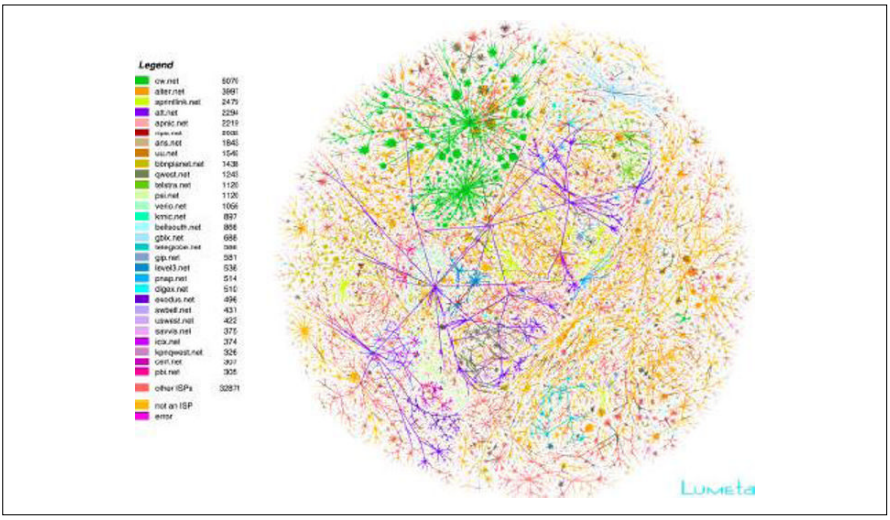

Fig. 1.17. Internet topology by Hal Burch and Bill Cheswick. Source: http://www.medien-kunstnetz.de/works/internet-mapping-project/

1.3.4 Mapping Cyberspace

The term 'Cyberspace' was first coined by William Gibson (1984) in his book *Neuromancer* (2000). In this book he described it so: "Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts...A graphical representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the non-space of the mind, clusters and constellations of data. Like city lights, receding".

Martin Dodge and Rob Kitchen (2001) pioneered this topic with their Atlas of Cyberspace. One of the maps from the Atlas – *Internet topology by Hal Burch and Bill Cheswick* – is depicted in *Figure 1.17.*

1.3.5 Mapping Culture and Society

During the 2008 Beijing Olympic Games the *New York Times* web site provided maps illustrating medal counts from previous games. An example is the map in *Figure 1.18,* which shows the complete medal count from Summer Games of the XXVIIIth Olympiad in Athens. The relative size of each country is determined by its medal count. The map is interactive and animated.

'A new map of Travel Time to Major Cities' *(Figure 1.19)* was published as part of the World Bank's World Development Report 2009 shows the extent of urbanisation by depicting travel time to 8,500 Major Cities. The map shows the results of

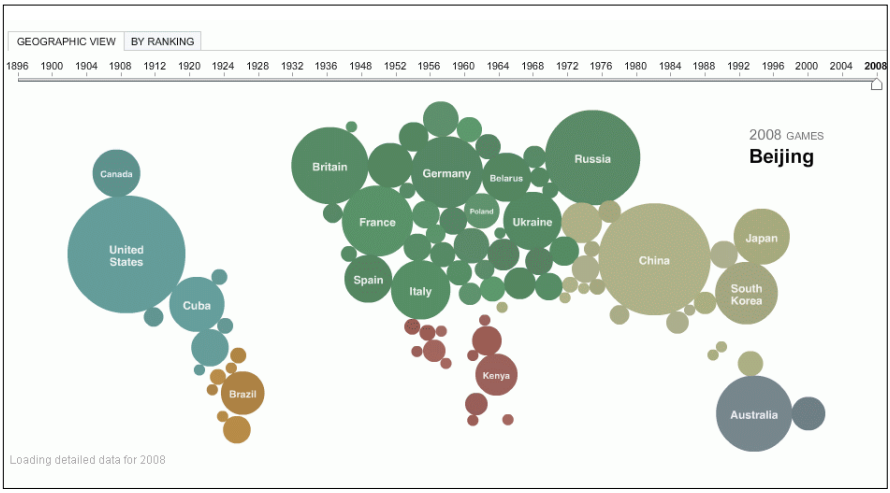

Fig. 1.18. A Map of Olympic Medals. Source: NY Times, August 4, 2008, www.nytimes.com/interactive/2008/08/04/sports/olympics/20080804_MEDALCOUNT_MAP.html

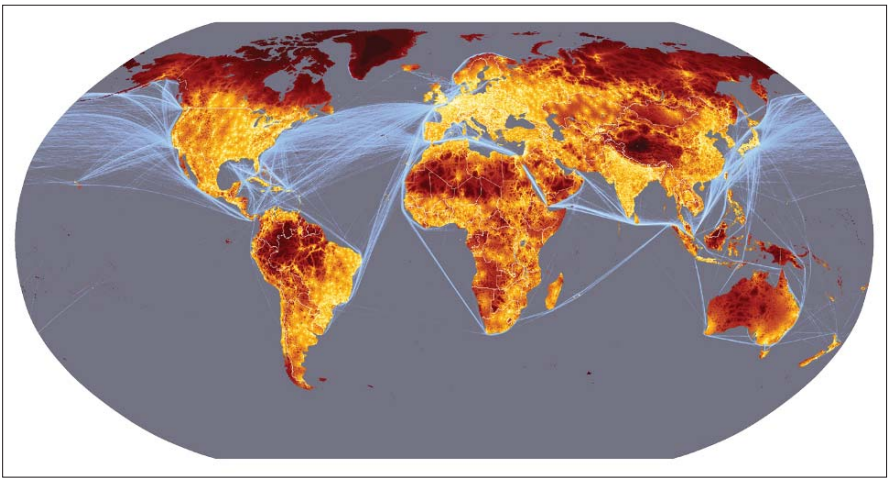

Fig. 1.19. A Map of Olympic Medals. Source: NY Times, August 4, 2008 http://www.nytimes.com/interactive/2008/08/04/sports/olympics/20080804_MEDALCOUNT_MAP.html

global travel and international trade – making some parts of the world accessible, but still many regions remain isolated.

These examples illustrate how different geographies are mapped to facilitate a better understanding of spatial relationships. However, the success of these products as an information resource depends on whether the user can interpret what is depicted. The next section addresses this.

1.4 Not-Reality and Maps

If the users of cartographic products can be confused by simple imagery that depicts an element of reality, then how do they handle maps about not-reality? Many maps have been produced that depict worlds of fantasy or worlds created by media like books, film and television. Book readers, viewers of television and movies, and even radio listeners have created their own mental maps of places that have never existed. Yes, this is what authors and film directors want us to do, to create images from their written or image 'cues. But, is reality confused with not-reality?

To examine if this might prove to be problematic one conventional map substitute is investigated – the London Underground map designed by Harry Beck of London Transport. Beck proposed an altogether different map from its 'above-surface' map of London cousin, showing London from the viewpoint of a commuter on the London Underground *(Figure 1.20)*. Beck, modified geography so that the artefact would communicate information better. His idea was that users of the London

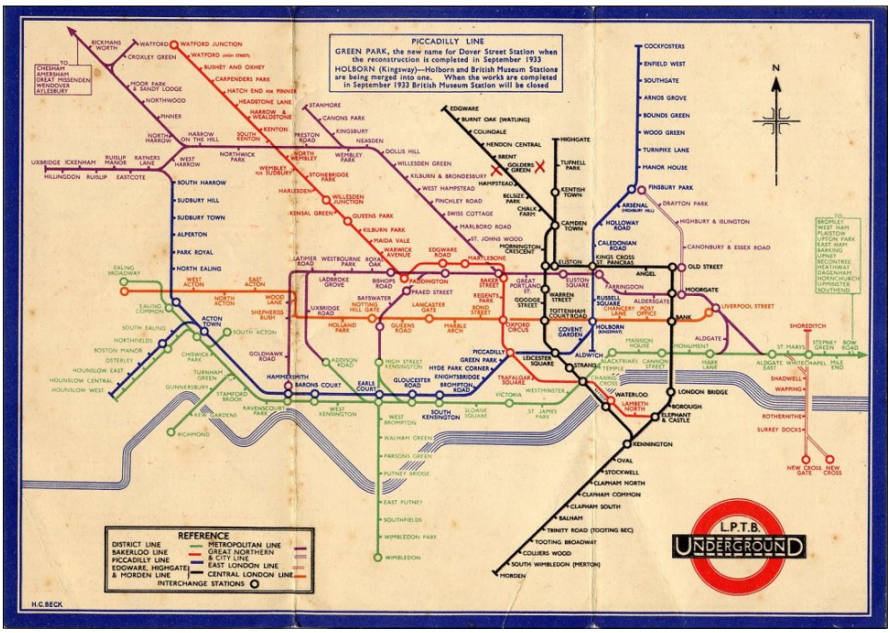

Fig. 1.20. Beck's London Underground map 1933. Source: http://uk.geocities.com/lhsoicher/images/1933a.jpg

Underground were interested in the line they were travelling on and the connections they could make. This was all they needed. This led to his design for a new map of the Underground, which abandoned above ground information and concentrated on a simple map of the transportation system.

Londoners and visitors now use it to enter hitherto unexplored territory using a tool that makes it easy to understand the system and to make connections. 'Real' distances and directions were distorted to improve map efficiency. "The interchanges were important".

Compare Beck's map of 1933 to previous maps, 1907 (Evening News Tube Map) *(Figure 1.21a),* 1922 (MacDonald Gill Map) *(Figure 1.21b)* and 1931/32 (32 Stingemore Map) *(Figure 1.21c).* Each of these designs was 'faithful' to geography. And, what went on below ground was depicted using 'above-ground' techniques. They showed positionally-correct underground train lines, but their design made interpreting the 'system', with its various lines and connections more difficult than it need be. Beck's map simplified the system by producing maps that ignored the rules of geographical depiction. His map was different, he used alternative depiction strategies and a more efficient communication artefact resulted.

This example illustrates how navigation (especially underground) works better depicted if non-realistic maps are used in preference to geographically-correct maps. But, for the first-time visitor to London, and perhaps also for some long-time

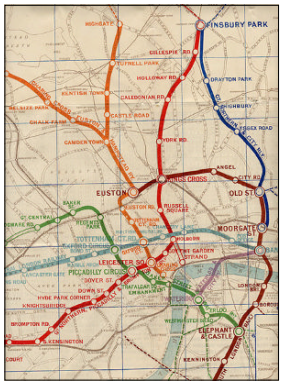

Fig. 1.21a. 1907 Evening News Tube Map Source: http://uk.geocities.com/lhsoicher/images/1907_central.jpg

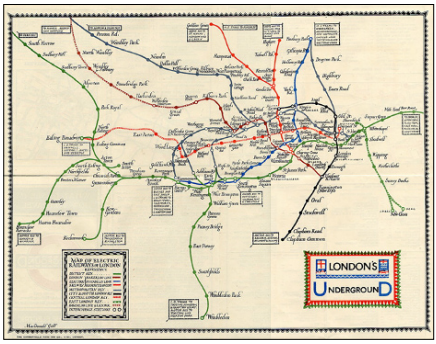

Fig. 1.21a. 1922 MacDonald Gill Map. Source: http://uk.geocities.com/lhsoicher/images/gill_w.jpg and http://uk.geocities.com/lhsoicher/images/gill_e.jpg

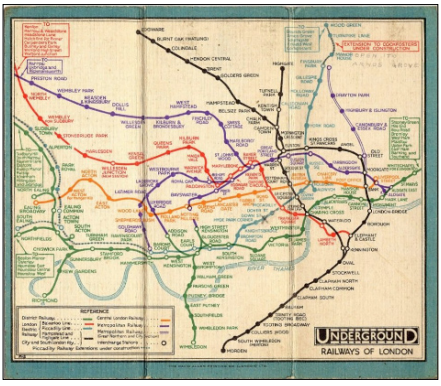

Fig. 1.21a. 1931/32 Stingemore Map. Source: http://uk.geocities.com/lhsoicher/images/stingemore.jpg

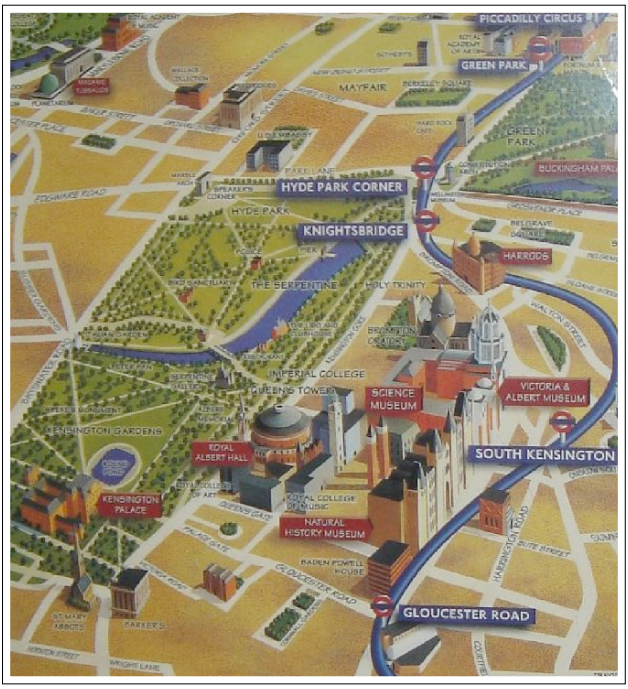

Fig. 1.22. London above ground promotion in London transport trains. Photo: William Cartwright, 2006

London dwellers, what is the composite mental map of London? Can the user 'fuse' together an image of the entire city, and how it works, from this type of map and, is that fused mapping a true and accurate image of the city?

1.5 Using Maps to Plan Works

As an aside, but related to this topic, maps, whether it be sketch maps or more formal maps, have been used by authors to plan their writing or media production. Three examples are provided here to illustrate this use of maps.

1) In 1951 Jack Kerouac wrote his book On the Road (Kerouac 1957). The map in *Figure 1.23* is from his diary and it shows the itinerary of a trip from July to October 1947. This route was part of the journey that Kerouac described in his book.
2) Russell Kirkpatrick, a New Zealand is a writer and cartographer. He first produced a topographic map of the 'land' in which his stories were set when developing his ‹Fire of Heaven› series, the first book in the series, *Across the Face of the World* (Harper-Collins 2004). He produced the topographic maps (see an example in

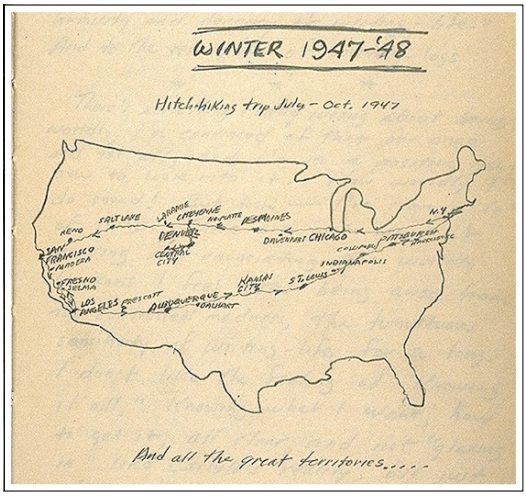

Fig. 1.23. 'On the Road' map. Jack Kerouac's sketch in his diary showing the itinerary of a trip from July to October 1947. Source: http://strangemaps.wordpress.com/page/9/

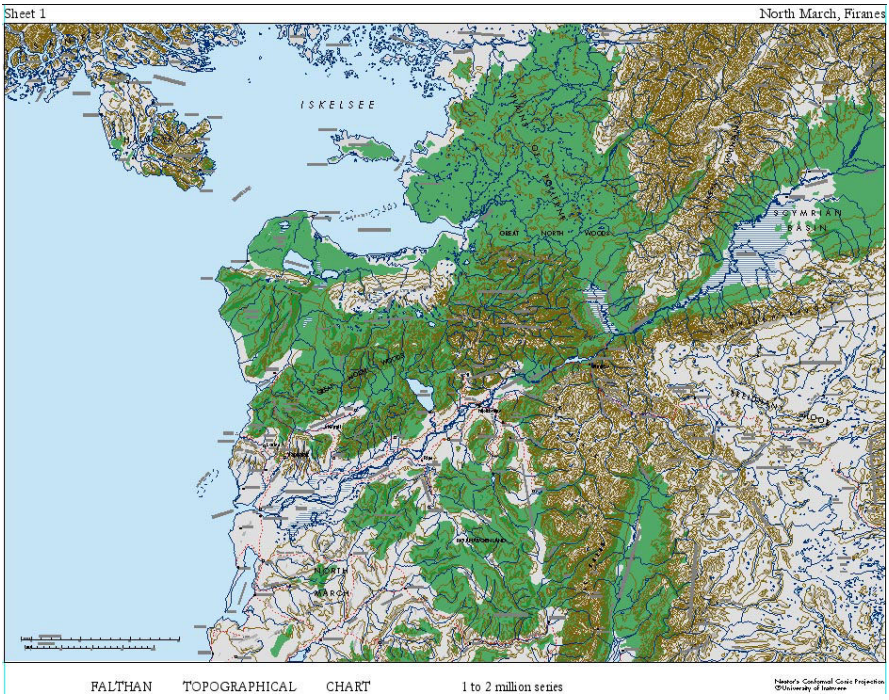

Fig. 1.24. North March, Firanes Topographical Chart. Pseudo topographic map produced by Russell Kirkpatrick to guide where chapters of his book trilogy, Across the Face of the World, were set. Source: http://www.voyageronline.com.au/russellkirkpatrick/image_large.cfm?ImageID=5

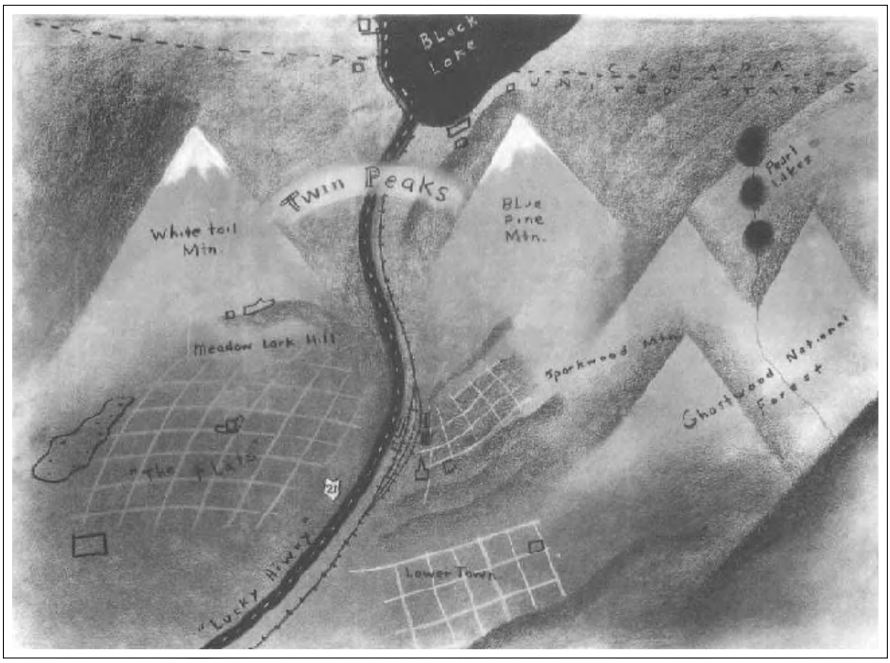

Fig. 1.25. Director's impression of Twin Peaks. Source: http://www.austinkleon.com/2008/01/29/map-of-twin-peaks-by-david-lynch/.

Figure 1.24) before writing his trilogy, so the stories would be placed correctly in the 'terrain' (Cartwright 2004).

3) To present their pilot script for the television series *Twin Peaks* to the ABC, Director David Lynch drew a map of his mental image to assist scripting and filming continuity (Kleon 2008). This showed the layout of the fictional town Twin Peaks, where the television series was set. The map is illustrated in *Figure 1.25.*

1.6 Discussion

The use of New Media, as previously stated, allows users to explore, locate and use a myriad of geospatial visualization products. This has the potential to cause some problems if sufficient care is not taken. Cartwright commented upon this in 1997:

"However, as users adapt to using things like multimedia maps and maps via the Internet there is a need to re-assess how the user 'sees' reality and how the use of new (electronic) media may present something that bears no resemblance to reality at all, mapping what MacEachren (1995) calls 'not-Reality' " (Cartwright 1997).

How does it effect the way in which users of New Media explore geography, and are they presented with credible information. But do they care if they are presented with 'real' information at all.

So, which reality to work with? And how do we get information about the user's reality? This reality can be considered to be in three areas:

- Geographical – the users' perception about geography, related to experience in things geographical and how the elements of geography can be transmitted via maps (digital or otherwise);
- Usage – how the user actually uses media; and
- Knowledge about the way in which the medium works, how to work with maps delivered via this medium and the general distortions of geographical information when it is transmitted through maps

Distortion of reality may be related to the 'viewing media', and this is one aspect of information delivery that cartographers have no control over. To this can be added the uncertainty, or, better still, lack of knowledge about whether different realities can be associated with the use of different media.

There are many issues related to how different media is applied to the delivery and portrayal of geospatial information. (See Cartwright 2002 for a treatment on this subject). Also, there are a number of issues related to the use of maps in non-map media. Areas needing research are related to:

- The general public is generally inexperienced users of media as delivery mechanisms of information;
- How to eliminate the 'gloss of the new' when evaluating the effectiveness of interactive multimedia products and delivery strategies;
- The general impact of contemporary media and its effect on changing geographical realities;
- The general public's confidence in information delivered by popular media;
- Confusion between real and non-real;
- Fusion of real and non-real;
- The fact that there is no real 'groundtruth' for quality/accuracy of information (See Cartwright, 1997 for a discussion on groundtruth); and
- The overwhelming power of combining media (as multi-media).

Do the 'tools' for geographical visualization change the viewpoint of space or place and therefore, if so, is a 'jaundiced' view of (geographical) reality provided which aids in the construction of a particular mental map and thus an individual's perception of geography. What does this mean for the providers of tools to assist in understanding geography?

1.7 Conclusion

Do these 'simple', but effective, graphic communication devices provide just one window into reality? And, do naive users of these products, when using them like any other mapping product; compose an image of the world when using this graphic window that is not a true image of reality? If the users of cartographic products can be confused by simple imagery that depicts an element of reality, then how do they handle maps about not-reality?

Does the way in which the use of spatial information provision artifacts for depicting different geographies need to be evaluated to discover whether different 'views' of reality are presented (and transmitted)? Papert (1993) saw that certain things need to be taken into consideration if one is to properly address the use of 'different' geo-spatial depicters – those that allow users to construct their own mind sets of data and hence their own interpretation of geographic phenomena. Therefore, just using an existing map or existing mapping conventions may not be enough when representing different geographies.

Getting visualizations of reality right, and making them work is a difficult task, especially when different geographies are being mapped. Sometimes we undertake the design and production of visualisations, and the appropriate access/interaction components somewhat remotely from the user. Getting this 'right' takes much time and effort and if users are to appreciate geography, and the elements of geography displayed in visualizations, we need to incorporate their understanding of geography into the products we design and develop.

Acknowledgements

Thank you to the anonymous reviewer whose comments have been incorporated into this paper.

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Chapter 2

Mapping Practices for Different Geographies

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Abstract

That maps are among our most valuable heuristic instruments has become even more pronounced in our contemporary technosocial environment which demands continuous cognitive activity: the sophisticated new technologies pervading everyday life have not only become an integral part of it but also effectively produce new forms of human positions and positioning involving us in active and continuous interchanges in realtime. This implies that they generate nothing less than new modes of subjectivity. Although maps have to some extent always fulfilled these functions, what is different today are the technologies at our disposal, which not only generate new dynamic spaces but which also enable and challenge us to come up with new strategies of mapping allowing for both improvisational and subjective positioning in constant negotiations for space.

This development has been increasingly interrogated by digital artists. Seeing the need to create new mapping strategies, these artists have their works even go so far as to imply that the subject-object framework be relinquished for that of an implicated agent and an expansive field in which the agency of any presence is intertwined with other agencies. Such an approach would involve mappings of the intermeshing between agents responding to their environment in ceaseless participation. What would these maps look like? Are we, as some suggest, at the point of entering a new shift of mapping paradigm, similar to the one that occurred in early modernity when the 'scientific' maps produced by cartographic projection replaced the illustrated and highly narrative medieval maps? Cartographic research and cyberart join here as such an approach would seem to carry the potential not only for theorizing forms of mapping our rapidly changing technosocial space but also for a fruitful dialogue among art, technology and science. This will be discussed by examining the works by digital artists Stelarc, Char Davis, Rejane Cantoni and Daniela Kutschat.

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2.1 Introduction

What mapping practices are used to chart the technosocial spaces created by new technologies and how can we orient ourselves in such new expanses? As new technologies generate new technosocial spaces, novel strategies of orientation become necessary. This development has increasingly caught the attention of contemporary artists who have started to interrogate the spaces created by these new and sophisticated technologies – the Internet, GPS, WLAN, international databanks, RFID object space, smart architecture / fluid architecture, etc. These so-called "anthropotechnical" spaces are radically changing not only our relationships with the life-world but also the way we orient ourselves in space. How do we experience these fields that are characterized by an instant and dynamic relationship between humans and technology? And how can we locate ourselves in a world that is increasingly IT-dominated and therefore fluid, instantaneous and consistently interacting? What new systems of orientation are required to explore these spaces which have been scientifically but not yet philosophically investigated, as these mappings do not only concern novel kinds of spatial awareness but also new modes of subjectivity?

These and similar questions have recently been frequently addressed by digital artists who even more specifically attempt to map the new forms of human positions and positioning produced by our active and continuous interchanges in real-time. Although maps have to some extent always fulfilled these functions, what is different today are the technologies at our disposal which not only generate new dynamic spaces but also *demand* the development of new mapping strategies allowing for both improvisational and subjective positioning in constant negotiations for space.

Locating the subject has always been one of the prime functions of maps – in early modern times, the rediscovery of Ptolemy and the growth of the scientific revolution produced new interest in the human body and the geography of the actual world. This triggered new developments in the fine arts and also in literature: not only were travel narratives adorned with carefully crafted maps but a new kind of writing emerged. The development of printing suddenly located discourse between meaning and its spatial form on the printed page, which made the relationship between rhetoric and diagrams visible. It is interesting to follow how, at the time of geographical expansion, cartographic writing developed when writers such as Rabelais, Montaigne and Cervantes sought to "map out" their worlds for their readers by appropriating the worlds they were navigating through discourse and space. As Tom Conley (1997, p. 3) suggest, even Descartes, Modernity's philosopher *par excellence,* could be seen as a cartographer who "fashions himself as a surveyor, a topographer, in the double guise of an *ingénieur du roi* and *an ingénieur du soi".* This new subject had to develop new strategies to deal with the Cartesian space that Western maps embody, making him or her an omniscient spectator of the

projected space that maps represented as objects of art, science and technology. As maps were plotted a new self emerged which was partly defined by the relationship of the self to space. This relationship was however very varied: as Svetlana Alpers (1983, p. 136) has shown, Dutch seventeenth-century map makers and painters, in particular Vermeer, skillfully employed a variety of pictorial strategies to "make the world visually immediate", foregrounding the map as a material representation combining art and science.

What is different today are the technologies at our and therefore also at the disposal of artists, because not only do these technologies generate new dynamic spaces, they even *demand* the development of new mapping strategies. I would go even further and suggest that we relinquish the subject-object framework for that of implicated agent and expansive field. This field could then be called an "agential space", as suggested by Vincent Colapietro (2007), and which he sees as a space in which agents are at once caught up transcending their immediate control and implicated in the effective exercise of their somatic, social agency. It involves improvisational and variable perspectives and positions of agents involved in incessant interpretation and recontextualisation. From this follows further that the sensorial experience of such a field or space becomes a function of the way the agent relates to the form of mapping employed. This approach would seem to carry the potential not only for theorizing different fields of research but also for a fruitful dialogue among cultural theory, technicity, and digital art, which I will discuss examining the works by digital artists Stelarc, Rejane Cantoni and Daniela Kutschat, and Char Davies.

2.2 New Spaces

"Agential space", then, designates the field in which the agency of any identifiable presence is intertwined with other agencies. In other words, these agents or presences are such situated and embodied forces that the exercise of agency is best understood in terms of introducing disturbances into this field, or tracing these intersecting force patterns. The notion of agential space seems all the more relevant in view of the extent to which new technologies increasingly influence our lives. As Nigel Thrift puts it,

> *We have to look at how, as a result of the intervention of software and new forms of address, these background time-spaces are changing their character, producing novel kinds of behaviours that would not have been possible before and new types of objects which presage more active environments.* (Thrift 2004, p. 583)

In other words, the instantaneous positioning relationship that these new technologies produce are based on is an *Umwelt* of information, which releases humans into a coordinate system of (re-) active real-time. The new strategies and grammars of

orientation that such coordinate systems demand have already been analyzed from the perspectives of the natural and technological sciences. The Humanities have, however, not yet taken full account of what this development implies, in particular that it has created a need to redefine anthropological conditions and practices. New grammars of orientation demand new forms of mapping. What is characteristic for the ongoing technological revolution, however, are the informatization of space and a direct embedding of the representation in the spatial structure and in the spatializing technologies themselves.

Of prime interest here are therefore the medial spaces and complex practices of orientation developing against the background of this IT-based folding together of space – map – human. But how can such fluid spaces be mapped? And what would the maps and the mapping of this new space look like, since they would have to involve the description of the relationship between agent and map? Following Ingold (2004) and others, I will argue that, rather than the often-used metaphor of the map as network, these new maps would have to be meshworks. In the sense intended here, meshes are formed by interwoven lines articulating heterogeneous components, producing dynamic diagrams interacting so as to avoid collisions but yet affording growth and movement (cf. Certeau's "wandering lines"). In other words, they are processes involving diagrammatic thought of illimitable scope rather than closed systems of finite objects. Such a pragmatic approach implicates a dialogic and communicative self immersed in incessant recontextualization and, therefore, involves mappings of the intermeshing between agents ceaselessly participating in and responding to their environments.

2.3 What Kind of Maps?

Let me therefore start by defining a map from a semiotic perspective. A map is a diagram, the graphic register of correspondence between two spaces that relationally represents its object. It is this relational quality that provides diagrams with the claim to more or less objectively represent 'reality' that has become discounted in other forms of representation today. I would argue that what makes the diagram such a useful figuration is that

- diagrams are relatively independent to their objects: the relationship between the objects exists independent of the map, and can be independently located and calculated.
- diagrams are abstracted to a certain criteria of relevance that can be generalized.
- diagrams represent both intelligible and sensible relations: they do not need to represent something that exists but can also be a model for the production of something new, e.g. a blue-print of an architect's drawing for the construction of a house.

This is what accounts for the creative potential of diagrams: since they allow experimenting on, both on paper, on screen or in our minds, this very feature makes them excellent tools for outlining both thought and action. It makes them indispensable for formal reasoning: according to Charles Sanders Peirce, diagrammatic reasoning is fundamental to our thought processes. The diagram is a complex iconic sign affording – indeed, inviting – such possibilities of manipulation and transformation as it "suppresses a quantity of details, and so allows the mind more easily to think of its important features" (CP. 2.282).

But what is particular with diagrams such as maps is that they have strong indexical properties, which is what I would argue accounts for their dynamism: diagrams presuppose, even demand interaction. This lies in the indexicality of the diagram/map as a visual sign. Even though the diagram is iconic, it is, as a visual sign, always "embodied in some particular materiality or particular form, or as instance of an iconic representation" (cf. Santaella 2001). A diagram always refers to something – even more so, it calls our attention to the object it refers to and to the formal similarity between these relations.

This becomes vital in map reading. Since the most important function of maps is their interaction with their users, these therefore become part and parcel of the map action – because users must locate themselves within the map to engage with it in order to orientate themselves not only within the map but in the 'real' or imaginary space it represents. With map reading, 'I am here' becomes 'I am there' – a strange fusion of a deictic gesture that points *from* the body to the map (cf. Sibylle Krämer) and at the same time to itself: the diagram or map user, as a body positioned in space, is therefore an essential part of it. Indexicality becomes the condition for the possibility of operating a map. Because maps demand an active user to function, their bird's-eye or vertical orthogonal view was once made for those who needed an overview to survey their commercial enterprises or lands. That is what makes modern maps off-springs of modernity and embodying the idea of the sovereign subject – not only is the map made from the viewpoint of a "celestial eye" (Certeau 1964, p. 92), but in order to use the map, the user *must* depart from an "all-seeing" perspective or position, mentally taking in – seizing – the environment from his or her point of view. This development focused on maps as objects and products instead of processes of mapping: the convention of perspective made the late Medieval and Renaissance spectator and mapmaker into "a totalizing eye" (Certeau 1984, p. 92), seeing the world as a *tableau* and plan.

The modern map can thus be seen as the epitome of Cartesian subjectivity. Maps were once instrumental for the development of the Cartesian concepts of time and space (cf. Black 1997, p. 7) and it might well be that they will be essential for developing the new sense of space and time instigated by our new technologies. This space is, in Nigel Thrift's words, "based on continuous calculation at each and every point along each and every line of movement" (2004, p. 583). But, as he points out,

at the same time these new understandings of space and time are characterized by a sense as being "more plastic, constantly mobile and dynamic".

2.4 New Maps for New Spaces

How can this space be mapped? What features of our present mapping practices can be applied to this new evolving "qualculative" space which would give rise to a "qualculative sense" (Thrift 2004, p. 583)? In his view, this new sense would rely on 1) a series of prostheses for cognitive assistance and which automatically takes care of the navigation (2) a provisional sense of spatial co-ordination consistently revising and repositioning itself (3) continuous access to information (4) a more elastic sense of metric and (5) a more 'nomadologic' sense of permanence and domesticity than has been characteristic of Western societies since the fourteenth century (Thrift 2004, p. 593).

However, this sense of space as relative, as 'becoming', still relies on 'absolute' space. It is still based on the mathematical calculations without which our virtual worlds would be unthinkable. It depends on a "fine grid of calculation", which is what makes these new capacities at all possible. Such a grid must necessarily be some kind of diagram, which not only embodies the multiple calculations which produced it but which indeed has the possibility to produce new senses of spatial – and temporal – knowledge. It must necessarily also be performative, since it generates new space relative to it, which would mean that, far from being a static and finite object, it should open up new spatial possibilities and potential. Mapping becomes much more a question of perspectives and positions of agents who are implicated in these spaces, allowing for both improvisational and subjective positioning in continuous negotiations for space. Therefore, it also involves the body of agents and the new body schema acquired through the development of sensory (visual and auditory) and intelligent machines to extend apparent body limits (cf. Ljungberg 2006).

Such processes could be seen as a modern anthropotechnical version of the archaic practice of "wayfaring", which produced sketch maps of travels and voyages. Comparing the function and form of the lines on a sketch maps with those of cartographic maps, the anthropologist Tim Ingold (2000, p. 56, 230) argues that, whereas the sketch map consists of lines drawn *along* a surface, 'scientific' or modern cartographic maps go *across,* cutting through the ocean following the course plotted by the navigator. Once arrived (although preserved in a logbook), the 'ruled' line can be rubbed out. The 'sketched' line, however, is narrative: it is a gesture drawn in a close context to its referent and thus highly indexical as it is made up of stories of comings and goings.

These highly indexicalized maps disappeared with the development of modern cartography, which relied on the subject-object relation to the environment. That relationship was presupposed by Cartesian subjectivity, which made the user of the map an omniscient spectator. Such a dualist approach to the world is precisely what these new technologies now seem to challenge by evoking new modes of agency as involvement in social sets of practices. Moreover, these new modes replace the subject-object relation with that of map users as socially situated and implicated agents in an expansive field, orienting themselves along the lines of the meshwork formed by the interaction between them and the environment. These agents are therefore participants, responding, reacting and interacting to and with other agents as well as to the environment, creatively transforming and transfiguring it. Moreover, the agents –our – relationship to themselves or to ourselves is always made more complex by our relationship to others. That is why we are always situated and embodied forces whose exercise of agency is best understood in terms of introducing disturbances into a particular space or of tracing the complex, consistently emerging patterns of intertwining forces as an ongoing dialogue between us and our *Umwelt.*

2.5 Mapping Fluid Spaces

This development has caught the attention of artists who have always been at the forefront of technosocial developments. Those working in digital media in particular have been insistently interrogating the consequences and the potential of such intermeshing processes. Seizing the opportunity to both thematize and explore what these new technosocial environments *mean* and what positions and perspectives they create, artists have consistently been blurring and eroding the boundaries between subject and object by mapping their bodies into cyberspace, positioning themselves and others as responsive agents. Such transmediality shifts the attention from the individual body to complex human – technology interfaces within collective infrastructures. As Johannes Birringer points out, the resulting interactivity indicates "a new understanding of environments of relations / responsibility and a relational aesthetics based on interhuman exchange or physical interaction as well as a new technological kinesthetics" (Birringer 2006, p. 300).

One of the first to engage with this kind of feedback systems and cybernetic loops was the Australian performance artist Stelarc. Stelarc's project for the past twenty years has been to try to redesign the body by the means of various prostheses in order to overcome the body's shortcomings in an increasingly technosocial environment. As he argues (1998, p. 7), the body's metabolism can no longer "cope with the speed and power, and precision of technology", but, instead, finds itself in alien

environments "unplugged from its biosphere" and lost in technosocial space. That is why Stelarc finds the body "obsolete" – not that we could do away with it but in the sense that the notion of an ego-driven body like a "simplistic, zombie-like body being driven by a psyche, mind or self" is invalid, if it is not what Birringer (2006, p. 304) calls an "expressive body" that performs and responds with the sensorial environment it is in.

So viewed, the body is not a site of inscription but a physiological structure; it is no longer an "object of desire", but, instead, an "object for redesign". Stelarc is not interested in the notion of cyborg as a body that has undergone a traumatic loss of organs and, therefore, receives implanted metallic parts, a "sci-fi, macho, military, metallic-phallic construct" (1998, p. 8). This notion projects a medical body on life-support systems. Instead, he sees this redesigned body as the opportunity for a multiplicity of bodies that can be separated spatially but joined electronically to become connected and thus, evolve into a greater operational entity. The Internet, in Stelarc's view, is not a strategy ideal for disembodiment, since you need a physical body to be plugged into the system. What it offers is a potential for both intimate and involuntary experiences, such as in Stelarc's use of his "Third Hand" and by his electronically wiring his own body into the Internet.

By using collective infrastructures such as the Internet, Stelarc achieved to be telematically – and simultaneously – present at the Pompidou Centre in Paris, the Media Lab in Helsinki and The Doors of Perception conference in Amsterdam.

Fig. 2.1. Stelarc's "Split Body"Performance. (1995) Galerie Kapelica, Ljubljana. Photo: Igor Andjelic.

During his performance, people in these three cities could access Stelarc's body to remotely choreograph its movements via a touch-screen interface. This enabled them to enter another body, namely Stelarc's, in another place, at the same time as Stelarc's body became a "host for the behavior of remote agents" (Stelarc 2002).

Stelarc's performances could therefore be viewed as

- an early and very schematic prototype of the digital meshwork mapping anthropotechnical space as its interwoven cables – i.e. its "lines" articulating heterogeneous components – produce new technosocial space in constant interaction with the map 'users', the audience inducing his movements at the various touch-screen interfaces
- demonstrating how agency might be practiced by bringing in disturbances into a field or by generating complex emerging patterns of intertwining forces
- strongly suggesting the necessity of theorizing a new kind of spatial distribution, in which the categories 'nearness' and 'distance' are made "obsolete" – a word Stelarc himself likes to use when it comes to the body and bodily functions
- an example of the interplay of socially and somatically implicated agents in an expansive and expanding field and in which agents as such are inescapably involved in the lives and activities of other agents. This not only brings to the fore the interhuman exchange and new technological aesthetics that Birringer (2006: 300) observes but also contributes to a new understanding of responsive environments

Moreover, Stelarc's performance enhances the dialogic nature of agential space as the interplay between the users and the various avatars, the "outgrowths" of mathematically calculated grids of time and space, functions on the premise of socially positioned and responsive participation, namely that all parts follow certain prescripted rules and codes.

In his "Ping Body" performance in 1996 *(Figure 2.2),* Stelarc took this even further by considering an agent's physical action not prompted by another agent in a different place but by the activity in the agential field produced by the Internet. During this performance, the ping protocol (the onomatopoeic word for the sound generated by sonar equipment in submarines) in Unix was used to transmit reverberating signals to global locations – live during the performance – that 'pinged' back to the host computer in Luxembourg. The time it took was measured in milliseconds, and these durations were mapped onto the body's muscles through the simulation system. Thus, this time, the body was moving to the ebb and flow of Internet activity, as an agent continuously interacting in a space crisscrossed with patterns of other agencies.

The mapping this performance makes possible is the spatial distance and transmission time to body motion. The ping values from 0–2000 milliseconds indicating levels of Internet distance and density activate multiple muscle stimulation in order

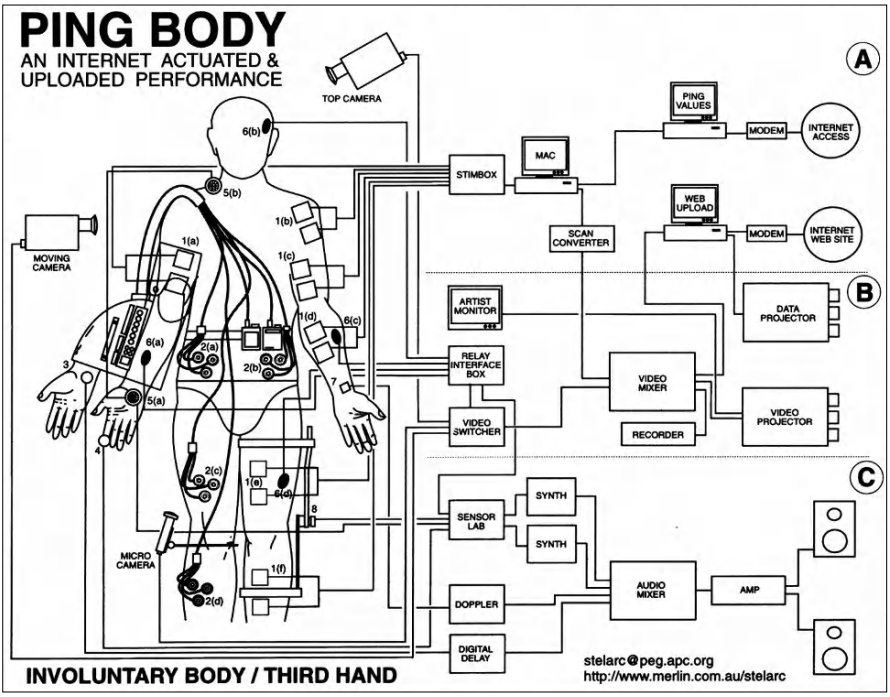

Fig. 2.2. "Ping Body" diagram (1996).

to choreograph and compose the agent body's (in this case Stelarc's) performances. The sense of the space produced is clearly "qualculative", not only because of its use of various prostheses offering more or less automatic cognitive assistance for much of the navigation, but also because its consistently revised spatial coordination is based on incessant calculation, continual access to information and 'nomadologic' sense of location. The result, that the agential space, i.e., collective Internet activity, moves a particular agent body and produces physical action, is a compelling inversion of the usual interface agent / Internet, the operation of which is usually determined by collective bodies. In this instance, it is the agential space which not only transmits information but also induces physical action. Space itself performs – and acquires a performative function.

My next example is a mapping of an immersive interactive environment called *op_era* (2001 and 2003), developed by Rejane Cantoni and Daniela Kutschat. Addressing the problem of human / technical involvement, *op_era* explores how and through what kind of interfaces one system may best interact with another and how we can enter and interact with a data world from perspectives we are familiar with, without being disturbed by incalculable devices beyond our control.

op_era is a world shaped as a set of interconnected logical dimensions, conceived to generate spatial cognition through multisensorial experimentation of space

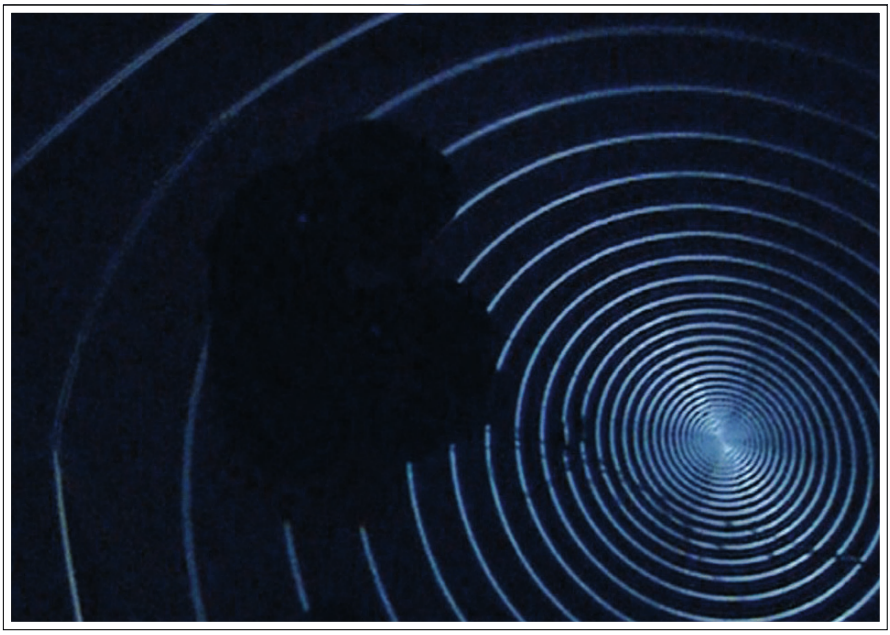

Fig. 2.3. Cantoni and Kutschat, op_era: sonar dimension (screen shot)

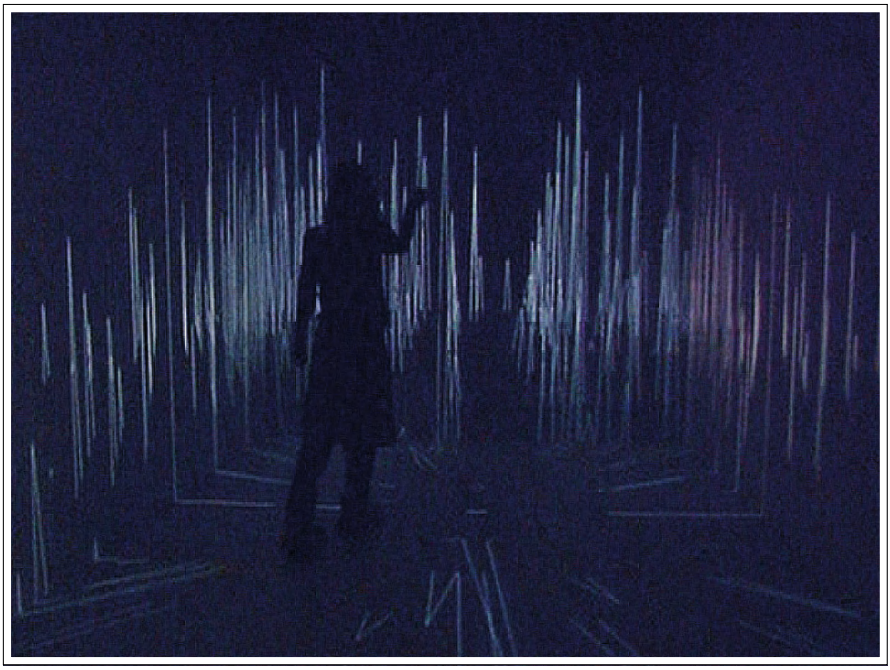

Fig. 2.4. Cantoni and Kutschat, op_era: first dimension (screen shot)

models evolving in relation to the human body. Its logical architecture consists of interacting dimensions structured by logical linkages. Each dimension leads to the next and simultaneously to all previous ones. In some sense, *op_era* has a beginning, a kind of narrative hierarchy from the first dimension to the fourth, but it has no end, nor any kind of narrative path leading from a higher dimension to a lower one. Such a structure is created with the intention to generate feedback loops, which allow events occurring in lower dimensions to affect the outcome of events in higher ones. The technological device the artists are using is the "Haptic Wall" – a SMART wall interface designed to produce tactile stimuli originating from sonic data collected by a set of microphones placed in and around the exhibit area. As soon as a microphone picks up a sound, the software samples and converts it into outputs controlling sensors built into the wall. The four dimensions in *op_era,* namely X, XY, XYZ and XYZT relate to the history of spatial concepts. The first dimension, X, is a finite segment composed by a multitude of points that are sound-based elements representing pre-programmed computational objects that make up the world as sounds. Their nature is to transmit – attack, sustain or release from reverberation to echo – sonorous information. In this dimension, the user distinguishes the shape of space and his or her relative position in it by emitting and receiving sound information. Interaction or space cognition are limited to ear perception; in other words, the overall spatial concept is placed in reverberation.

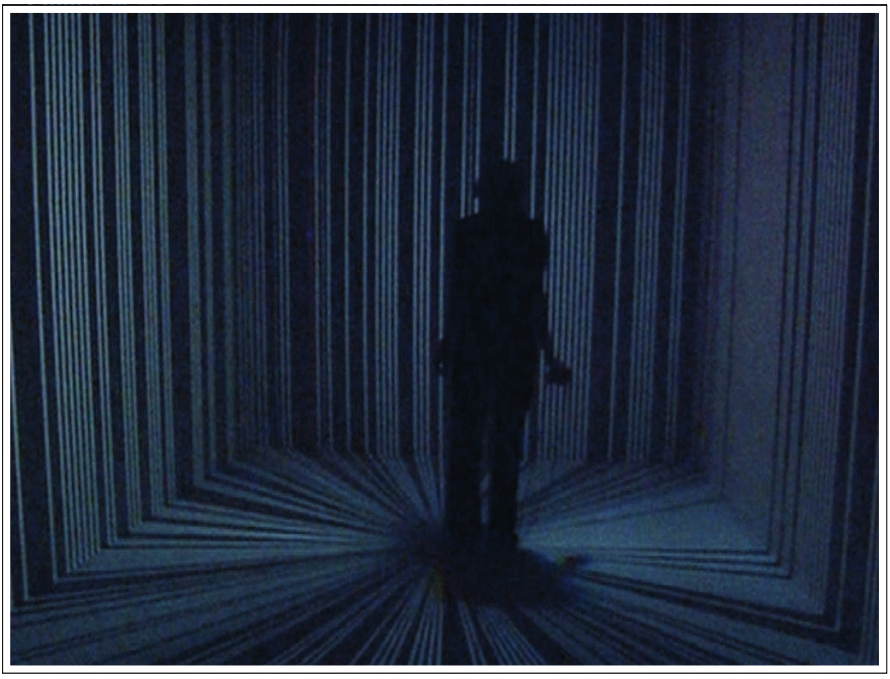

Fig. 2.5. Cantoni and Kutschat, op_era: second dimension (screen shot)

The realm of the second dimension, XY, is flat. Interacting by drawing the shape of space, the artists have it extend into two dimensions: the 'imported' one, X, or length, plus width. It contains all the objects of the world, which 'exist' only within the limits of length and width, like a huge flat screen. There are four cardinal orientation points – N, S, E, W – within this dimension. Therefore, objects and the human agent / interactor are free to move in four directions – up and down, right or left. All objects are *rendered* as light waves independently of their nature, i.e. whether they are sounds, shapes, or avatars, but *perceived* as vibrating lines, with all occupants of this dimension, including the user, having a common boundary: a space confined to a finite and limited plane. Only by touching will the human agent / interactor know the actual nature of an object, whether it is a shape or a sound element. Since space in XY is confined to a finite and limited plane, the logic follows that if we try to exceed its limitations we will step out of it.

The third dimension, XYZ, is a cubic realm, which turns space into an essentially empty box – a limitless void in which all things are contained and through which they move. Within this imaginary box three forms – a green triangle, a red square and a blue circle – perform a kind of Oskar Schlemmer's mathematical ballet, as the artists have suggested. All forms have various form "behaviors" attributed to them, translated randomly according to the intrinsic qualities of their shapes. The triangle moves through the diagonals, the square through the orthogonal axes and the circle by rotating like a satellite. This ballet would go on forever were it not for the users' interaction but, as the human body is incorporated into the spatial scheme, the choreographic algorithm tracks its presence, generating responsive events by changing and flipping the plane and direction.

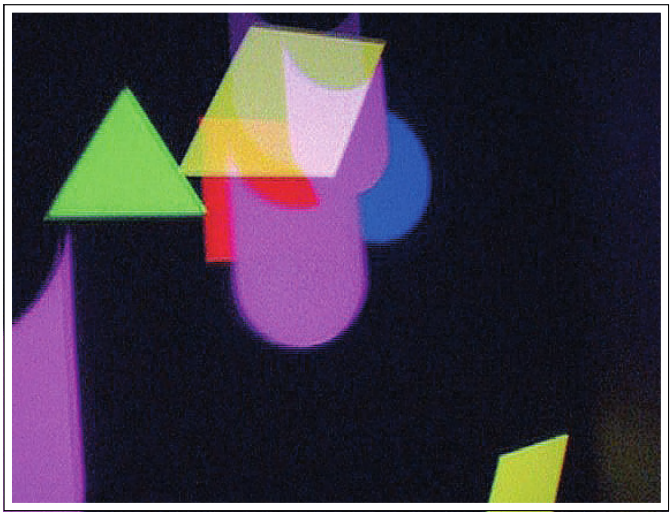

Fig. 2.6. Cantoni and Kutschat, op_era: third (cubic) dimension (screen shot)

In the fourth dimension, XYZ and T form a landscape evolving in time. Space is projected as a condensation of all three realms – X, XY, XYZ – composed by a multitude of emerging Lorentz attractors (three-dimensional structures corresponding to the long-term behavior of a chaotic flow) evolving in time according to the interactor's position in a complex, non-repeating pattern. In this dimension, space visualization and cognition is only possible through simulation.

As you can see from Rejane's and Daniela's "short history of space", in this space

- the interaction human / technology is tied to the development of spatial dimensions, even limiting the potential experience of space
- everything is spatially distributed in this responsive field, with several possible points of departure
- the successively 'folding' boundaries, though at first clearly distinguishable, suddenly either dissolve or fold into something else, interacting with the agents' positioning and perspective
- space is 'relative' as it is set in motion by the agent's touch, which foregrounds the importance of the agent's body
- agency is understood in terms of introducing disturbances or tracing complex patterns, with the consequence that, in such interactive motion, space in all its various forms is in – and set in – constant motion – movement-space abstracted

Interactivity in these art works involves an entire environment that can only be mapped through the continuous biofeedback from the artists' sensory stimuli, which is also the case in my last example, Char Davies' immersive environment *Osmose*. The 'wayfaring' along the spaces is digitally created by close interaction with the environment. This is vital – in the word's true sense – since the navigating through it depends on the voyager's breathing in and breathing out. Using semi-transparent visuals and luminous particles for the participants to voyage through her twelve virtual "worlds", Davies bases the interface on breath and balance to allow participants to simply "float" by breathing-in to rise, to fall and to lean to change direction. In addition, the hands-off interface frees participants from the urge to "handle" things and from habitual gravity-bound modes of interaction and navigation. Entering *Osmose* through a 'forest grid', they can then voyage between the twelve various worlds, ranging from seemingly 'natural' ones such as e.g. 'pond', 'earth', 'leaf', 'forest', and cloud to that of 'code' and 'text', all centered around a 'clearing', and ending at the 'life-world'.

Davies is here demonstrating a kind of wayfaring along lines manifesting themselves in the flow of the images as an implicated agent who only partly undertakes this voyage by his or her own will. This is not only because the voyager's lungs, a major life supportive organ, are part of the navigation and force her or him into constant motion – if you stop breathing, you don't move / you die – but also because

Fig. 2.7. Cantoni and Kutschat, op_era: fourth dimension (Lorentz attractors, screen shot)

Fig. 2.8. Char Davies. Forest Grid. Still image captured during immersive performance of the virtual environment, Osmose (1995).

it makes you aware of air itself, as a communal element that we all share and are all dependant on. Moreover, although these VR images look like romantic nature photography, reminiscent of Thoreauan descriptions of pensive ponds and luminous clearings, they are infographic images, creating a numerically based reality. Davies' aim in creating synthetic images is not to project artificial worlds but to "remind people of their connection to the natural (rather than man-made) environment not only biologically but spiritually and psychologically, as regenerative source and mythological ground" (Davies 2004:, p. 75). As she points out, her method "involves circumventing the conventions of linear perspective, Cartesian space and objective realism… in order to collapse a culturally-created distance between subject-viewer and the world" (2004, p. 75).

Davies' immersive space therefore challenges VR's general tendency towards disembodiment. As she points out,

> *As a realm ruled by mind, virtual reality—as conventionally constructed—is the epitome of Cartesian desire, in that it enables the construction of artificial worlds where there is the illusion of total control, where aging mortal flesh is absent, and where, to paraphrase Laurie Anderson, there is no "dirt"…*
>
> (Davies 2004, p. 73)

Refusing to accept such cultural paradigms, she suggests an alternative approach to virtual space based on her "own particular experience of being in the world". That is her reason for grounding the immersive experience on the voyager's own breathing and balance via a user-interface and for using semi-transparent visuals to generate a magic, dream-like world. At the same time, her installations expose the contradiction inherent in virtual spaces. As Ron Burnett (2004, p. 104) argues, it is hard to differentiate between artifice, experience and conscious participation because the immersive power of her installations is such that the experiences are more "visceral" than intellectual. Nevertheless, mapping this floating, ambiguous world requires both questioning our habitual and conventional ways of seeing and developing an entirely new sense of orientation.

So viewed, Davies' endeavor ties in both with Certeau's concept of "wandering lines" and Ingold's wayfaring mapped as meshwork, as interwoven lines of heterogeneous components. Therefore, the space she creates can be said

- to be relative to the Cartesian grid the voyager must transcend
- to force voyagers to be perpetually mobile, breathing and moving through space while
- to produce space-time out of multiple encounters

It could therefore be designated as an example of 'nomadologic' space – suggesting a new sense of space as folded and animate, one that assumes a moving point of view. Thrift's (2004) description of movement-space discussed above throws additional insight into Davies' immersive environment, since he describes this kind of

interactive qualculative time-space as one in which "[i]ncreasingly agents do not encounter finished, pre-existing objects but rather 'clearings' that disclose opportunities to intervene in the flow" (Thrift 2004, p. 593). Thrift's reference to Knorr-Cetina's (2003) 'clearings' seems particularly apt to describe Davis' cybernetic voyaging. By letting the entire enterprise depend on the voyager's breathing, Davis has chosen an extreme variety to display the characteristically interactive, dialogical and responsive nature of agential space. Space here is indeed folded and animate, in the sense of not being relative but much more suggesting a new and more plastic sense of space and time making everything "framed as in perpetual movement" (Thrift 2004, p. 592). I would argue that this is precisely what Davis addresses in her immersive art works.

2.6 Conclusion

What new perspectives do these new agential spaces suggest? What new positions and positionings come forth in such artist mappings? I would argue that these interactions humans / technology, the generation of what Nigel Thrift calls "qualculation" (2004, p. 293) and the new apprehensions of the altered time and space they generate demonstrate the extent to which agents, though inherently implicated in social, somatic practices, are yet able to transfigure and transgress these by their creative imagination. We cannot get away from Cartesian space, since the mathematical calculations underlying it also provide the perspectives and projections for the responsive fields in which participating agents are at once caught up in fields transcending their immediate control and implicated in the effective exercise of their somatic, social agency. However, Cartesian space emerges *out of* these formalizations and symbolization, rather than the other way round, that agential placements and positions emerging out of abstract Cartesian space. But what these novel technologies offer are new possibilities of mapping and projecting of and by these bounded, situated agents who are not so bounded and circumscribed that they are not able to transfigure this space by their creative imagination.

As we mentioned earlier, all map reading is indexical from the aspect that it refers a) to the relationship between user and map and b) to the relationship between the map and its referents. In cyberspace, there is yet another indexical aspect. Because, although these various attempts to map technosocial space in digital art involve highly sophisticated technologies, the participants nevertheless need a physical body for the interactive experience, which means that they need to be indexically, i.e. referentially anchored. Interacting in virtual space, the participant becomes a biocybernetic body, divided into two complementary media: one body which remains carnal and "real" in the environment it exists, and its avatar, which is the virtual, disembodied projection of the "real" body (cf. Santaella 2003). Although we

might seem to momentarily lose ourselves in cyberspace, our physical body remains carnal and "real". That is what makes it possible for us to maintain proprioception, the sensation of self from within the body.

Although the medium of digital art is fundamentally self-referential, as are our digital maps, and may seem virtually non-indexical, there must still be reference in order for us not to lose ourselves in these cyber- and antropotechnical fields. However, in this agential space with its ceaseless intermeshing of various agents, life becomes a meshwork of successive foldings. It is not a network of connectors, since this environment cannot be bounded; it is a constantly expanding space along which we live our lives as a transformative process. That is why mapping this new space requires different strategies because what we are mapping is a world of processes, of continuous numerical calculations and of nomadologic movement of transformation and change.

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Figures

2.1. Stelarc, 1995, "Split Performance". Photo by kind permission of the artist.

2.2. Stelarc, 1996, "Ping Body" diagram. Image by kind permission of the artist.

2.3–2.7. Kutschat, D., and Cantoni, R., 2003, *op_era*. DVD recording of installation, gift from the artists.

2.8. Davies, Ch., 1995, *Osmose.* Image by kind permission of the artist.

Chapter 3

Spatial Metaphors for Mapping Informal Geographies

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Abstract

Multidisciplinary research projects generate much non-physical/human geographic information. However, much of this information is collected and archived with no reference to geography. By mapping this type of information the communication of schemes and coherencies of complex data can be simplified. This can be termed "mapping informal geographies", as the 'geography' of this information can be considered to be less rigorous than the 'normal' geography represented through maps. Products utilised to represent these geographies generally comprise map-like representations of non-geographic constructed spaces. Due to the fact that the resulting depictions lack the underpinnings of traditional geographical information they are mostly not considered to be maps in a common sense. These depictions do not represent geographies that map users are accustomed to, but these maps of other geographies are powerful tools with which to better understand the complexities of the geographies of other disciplines.

3.1 Introduction

Scientific research produces large archives of data, in most instances soored and output using digital technologies. This information is often accessible via textual and graphical information systems based on highly developed information architectures. According to Fabrikant (2000) the bottleneck in information processing in the communication of schemes and coherencies of complex data seems to lie in the user interface, which restricts the potential of exploiting contemporary computa-

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tional and communications technologies. The current query interfaces used in many digital archives provide insufficient guidance for information seekers. One way to overcome current impediments in information access and retrieval are to develop and represent spatializations of this information, a special kind of visualization combining techniques from various fields of visual design and communicating with spatial metaphors.

When developing traditional mapping products cartographers usually visualize data within existing defined relationships of the collected data to geographic space and time. Informal geographies are different. They are about non-physical/human geographic information, where, usually, the content cannot be geotagged in the conventional manner. Before these topics can be mapped the information has to be spatialized in some way. Due to the fact that the resulting representations lack traditional geographical information foundations they are mostly not considered to be maps *per se.* These depictions do not represent the geographies that map users are accustomed to seeing, but different geographies are represented, demanding that the user must comprehend the fundamentals of these different geographies. The maps resulting from the process for representing the spatialization of this different geography are not mere cartographic products, but information graphics that depict the essential elements of different disciplines through processes that are commonplace in cartography, but perhaps altogether little used in other research disciplines.

In order to better represent these different geographies it is essential that other disciplines that wish to spatialize their information work closely with cartography and geography. The (spatial) analytical and representation theories and methodologies from geography and cartography can be applied within multidisciplinary teams that bring-together domain experts with cartographers and geographers.

The Cultural History Information System (CHIS) is a research node within a large multidisciplinary research team that is exploring the data archives of a knowledge domain like the Cultural History of the Western Himalaya from the 8th century. This research is based on ideas and concepts from various scientific fields, including art history, Tibetan and Sanskrit philology, numismatic and Buddhist philosophy. Initial collaborative work has indicated that a great part of the information used by the various research nodes has sparse spatial connectivity or the spatial component is not important for the specific research question being addressed. This makes it necessary to invest in other forms of visualization, after the appropriate spatialization of the data collected and addressed according to non-conventional or different geographical concepts, with due reference to the cartographers' task – the visual communication of geographical information.

3.2 Different Geographies

When beginning work with the multidisciplinary team it became apparent almost immediately that multidisciplinary research projects generate much non-physical/human geographic information. As well, this information is generally collected without defining geo-spatial relationships in conventional geographical terms. In order to analyse data and develop an appropriate graphical representation of that data, the nature of the discipline-specific data has to be analyzed and preprocessed before the design of a representation of this geography (generally via maps) can begin. The best way to distinguish the underpinning structure of the information collected is to define the main properties, the characteristics of the content, the appropriate representation approach to employ, an appropriate reference system and the extent of the geography being mapped (Kinberger 2009).

3.2.1 Formal Geographies

When defining informal geographies a good starting point is to first define formal geographies – those that geographers and cartographers are familiar with. Formal geographies are about how the extent of physical elements or human activities are determined by or are impacted by a landscape, a region or an area of study. These are the geographies that cartographers have traditionally mapped. There is a general understanding about what the geography is, how to collect and archive the data and how to produce representations of that geography for analysis and interpretation. In the context of this multidisciplinary research the term 'formal information' refers to any information, which either represents phenomena from the real world, one which has been well defined in terms of space and time (geodata), or discipline-specific information that is directly linked to the geodata (thematic data).

Geodata are the underlying references for thematic data and are utilised in a spatial model to facilitate the recording of elements such as point, line or area. Each dataset that stores information about different spatial features needs a defined spatial reference system to provide the scientific basis for recording and retrieving this in a computerized geodata application.

Geodata used in the mapping system can either be vector or raster data (satellite images, elevation models and maps). Usually a special set of geodata is compiled and visualized to present the base map. The base map is important for orientation within an area and for use as a visual reference for thematic data that is 'overlaid' atop the base map.

Thematic data (which is determined by domain experts) can be any information which is directly related to one or more features of the geodata. It is important for the correct integration of all data, that the data collected for a certain topic is linked

clearly to space and time. One possibility for connecting thematic data to a spatial reference is a gazetteer, which organises and presents a list of known geographic locations and provides a key to finding that information, for example in an atlas. Another way to add spatial location to thematic data is to undertake a survey of a research area and geotag information using survey equipment like a GPS (Global Positioning System) device.

Spatial information is related to geographic space, which contains the spatial information and is used as a framework for recording. To uniquely identify any location on the Earth's surface (the process of geolocating or geotagging) a graticule is employed as a reference frame for the imaginary network of latitude and longitude. The location of a point in a three-dimensional coordinate system is recorded using a pair of coordinates (easting and northing) for two dimensions and height (the third dimension). As well, time (perhaps the date of data recording or the estimated age of things like buildings or artefacts) can also be recorded (as the fourth dimension). A number of manipulations of a reference frame may have to take place to properly represent geodata. This includes changing the graticule's appearance as a result of generating a map projection that is appropriate for the data being depicted (Slocum et. al. 2009).

3.2.2 Informal Geographies

When working with informal geographies usually the data being collected cannot be 'geotagged' in a conventional sense. In many instances this non-geographic information cannot be related to any of the conventional geodata systems like those used with typical thematic data being mapped. Traditionally these geographies have been visualized using non-map methods in the form of diagrams, flow charts, or other representations not needing a conventional a spatial reference system.

Common forms of representation for informal geographies can be text or complex database systems. Large amounts of information are usually stored in a database, administrated by a database management system. Before this data can be represented in a map-like representation the information has to be spatialized in some way. This also means reducing multidimensional data into two, three or four (time)-dimensional information. Multidimensional Scaling and Factor Analysis are known methods from statistics used to solve this problem. A so called 'information space' is created by adding a locational ordering system including the concept of distance, direction, magnitude (height), etc.

Considering the topic of the CHIS subproject of the Cultural History of the Western Himalaya this could be for example a "philospace" for the Philosophy node of the project. Using the spatial metaphor of distance, philosophical ideas which are more similar are nearer and ideas which have no or little similarity are

considered to be further away. In a third dimension (philosophic elevation model) this could mean that ideas which are stronger or more distributed are at a higher level (visualized as a peak) and less proven ideas 'mapped' at a lower elevation. The result will be a philosophical landscape, showing the extent of philosophical ideas and the prominence of certain areas of philosophy.

The border between formal an informal geographies is not a hard line. Considering the numismatic research for example (a node in the Cultural History of the Western Himalaya multidisciplinary research project), there are the coins, physical objects which carry nearly all the information important in the research field. Their current location or the location where they were found is a direct link to geographic space. But the current or the find location is irrelevant to the research, as there are only a few different locations, which can be linked to thousands of ancient coins (place of minting, trade routes, market towns, etc.). More important for this research is the chronological connection between the different coins. In this case more than one kind of visualization might be necessary.

3.3 Spatialization and Spatial Reference Frames

The concept of *mapping informal geographies* comprises map-like representations of non-geographic constructed spaces. Visualizing this kind of information in a map is a way of simplifying the communication of schemes and coherencies of complex data. In this context the term *"spatialization"* is used by Skupin & Fabrikant (2003, p. 95), to describe the extension of geographic principles and cartographic methods to visualizations of non-geographic information.

There are different approaches to visualize informal geographies from simple depictions like data or tag clouds to complex graphical constructions like Self Organizing Maps (SOM). Where data clouds can vary from a simple alphabetical index to different clouds based on certain algorithms, the SOM is always a complex visualization method. For the user it is like reading a map – easy depictions can be understood at one glance and complex maps have to be 'read' more thoroughly. A common method in information visualization to generate a 'map-like' representation of non-spatial information is the application of spatial metaphors, also known as 'spatialization' (Skupin & Buttenfield 1997, p. 117).

To build an information space a spatial reference frame is needed. Fabrikant and Buttenfield (2001) define a frame of reference as "… a perspective or an approach that one takes on to frame a solution to a particular application. A frame of reference emphasizes certain aspects of the solution or allows specific properties of the solution to emerge." They formalize three different spatial frames of reference: geographic space, cognitive space and Benediktine space. The elements of these spaces are itemized in *Table 3.1*.

Table 3.1. Spatial Metaphors Underlying Representations in Different SpatialFrames of Reference (Fabrikant & Buttenfield 2001, p. 271)

Spatial Frame of Reference	Metaphors
Geographic Space	Representing a phenomenon's structure with a metaphor that is based on an experimental, locational ordering principle. Real-world concepts of distance, direction, magnitude (height), and so on take on a semantic (functional) association. Generalizing the representation to maximal 3D (plus time) modifies the level of semantic detail apparent in the view.
Cognitive Space	Tailoring or refining the representation in order to simplify the phenomenon's semantic complexity and to facilitate use and user comprehension. The refinement is based on viewer expectations about spatial relationships in geographic space.
Benetiktine Space	Transforming or reducing a phenomenon's multidimensional semantic dimensions into a lower dimensional representation (e. g., a Cartesian coordinate system). The transformation preserves the semantics of a phenomenon's attributes and the semantic of relationship between phenomena, permitting associations between motion (transit) and semantic content.

For a map-like representation, applying the geographic space as a spatial reference frame seems to be the best solution. It is the consequent implementation of a geographic metaphor and therefore similar to the geographic space used in a map-based information system.

When comparing maps of different geographies it is important to consider, that the distances between occurrences on spatializations cannot be measured in metric units (e.g. kilometers), but in their degree of similarity. Fabrikant and Buttenfield (2001) distinguish two forms of spatialization: semantic and geometric. With semantic spatialization the distance between objects is computed by analyzing the textual content of objects. This data is subsequenty transformed into numerical values. The geometrical spatialization calculates the distances between the objects directly from numerical data (Jongh & Ormeling 2003).

3.4 Visualization Examples

Here, two examples of graphical representations of informal geographies are provided as examples of extensions to a map-based information system. A tag or data cloud could be one way to represent the metadata (amount of objects linked to a specific location, collection or keyword) and the SOM-Algorithm (Kohonen 2001) could be used as the spatial basis for a mapping cultural themes that represent the terms considered in cultural history studies.

A tag or data cloud is a popular type of visualization where the connection to a spatial reference frame is not too rigorous. A tag cloud, often called a weighted list in visual design, is a visual depiction of user-generated tags used typically to describe the content of web sites (wikipedia.org, 2009). There are three common

types of usage – displaying metadata, popularity or categories. The ordering can be alphabetical, random, sorted by weight or semantically clustered.

A data cloud *(Figure 3.1)* is similar to a tag cloud, but instead of word count, displays data such as population or stock market price. It uses font type, font size and font color to indicate numerical values.

The spatialization 'terms of geography' *(Figure 3.2)* from Andre Skupin is one example of the application of a geographic metaphor in combination with carto-

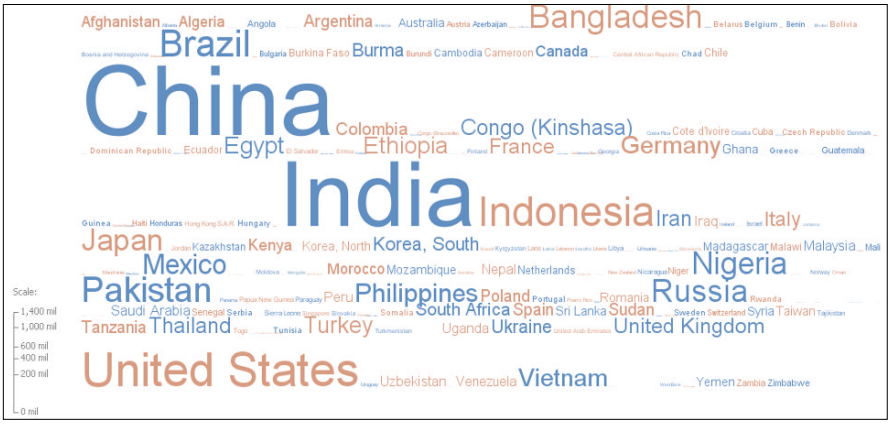

Fig. 3.1. Data cloud showing world population by country, 2007. Source: http://upload.wikimedia.org/wikipedia/commons/7/78/World_Population.png

Fig. 3.2. The terms of geography, copyright André Skupin. Source: www.scimaps.org

graphic design principles. It provides a visualization of more than 22,000 abstracts submitted to the Annual Meetings of the Association of American Geographers during a ten-year period. The depiction is based on the representation of each document as an n-dimensional vector of terms. These vectors are used to construct a neural network model of the geographic knowledge domain using a Self-Organizing Map. The resulting neural network model is then transformed into a 'landscape', in which elevation indicates the degree to which a single, focused topic is addressed and multilevel text labels associated with regions in the visualization are added. The final rendering was executed using a standard Geographic Information Systems (GIS) software package.

The type of visualization used by Skupin for his 'terms of geography' is often referred to as 'themescape' (Spence 2001, Wise et. al. 1995). Appearing similar to a three-dimensional landscape its reference frame is based in geography and emphasizes the morphological structure of an information space, including geometry, topology, and dimensionality.

3.5 Summary and Outlook

The huge amount of non-physical/human geographic information that is collected without defining geo-spatial relationships during research requires new query interfaces to communicate schemes and coherencies of the complex data to enable these large and complex datasets to be better 'read' and understood. In order to choose an appropriate graphical representation, the nature of the various data has to be analyzed and preprocessed before attempting to visualize the discipline-specific data collected. One solution could be spatialization, a type of visualization that combines the techniques from various fields of visual design and communication with spatial metaphors from cartography.

The different geographies that are subsequently defined by describing their main properties; the characteristics of the content, representation, reference system and space. The most important difference between formal and informal geographies is that the different geographies vary in the way that they portray the geospatial connections of the information. Where the formal geographies are connected to geographic space, the informal once cannot be immediately related to geographic space. To visualize this information different methods of spatialization of the data is required to transform them into a usable information space.

Different kinds of graphical representations can be employed – from tag cloud to themescapes (from information visualization), which can be adapted by cartographers and thus improved by the application of cartographic design principles. The choice of an appropriate visualization can be facilitated with reference to the spatial

properties preserved during the transformation process. But a real taxonomy of the different kind of visualizations that are best suited to mapping informal geographies still need to be identified. Further work is needed to define rules for the visualization of informal geographies. This should be based on the properties of the data, the kind of transformation and the kind of spatial reference and should be followed by rules for a better graphical representation.

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Chapter 4

Emotional Response to Space as an Additional Concept of Supporting Wayfinding in Ubiquitous Cartography

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Abstract

In this submission the concept of Emotional Wayfinding is analysed. It is anticipated, that the emotional relation and the degree of emotional response is structuring space and can therefore be relevant for human wayfinding. Possible measures for linking explicit links between person's memory/experience/emotional response with the physical environment are investigated and possible applications for navigation systems are discussed.

4.1 Introduction

The rapid development of the mobile internet enforces the emergence of Location Based Services (LBS). In addition to the more familiar car navigation systems, guiding systems for pedestrians are gaining in importance. In this context, the integration of attributes of spatial objects, such as landmarks, are widely accepted as being a necessary component of guiding systems; however, it is not entirely clear how the main aspects of space should be modelled. This paper provides a new approach based on psychological and geographic literature to further our understanding of navigation and wayfinding in ubiquitous environments, and introduces the concept of the subjective or emotional element of space.

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Imparting spatial information usually involves cartographic presentation forms. Ubiquitous cartography methods, including Location Based Services, can be seen as enabling new forms of cartographic communication processes. Navigation of our macro environment is a human ability that we tend to take for granted unless it fails. For example, we may get lost when visiting a new city. To find our way, we utilize various strategies such as relying on maps/technology created by others or by asking directions (other referent), or by searching using a specific landmark as a referent point (self-referent). As we become more familiar with the landscape, we build our own cognitive map of the area and subsequently rely on and use it to find our way. Once mentally constructed, we may add to or update our cognitive map, but generally the initial map appears to be relatively permanent and can serve as an important way-finding reference.

Lack of conscious awareness of the processes involved when performing tasks that activate and/or execute automated navigation and wayfinding processes, raises questions about the role that subjective evaluations and emotions play in the development, retention, and use of navigation/way-finding maps. That is, immediate subjective feelings about – and therefore emotional associations with – space and especially landmarks, hence emotional landmarks, may be tied automatically to the cognitive processes associated with navigation and wayfinding. Consequently, an emotional representation may enhance or facilitate cognitive mapping.

In order to explore this concept, in this paper a first review on existing approaches on conceptualizing emotional geographies and methods of sensing emotions is reviewed. This provides the basis for the argument that emotional responses to space are highly relevant as an aid in navigating our environment. The chapter concludes with an evaluation of the relevance for investigating the role of emotional response to space in navigation and wayfinding.

4.2 Sensing Emotions

Various methodologies have been tested and developed for sensing emotions, which is understood in this context as one of the psychological processes (perception, cognition, memory, emotion, behaviour, physiology) that devices and sensors can 'experience' from (Westerink 2008). Different emotional expressions (or states of emotions) have been identified in the context of sensoring, among them are anger, sadness, happiness, cheerfulness (Tosa et al 1994); neutral, joy, boredom, sadness, anger, fear, indignation (Mozziconacci 1995); anger, fear, sadness, joy, disgust (Scherer 1995); neutral, happiness, sadness, anger, fear, boredom, disgust (Scherer 1995) and fear, anger, sadness, happiness (McGilloway et al 1995).

Several standard procedures exist for measuring the experience-related processes (Westerink et al 2008):

a. judgements and questionnaires (often elicited from the user, e.g., self-reports in the form of interviews or questionnaires);
b. behavioural observations; and
c. physiology recordings: e.g., ECG (electrocardiogram), EMG (electromyogram), GSR (galvanic skin response), BVP (photoplethysmograph)

The above measurements can also be automated to a certain extent, each type requiring a certain time period to come to relevant interpretation: For judgements & questionnaires this period is estimated to be *several minutes,* while for behaviour observations, it is more likely to be in the order of *seconds* and for physiology recordings events might already get noticed over the time course of *several milliseconds.* Jennifer A. Healey made a comparison on different physiology recordings (ECG, EMG, GSR, BVR) in (Healey 2008). Martin Ouwerkerk suggested using unobtrusive/unnoticeable sensing for physiology recordings. The key technology of this is "miniature wireless sensors" (Ouwekerk et al 2008).

For products and services, the emotional qualities of experiences are very important. For services as tools (which are meant to save time) positive experiences are seen as an asset, whereas negative experience should be avoided. Typical leisure time services (which are meant to spend time on), on the other hand, are often intended to deliver emotions, positive and negative alike. A wayfinding service can be seen as somehow in-between the function of leisure time services and tool services.

Three types of measurement environments have been used and tested (Healey 2008) so far for sensing emotions, including a laboratory setting, an ambulatory setting and an automobile scenario. The challenges for eliciting affective responses include:

a. The main challenge with measuring affective response in the laboratory is generating authentic affective responses within the short time the subjects participate and within the ethical guidelines of most oversight committees on the use of human subjects;
b. The two greatest challenges in the ambulatory environment are differentiating affective physiological responses from other physiological responses and accurately capturing affective ground truth; and
c. The automobile provides a compromise situation where the subject has restrained movement and where the situational ground truth can be recorded but where the subject can also face genuinely dangerous and unexpected situations. Although the range of emotions experienced while driving can be limited, the strength of feeling is often genuine and strong.

There are not many reported applications about making use of sensored emotions available. Mincheol Whang gave an example of "emotional computer" (2008), and Ben Mulder et al. used "Physiological Measures" for task adaptation (2008).

4.3 Emotional Wayfinding

The emotional significance of a particular space may enhance its remembrance and increase the accuracy of direction decisions. Despite the strong component of internal decision making and memory in wayfinding, however, no psychological literature was found that specifically addressed the facilitative significance of emotional landmarks in the context of every day wayfinding and navigation. Instead, references in the psychological literature pertaining to emotional landmarks are often vague, ill defined, or applied in a different context. Articles reviewed were generally centered on early childhood emotional development/developmental delay, emotional trauma, end-of-life developmental landmarks. Thus, any reference to emotional geographies is usually discussed within the context of inner personal growth arising from a traumatic event. Other researchers have focused on understanding the cognitive representations of a person's perception of a spatial environment through cognitive maps. Cognitive mapping deals with the underlying psychological structure of the environment as well as the distance between places. Thus, the psychological literature has drawn freely from geographic terminology as a way of articulating the internal navigational process(es) associated with emotional growth or cognitive representations, whereas the geographical literature has focused predominantly on navigating and wayfinding in the external, physical environment. Although neither of these literature areas investigated the role of emotional landmarks as an aid to navigating the external physical (or virtual) environment directly, much can be learned from a brief review as research in both areas attempt to understand the inner navigation process and/or inner spatial representation of the individual. Currently, the role that emotion plays in facilitating wayfinding and navigation has been difficult to examine. Lack of research geared toward the development of appropriate methodologies may stem partially from cultural biases toward favouring logic or cognitive strategies and denying or devaluing the role(s) of emotion.

The measurement of unconscious awareness has had limited success to date, perhaps because the study of consciousness was until recently viewed as "unsuitable for scientific research" (Zahavi 2004) and regarded with suspicion (Damasio 1999). A recent increase in the literature suggests there is a resurgence of interest in this topic likely due to changes in technological development and conceptual changes (Zahavi, 2004). Instead, an interesting paper by Merskey (1997) – in which he struggled to define consciousness in the context of pain and behaviour – appears to be quite relevant to the current topic. He identified three elements of consciousness: (1) the occurrence of an observable external event accompanied by an experience (i.e., sensation or emotion – with or without an external reference point); (2) an internal emotional state, and (3) an awareness of knowing something. Merskey further stated that, in the first element, there may or may not be some sort of external reference point. This particular definition of consciousness may provide

an important starting point for research investigating emotional landmarks in the real or virtual world. For example, it is proposed here, that a landmark may include both an internal and an external reference point – connected via both an individual's emotional state as well as his or her cognitions. This idea is consistent with Goldie's (2000) classification of feelings as internally focused (i.e., feelings related to one's own bodily sensations) versus externally focused (i.e., feelings related to an object). It is also proposed here that the third element identified by Merskey – awareness of knowing something – may serve as the mechanism for obtaining information about emotional landmarks.

The utility of an emotional response to space does not minimize or eliminate the relevance of building a cognitive map of an environment. Rather, an emotional landmark is thought to enhance (positively or negatively) the ability to develop a cognitive map; emotional processing is presumed to be automatic and without conscious choice. The ability to link the emotion to a specific event at a specific landmark may facilitate not only wayfinding and navigation during times when one's cognitive state is overloaded, but it may actually speed up the every day process of cognitive mapping. Such an exploration may also help elucidate individual differences in the self-estimation of spatial anxiety and environmental competencies that were discussed by Schmitz (1999), as well as reveal how emotional landmarks relate to landmark and/or route finding preferences. Although not stated, the primary and secondary types of survey knowledge reported by Thorndyke and Hayes-Roth (1982) which are acquired through immediate interaction with the environment would, presumably, be linked with the emotional and sensory state of the explorer. An examination of the role of emotional landmarks, therefore, may contribute to our knowledge of navigation and wayfinding in the physical world, in cyberspace in general, and cybercartography in particular. Although not specifically referred to as emotional landmarks, the ideas discussed above are consistent with the conceptual model of the environment-behaviour interaction developed by Kitchin (1996) which suggests that knowledge acquisition of the environment is derived through emotionally biased memory-processing systems.

4.4 Conceptual Structure

Emotional response to space can be characterized by its emotional significance for an individual, wheras a physical connection to the environment does not exist. The individual moulding of an objects´ emotional significance can be further classified to direct-, indirect- and collaborative response according to the form and status of physiological development (Davidson et al 2006).

Direct responses to space or spatial objects are created by direct episodic experiences, thus form direct episodic memories. The dependency on time is source for

further determination to “history based episodes”, which bases on individual experiences in the past, and “current episodes”, where current emotions and experiences build up new landmarks within the personal knowledge base.

Indirect landmarks are built up by “third party events”, which form some kind of semantic memory based on third party narrations. The creation of indirect semantic landmarks may be achieved by personal narrations of others, where variations of emotional response depending on the basis of relation-confidence are expectable, or factual knowledge extracted from different kind of media, like books, data, news, etc.

Collaborative responses to space are the result of demographic reasoning. Although this class seems to consist of an external, thus-non individual, component, this is the result of stochastic evaluation. Actually no physical obvious relations, but physiological accordances among the user-group to specific objects or behaviors may be observable. The result of these observations describes social landmarks, which should have strong relations to individual episodes and the internal knowledge of the individual.

In order to serve as additional “layer” or landmark for navigation tasks each of these classes need to have a link to space. This reference to the external, real environment may be in form of a direct or indirect connection to or description of space with various granularities and degree of emotional response. As next step an empirical verification of the concept with various user groups and different scenarios is aimed at.

4.5 Conclusions

The inclusion of emotional layers and landmarks in multi-media, multi-sensory ubiquitous cartographic technologies, such as LBS, is expected to provide a deeper understanding of navigation and wayfinding. This knowledge will provide direction for the selection of content use in development of ubiquitous cartographic supports for both the real and virtual worlds. That is, this knowledge may lead to both the development of augmentation devices for those who have difficulty in wayfinding, as well as a means of enhancing the experience for the user. Consequently, the author plans to test the conceptual model in order to understand the role that emotion plays in facilitating wayfinding and navigation and to identify the model that provides the best fit to the data.

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Chapter 5

An Artistic Perspective for Affective Cartography

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Abstract

Although affective and collaborative mapping are currently being studied in Cartography these two paradigms are not exclusive to this discipline. In fact, different disciplines are actively engaged in exploring their possibilities. For example artworks that are demonstrating how contemporary art and design can be used for exploring the relationship between people and space in order to discover new realities, perceptions and emotions that possibly could remain unknown under the objectivity of the conventional map representations. This paper aims to provide an overview of some artworks that are unfolding the realms of affective mapping where everything that takes place in a physical dimension only acquires its meaning through the collaboration of the participants or the sharing of an artist's perspective. Through a discussion of these artistic developments, new research challenges are described in a way that brings together arts, society and cartography will be explored.

5.1 Introduction

Antje Lehn (Lehn 2008) has recently acknowledged that, "when we accept the fact that all maps only function under the premise of omitting or distorting parts of reality, we can see that there is not such a large gap between scientific and artistic cartography. The rational and the irrational should not be simply divided up between the scientific and the artistic; in fact we can see beyond the cliché that reality always

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consists of both." In this paper, this consideration is taken a step further in order to understand that, in effect, the so-called objective measurements of things and their representations are sometimes not effective when we seek to explain in a descriptive and complete way, many concepts and realities that we cannot abstract from ourselves. To this we may add: why should we abstract these aspects from ourselves? In order to have a better understanding of the world we live in, it is probably interesting to challenge the so-called objectivity of the world that surrounds us, and to recognize and point out those places that bear subjective meanings for us. Through recognition of the importance of our transition through personal spaces, we are able to give a material shape to certain moods and memories.

The notion of the city as a single entity is increasingly being problematized. As a consequence of the personal experience of places, we are witnessing the multiplication of our understanding of cities and landscapes – there are as many cities as city dwellers, each of them with his/her own view of the city, which in turn, generates his/her perceived city. The quiet, the hectic, the dangerous spots or simply those spots that make us feel happy can surely be measured, analyzed and objectified. Accepting the subjective vision as a source of useful information (urban planning may be a good example) would no doubt be enriching to our engagement with place. If psychogeography tries to understand the effects and the way the geographic environment shapes our emotions and behaviors, it seems logical to draw maps describing places drenched in subjectivity, starting from a view that may be personal, historical, social, political or media-related or even, why not, from visions that may be romantic, dream-related or hedonistic. Many artists have worked on this desire and their work, free from general or universal considerations, invites us to experiment and reflect on our immediate environment, to look at it and penetrate it.

The aim of this paper is to establish a perspective of why affective and collaborative mapping should be brought together. In order to achieve that, the use of some examples of contemporary art, new media art and design projects are considered as a starting point. In the next section, we will introduce the concept of affective cartography by linking it to collaborative cartography, the source on which it feeds. We will then proceed to describe a few specific cases of artworks that can be understood as participatory collaborations or agent perspectives based on the use of Information Technology (IT) or not. These cases have been selected to illustrate the diversity in affective mapping that might take place (performance, installations, web); and finally, we will identify new research challenges in the field of Cartography.

5.2 The Intermingling of Collaborative and Affective Cartography

The need to combine geographic information with subjective information emerges naturally as shown in projects such as The Atlas of Emotions (Bruno 2002), The Atlas of Literature (Piatti et al 2008) or the Atlas of Cinema (Caquard 2008). People are usually linked to specific locations that they know very well, and towards which they have developed both positive and negative affection or emotions. If people already have the chance to talk about places by employing modern participation tools, and to supply information on places they know well for the collaborative creation of maps, it is impossible not to conceive of a new, emerging cartography in which information of a personal nature and whose subjective quality gives place to what Cartwright and his collaborators have coined as Affective Cartography (Cartwright et al. 2008).

Craglia, Goodchild and others (Craglia et al. 2008) also refer to the benefits that collective participation could bring to the attainment of geographic information − what they call Volunteered Geographic Information, stressing the importance of the subjective aspects. In the article titled as "Next-Generation Digital Earth", they point out that "the potential of up to 6 billion human sensors to monitor the state of the environment, validate global models with local knowledge, and provide information that only humans can capture (e.g. emotions, and perceptions like fear of crime) is vast and has yet to be fully exploited".

Therefore, it is only logical to think that collaborative cartography, of which we already know so many examples (let's not forget the Open Street Map as a quintessential example), will keep on growing, and that the affective branch will be one of the trends within a bigger development. Some signs already show that the relationship between the affects and the dwelled spaces, is an issue in our modern society. This can be seen in many diverse artistic expressions, some of them dealing explicitly with user generated content or Collaborative Cartography; people expressing their feelings or subjective opinions about places they know well and doing it in an aggregate way. Some of these examples will be referred in the following pages.

5.3 When Art Meets Affective Cartography

Drawing maps means visualizing correspondences and their metaphors. A map is such a powerful symbolic image that it is hardly surprising that many artists, today and in the past, have used it as a tool, as a vehicle for expression and reflection, for protest and other purposes. Many examples of this have been collected in important

publications (de Diego 2008, Woodward 1987). Nowadays we also find examples of artists whose artwork, presented individually or as a part of collective shows, are taking a path not dissimilar to what we understand today as affective mapping. Some examples are the "Mapping the Self" exhibition in the Museum of Contemporary Art in Chicago, the Conflux Festival events in New York, or Medialab Prado's workshops in Madrid, Spain.

In this section we propose a very simple classification, depending on whether these artworks employ information technology or not. In those cases in which it is not employed, we find many artworks whose aim is to give some insight of local spatial aspects, whereas the overall spatial scope is much wider in those artworks that employ some sort of information technology such as video and audio. We have also observed that it is possible to differentiate between two types of affective mapping depending on whether the collaboration of individuals is required or not. When affective mapping is carried out by means of collaboration, the starting point for the creation of maps is often of a subjective nature. In this case the artist asks the participants for a series of data, collects a list of opinions about the dwelled space (be it known or remembered), then processes and codifies them and finally gives shape to new visual representations or artifacts. In another category we would place those affective maps made by only one individual or agent. In these cases, the affective aspects stem from the capacity to stir up emotions in the map's receiver, be it due to the subject of study or to any other particular treatment (for example, the way it is shown).

5.3.1 Examples of Affective Mapping without using Information Technology

5.3.1.1 Participative Collaboration

Many of the references we have found in relation to affective Cartography are based on the creation of maps through the aggregation of subjective data. This way, their purpose is to put together perceptions and personal tales in order to gradually determine patterns of positive and negative events that lead to a re-reading of the environment. It is impossible not to be reminded of cartographers' and geographers' views when we read the views of artists dealing with space, like Kueneke, Pineda or Moro – after all, we all are tackling similar subjects. The artworks included in this section are of a participative nature. To this effect they suggest a series of rules and instructions that must be followed by all participants, resulting in the creation of a social network for the consecution of the final artwork. These networks are usually of a small size and short-lived, as they only exist during the development or the exposure of the artwork. Logically they are physical networks whose agents interact physically with the artwork and between each other. For example, in Liz Kueneke's

artworks the relationships between individuals who form an extremely short-lived network are an essential part of the final result for the artist.

In these cases it is also necessary for a physical relationship between the individuals and the site of the investigation. This is because this location will be referred to in the development of the community map, as it must be covered, visited and known by the network's individuals if they are to take part in the artwork. The elements that take part in this game are also of a physical nature, starting with the maps subject to manipulation and over which the citizens will mark their ideas and impressions. These may be simply sketched on paper with a pencil, drawn on glass or printed on canvas, or they may be maps embroidered with colored threads over a big piece of cloth. The participant intervenes on them according to the rules that have been established by the artist; in general, he/she must answer to codified questions so that each participant's singular path can be drawn from them. The artwork gradually becomes a superposition of subjective data of ink, fabric, marks or stickers over maps, thus creating routes and subjective ways of looking at relationships, concepts, opinions and journeys of people in their territory.

This physical relationship between individuals, and between individuals and objects (including the final map), is possibly what brings a special charm to artworks of this nature. In this context we may highlight a few artworks. We will start with

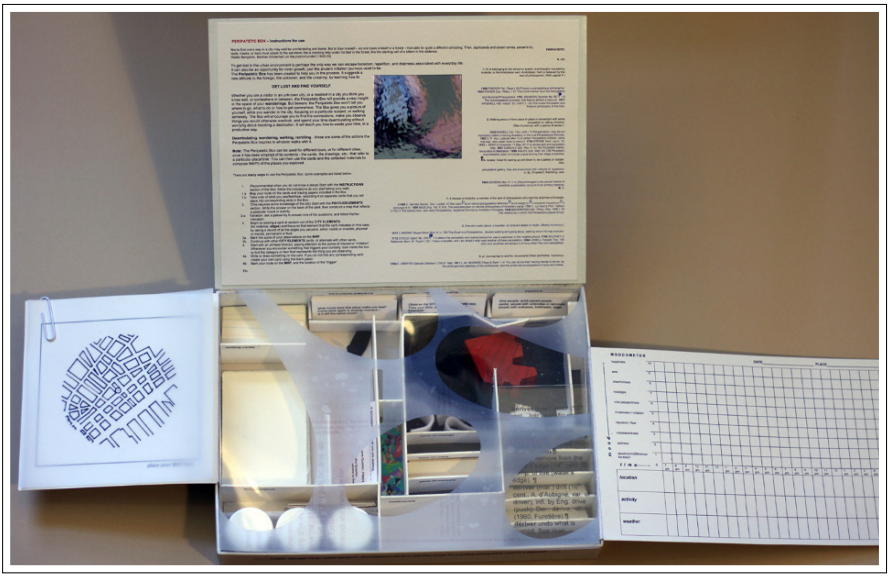

Fig. 5.1. Simonetta Moro's Peripatetic Box. The picture shows an initial sketch for the contents of the Peripatetic Box. This artwork was exhibited at Conflux 2008, Museum of Contemporary Art Chicago (in the context of "Mapping the Self", 2007–2008, curated by Tricia Vaneick). Also presented in a conference at TRIP (Territories Reimagined: International Perspectives), Manchester, UK, 2008.) Photo: Courtesy of S. Moro

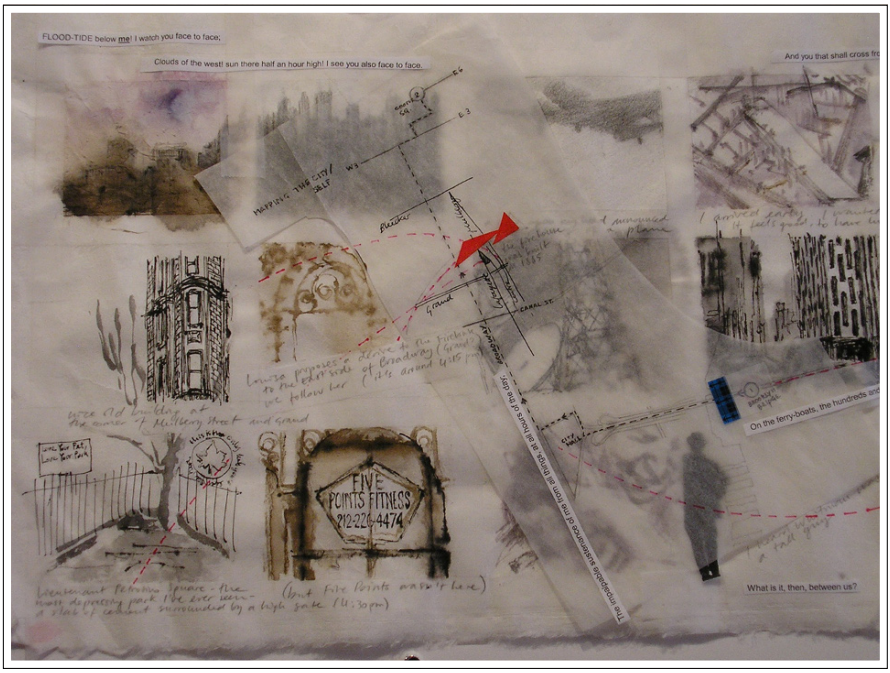

Fig. 5.2. Peripatetic Box Atlas. The chronicle of the artist's drift. Photo: Courtesy of S. Moro

Simonetta Moro's Peripatetic Box, which suggests the creation of one's own map of the city, indicating personal landmarks and recording the variations of mood in relation to places with the aid of a "moodometer". All the collected information will appear in a final artwork: "At the end of the festival, I will create a graph or map indicating the places box-users visit and their respective moods".

Barcelona-based artists Liz Kueneke and Margarita Pineda (North American the former, Colombian the latter) have carried out a series of joint artworks that fit into the aforementioned category. As they explain, they "knit, sew and mark those traces that, with the passage of time and the journeys, slowly create one single reading through the juxtaposition of elements, images and references." The meaning and the practice of their proposals are based on those spaces in transition, bearing in mind the various factors that took part in their configuration: physical transformations that took place during many years, along with deep social and economic changes. "Visible traces in the space, loaded with legendary memories that mark fixed points of identity and recognition where events left their mark, giving a symbolic identity to spaces, walls, structures, lanes, dwellings and transit zones."

Fig. 5.3. Territorios Mentales, by Liz Kueneke, Margarita Pineda and Ximena Covaleda, shown in different Spanish cities between 2005 and 2007. Photo: Courtesy of L. Kueneke.

Fig. 5.4. Territorios Mentales, by Liz Kueneke, Margarita Pineda and Ximena Covaleda. Photo: Courtesy of L. Kueneke.

Fig. 5.5. Bangalore Urban Fabric, by Liz Kueneke (January 2008). Urban fabric has also been exhibited in different cities, including Barcelona and the New York City Conflux Festival (2008). Photo: Courtesy of L. Kueneke.

5.3.1.2 Agent Perspectives

The maps created by the Spanish artist, actress and performer Rosa Casado represent a very interesting example of affective maps made by only one individual without the use of new technologies. Sometimes she draws them with chalk on the floor, in other occasions she employs toys in order to create a visual representation, or she may also create tri-dimensional models made of chocolate. In general, the aim of Casado's performance-maps is to reflect on the identity of places and the distribution of resources in the planet.

One example is her performance *"Paradise 2. El sonido incesante de un árbol caído"* (The Relentless Sound of a Fallen Tree) in which Casado describes a holiday trip she took from Spain to Mali, and Mr. Boye's migratory journey from Senegal to Spain. As she explains both trips, she illustrates them with chalk drawings of maps on the floor of a hall or a theatre. The maps she draws represent the world at different scales, amplifying the Earth from the solar system, with the aim of putting into context the aforementioned voyages. This allows her to give pseudo-scientific definitions of concepts related to human travels and to distort the location and the size of some countries.

Fig. 5.6. "Paradise 2. El sonido incesante de un árbol caído" is a performance created by Mike Brookes and Rosa Casado. Exhibited in several countries (2005/07) including Spain, Italy, United Kingdom and the United States. More on www.palomachueca.com. Photo by Rafael Gavalle

Fig. 5.7. Rosa Casado in "Las sin tierra: 7 intentos de cruzar el estrecho" by Rosa Casado, Mike Brookes, Jill Greenhalgh and Rocío Solís. Shown in Australia, Denmark, Colombia, Argentina among other countries. More information on www.palomachueca.com. Photo by Mariano Díaz.

Casado is an example of how new visual representations, such as the combination of cartography and theatre she employed, are capable of transmitting an enormous capacity of modifying, enriching and widening the mental image or the model of the world (and of space) in people's minds. The objective data are presented with a very peculiar type of multimedia, which bears no relation with the objectivity/coldness that is frequent in these reports, and the results are powerful and long lasting. If Pineda and Kueneke took us from the emotions to the map, with Casado we are taking a reverse path: from the map to the emotions, and with them to a whole learning process and a new knowledge of the world.

5.3.2 Examples of Affective Mapping based on Information Technology

As opposed to the aforementioned examples, where everything is done manually and takes place in a physical dimension so that the artwork only acquires its meaning with the presence of the participants or the artist, other artworks employ resources provided by modern IT, including Social Networks' possibilities of becoming an information tool for "affective mapping". The use of these resources produces a different kind of affective maps that differ from the former in both their results and in their creative process. Mainly because, it is possible to create wider and longer-lasting networks of participation for a given project, and subsequently to extend the observed space and to develop artworks whose scope goes beyond the merely local, reaching a regional and international scale. Logically this doesn't exclude the possibility of using technology in order to understand and outline local subjects (Freire 2007).

5.3.2.1 Participative Collaboration

Maps obtained by means of collaboration and aggregation of data, such as wiki-maps, require the presence of individuals who voluntarily contribute data (e.g. OMS and Google maps). However, the collaborator's authorization is not a requisite for capturing data anymore. They can be extracted directly from data that were poured on the Internet voluntarily, with individuals probably unsuspecting of the fact that their contributions would be employed for the creation of cartographic documents of this or any other kind. Maybe this way of data collecting should lead to a wider definition of Goodchild's term, "Volunteer Geoinformation" (Goodchild 2007).

We Feel Fine, by Harris and Kamvar, is an example of the search and aggregation of subjective data on a global scale, which turns many unaware individuals into collaborators of an artwork. In their web, the artwork is defined as "an exploration of human emotion on a global scale". Since August 2005, We Feel Fine has been

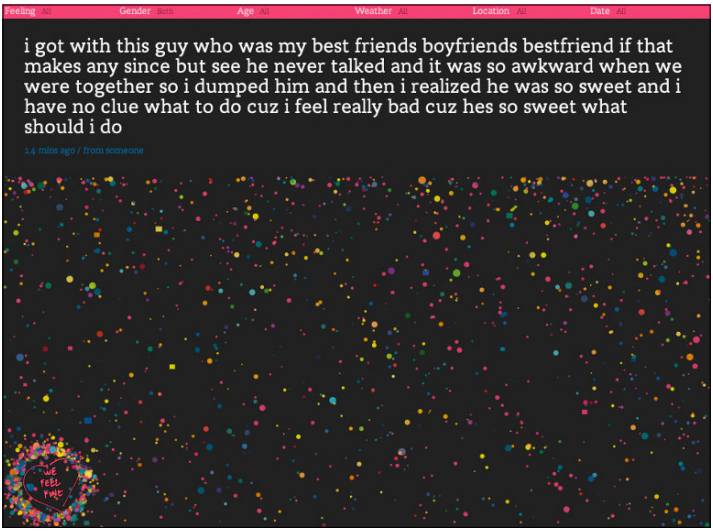

Fig. 5.8. Image taken from the We Feel Fine web site (www.wefeelfine.org) developed by Harris & Kamvar.

"harvesting human feelings from a large number of weblogs." Every few minutes, the system searches the world's newly posted blog entries for occurrences of the phrases "I feel" and "I am feeling". When it finds such a phrase, it records the full sentence, up to the period, and identifies the "feeling" expressed in that sentence (e.g. sad, happy, loved, etc.). Because blogs are structured in largely standard ways, the age, gender, and geographical location of the author can often be extracted and saved along with the sentence, as can the local weather conditions at the time the sentence was written. All of this information is saved (Harris & Kamvar 2008).

The results presented by this artwork may not be strictly cartographic, but in relation to possible applications in the field of Affective Cartography, we want to insist on it as an interesting method for capturing data, given that those data have been voluntarily posted on the net, which rules out any situation of pressure or persuasion in the collecting of said information. Additionally, that huge amount of personal information posted in the net acquires a new cartographic sense. However, it must be said that this tool deals with these feelings on a global scale, but it also seems an interesting idea to employ similar devices in order to extract data that lead to the creation of affective maps on bigger scales, even on a local scale, with a view to knowing how the dwellers of a space (urban or rural) perceive it, and to create maps that are close to psychogeography.

Another example that must be highlighted is City Murmur (Writing Academic English 2008). The introductory line to the artwork asks: "Have you ever thought of an urban space seen through the eyes of media?" The goal of this artwork is to understand and visualize how different media can describe the urban space through

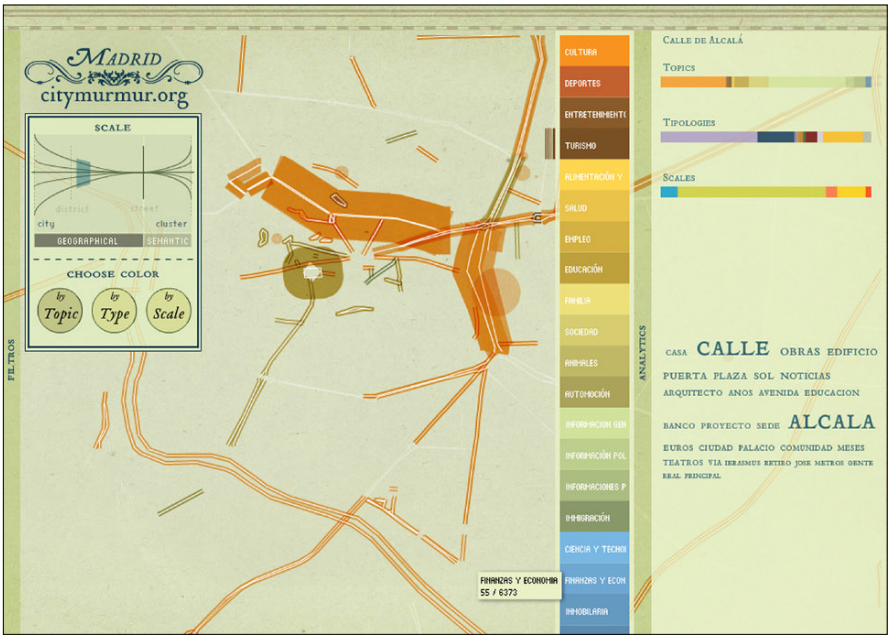

Fig. 5.9. Image taken from the City Murmur web site (www.citymurmur.org) developed by a work team called Writing Academic English in the context of the Visualizar 08 workshop conducted in Medialab-Prado, Madrid.

the attention that is paid to each street of the city. Official news, blogs and personal websites and other thematic media will be monitored in order to generate maps that highlight the patterns of perception of the urban space. This mapping will lead to the creation of a collection of maps, an atlas, which will monitor in time the changing perception of the city areas. The atlas will produce different maps based on different themes, sources and time.

We will focus now on a artwork that reminds us again of Cartwright et al. (Cartwright et al. 2008), when they state that "new technologies enable non-cartographers to produce viable maps, which while viewed as naïve mapping products in the eyes of cartographers, are usable products". An example may be "Much ado about nothing", conceived and developed by graphic design student Iván Huelves Illa. Huelves aims for a new representation of the noise in the city, far from the conventional cartographies that employ objective data collected in selected control points. In the case of this project, street recordings are employed in order to determine the various degrees of acoustic pollution, combined with pictures and films of the agents that generate those noises. These are linked to conflict spots of the city, although ideally any citizen or concerned person should be able to contribute his/her information to the project once it has been developed (it's still a prototype) from any point of the city.

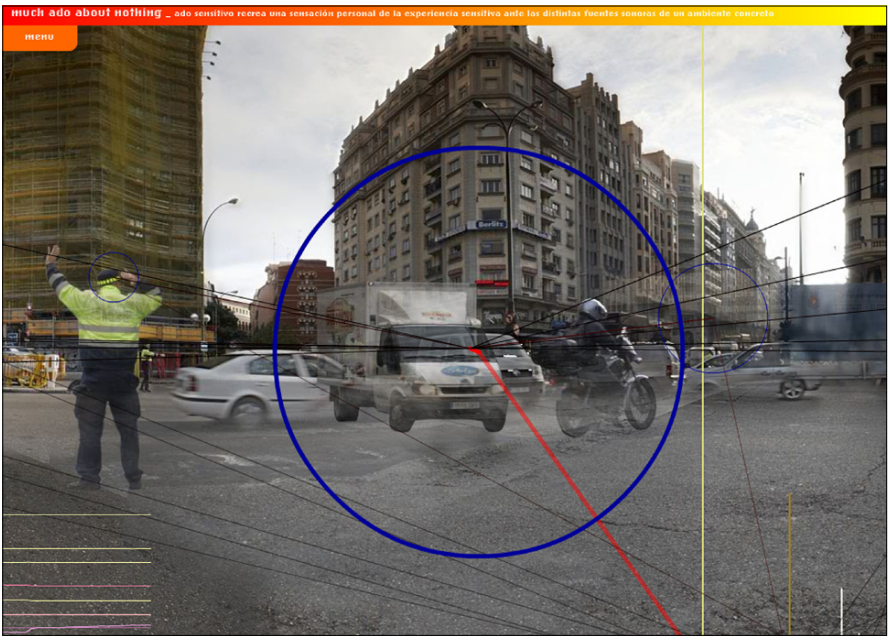

Fig. 5.10. Image taken from the Much Ado About Nothing web site (http://muchadoabout-nothing.medialab-prado.es/ado_sensitivo.html) developed by Ivan Huelves Illa (Visualizar 08 workshop, Medialab-Prado, Madrid, 2008.)

There is an interesting qualitative (affective) leap in Huelves' proposals for his maps, as he dispels with the use (and communication) of objective data (the level of decibels), going as far as to question the expressivity of these data for the average user. After all, who understands the meaning of a decibel, or knows what the acceptable level of decibels is? An even knowing it, can we really understand or visualize it? (Huelves, 2008). The future development of this artwork has been conceived as a collaborative environment, which makes Goodchild's statement about the huge potential of the participation of "human sensors to monitor the state of the environment" particularly relevant here.

5.3.2.2 Agent Perspectives

An example of collaborative and affective cartography from the point of the view of the implied message can be found in the artwork "Cartographies of the Strait", born in 2004 and still incomplete. The artwork emerged from the Indymedia Estrecho net and is linked to Fadaiat 2004, a meeting of artists, activists and technological experts from both sides of the Strait of Gibraltar. The aim was to introduce a vision of this geographic space as seen from these nets, that is, as a place of socio-political conflict, and also to present the artwork of said nets as an artwork for the transforma-

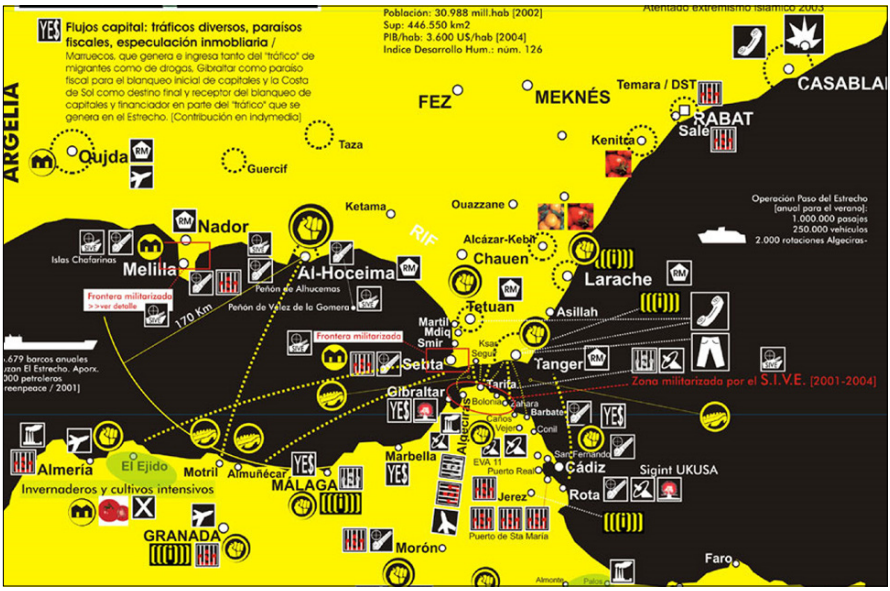

Fig. 5.11. An extract from the first version of the map "Cartografías del Estrecho" made in 2004. More information on http://www.hackitectura.net.

tion of this territory. The fluxes that cross the frontier were mapped taking the shape of the processes that took place in the Strait: militarization, migrations, displacement of capitals, communication and social movements. It was also an introduction of the nets of active social movements from both sides of the frontier, as well as their short and long-term projects. This way, the map also became an organizing tool. "Among other things, we're interested in the development of conceptual maps that prompt a dialogue with those maps based on geographic or social criteria (…) we've worked on both cartographies of political concepts and cartographies about the trends in the transformation of the territory of what some authors have called the post-border metropolis."

Although some of the agents who are developing Cartographies of the Strait are artists, the purpose of the artwork is definitely social, and in fact it is aimed at "social movements, social activists and artistic/cultural agents". Back in 2004, the project Cartographies of the Strait considered the possibility of linking cartography to the geolocation of the information generated in an open blog, Indymedia Estrecho (a network of media activists), via RSS (Indymedia Estrecho 2008). Nowadays, the aim of this artwork is the visualization of migratory, economic, political and cultural flows of the border-territory of South Europe and North Africa in an increased-reality environment, with a view to representing all the news published in Indymedia Estrecho's blog in real time on a tridimensional cartography of the strait, including also additional information. Although the final cartography achieved in

the artwork is carried out by employing objective data of each agent (e.g. artist), the emotional nature of the result achieved cannot be denied when we consider what is being represented – according to the Asociación Marroquí para la Comunicación, between 2,500 and 3,500 immigrants died in 2008, in the course of their journey from Asia-Africa to Europe.

5.4 What Affective Cartography Really Is

Affective cartography is about the representation of Place: therefore, it is about the acceptance of subjective data as worthy and useful data. Place-based metaphors such as personal experiences are important as evidence of the need for the representation of local spaces in affective Cartography. However, current place-based metaphors are incomplete since they cannot capture the individualistic life experiences, because they suffer from the ecological fallacy of applying aggregate measures to individual cases (Miller 2005). However, individual people-based metaphors are also incomplete as they suffer from the individualistic fallacy of ignoring synergistic, ecological effects at the place level. Considering both place and people is necessary for a full depiction of affective cartography.

Therefore since space only acquires its meaning with the presence of people, harvesting human feelings towards space will undeniably be important. The aggregation of different experiences about one single space is essential in evidencing facts and information that otherwise may probably remain unknown. Examining the implications of this view, affective cartography refers to a large, multidisciplinary body of research dealing with various facets of space experience. The literature review in this paper supports the discussion of both a collective and an individual artistic character of space experience. In the general sense, individuals are engaged in an exchange across contemporary art, new media art, design projects, and socio-cultural levels of aggregation. This transaction draws a motive force from an on-going process of differentiation and evaluation of natural and human-made objects that coexist in a local space. This process is integral to the development of cultures, and has led to the creation of conditions and levels of adaptation that confront both positive and negative experiences. Looking then at the specific artistic character, our literature review has revealed the reciprocities between individuals' experiences of local spaces and the aggregation of experiential bonds between them and their local spaces. However, very little is known about how the aggregation of experiences towards local space can quantitatively as well as qualitatively be represented and inferred from observations and evidences. Therefore, the research challenge is two-fold: (a) to define what local space is by pointing to ways in which experiences of natural and built places are bound together; and (b) to develop an affective representation that provides the framework for modeling dynamic, non-

linear and sharable experiences. The overall goal is to allow us to transmit memories and sensations and also to communicate emotions toward those places. It is proposed that this will help us improve practical aspects of life such as urban planning and the calculations of routes by a GPS, which have been so far too based on distance as their main criterion. It will also be possible to record those transformations suffered by spaces and to provide a historical perspective of these through the centuries or through the hours of the day, as well as a chance of retrieving them.

In affective cartography, we advise against approaches to representation problems that rely strictly on Cartography. This implies the need for an input from other disciplines, an in our case, the proposal that the arts and their representations of humanized places that are endowed with meanings and values-meanings derived from personal experiences of people in these places. This new Cartography may have as many authors as groups of people, individuals or even moods of individuals. The only condition is that space must be reshaped according to a subjective, non-visible idea (e.g. a fondness for certain places, fear of walking across other places, and states of nervous alteration provoked by certain areas in cities). The goal of the makers of affective Cartography is to embed experience in the pattern of relationships that hold and unfold among people, places, and cognitive processes. Meanings and qualities of spatial experience that are significant for individuals or groups as understood through reference to other forms of experience, individual and collective, past, present, and future.

The realization of this Cartography is an issue in which there is a vast research work to be done yet. Giving a symbolic identity to spaces, walls, structures, lanes, dwellings and transit zones may require the creation and acceptance of new symbolisms that may even go beyond those symbologies adopted in current cartographic representations. Perhaps other metaphors or artifacts yet to be researched are necessary for an understanding of space from these perspectives. Undoubtedly, the modern possibilities provided by the technology will empower its potential for development.

Finally, the temporal aspects of affective Cartography shape the general transactional character of spatial experience. On each level of aggregation, change takes place at a different pace. On a socio-cultural level, changes in institutions and technologies may emerge over many generations or within a single generation. On an individual level, change may accompany particular lifestyle events and also fall within predictable developmental and life-cycle stages. Because change tends to unfold at a different pace on each level, exchange across levels of aggregation tends to proceed at differing rates. At a given point in time, people sharing their spatial experiences may, whether or not they are conscious of their role in the process, experience tensions arising from discrepant biological, socio-cultural, and individual societal behavior.

5.5 Conclusions

We have analyzed different examples related to affective cartography. Most of them (Peripatetic Box, Psicografías Urbanas, Territorios Mentales, Murmur City, We Feel Fine, Desde, Much Ado) build a final image or artifact based on subjective data, regarded here as a valid source of information. This validity is reinforced by the fact that multiple views may exist and considered for one single space. For this purpose, diverse agents took part in these artworks, be it employing Web 2.0 tools or through the actual meeting of individuals (Psicografías Urbanas, Territorios Mentales). We have also taken into account some artworks based on objective data (performances by Rosa Casado, Cartografías del Estrecho) whose results have affectively moved their recipients and may have provoked changes in their habits and attitudes, due to the subject they tackle or to the way they have been presented or exhibited.

With the aforementioned examples of artworks, we have seen that one of the consequences of the new social habits on the web in terms of relating to physical space and geolocation is that cartography developed from voluntary data (UGC) will not be limited to the supply of objective data, but will also deal with aspects related to its perception. It also seems evident that those who contribute data to UGC-based cartographies will not always be aware of it or do it deliberately. A geotagged human feeling will be enough to become a part of the most unsuspected cartographies. This will lead to a number of emerging cartographies that are slowly acquiring presence in various fields, cartography among them. Their utility in terms of giving a complete view of reality is very questionable – but so is the aim of giving a total explanation of a reality taking into consideration one single image of it. No matter how objective this image is, it will only project a partial image. Therefore it seems necessary to consider the ability of this new kind of IT-supported affective cartography in order to achieve a better understanding of the space we live in – the Place, not the Space. We think we should not consider it only from a playful point of view; if it's possible to reflect the various visions and detect the needs of diverse social groups inside the same space, its social usefulness will be undeniable. Equally interesting would be the study of possibilities through devices similar to those exposed here, ways of sharing or generating maps of the collective and focalized memory.

It would also be necessary to go deeper into the benefits and disadvantages of the products resulting from it, and also into the definition of models and processes and the search of devices for control and representation. The study of quality issues related to this emerging cartography would also be advisable, as the classic parameters (positional accuracy, subject, temporality, integrity and logical consistency) do not seem to be the most adequate in these cases, which would lead to the search of new ways of evaluating the quality of these new maps.

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Chapter 6

Mapping the Imagined

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Abstract

This paper explores the relationship between the map and the imagination, the imagined and the act of representation and translation. Through a discussion of the phenomenon of imagining, the imagined and the imagination particularly as they relate to the creation of placescapes (Casey 2002), it is proposed that maps and the act of mapping enable us to travel to, and perhaps even know, places that we have never been. In this way the mapping of unknown geographies can help make the imagined real, and who knows where that may lead us.

6.1 Introduction

You are here is carefully placed on the map in front of me. Marked in a distinctive colour and typeface, this statement sits within the other spatial references of the map, each conveyed through text, line and colour. I look at the map and I read, *you are here,* but of course I am not. I am here, where I stand, if I were there (the here of the map) then I would exist on the plane of a representation of a particular part of the world and I wouldn't be here where my feet touch the ground. This is the paradox of the map. Maps are representations of somewhere; they depict the features of that place, as they are known at some point in time but they not where we literally are. It is through the use of the familiar (text and language) that mapmakers rely on the reader's ability to transpose themselves from their physical reality to some imagined position on a line, in a grid or a pictorial terrain. In reading maps we move between the literal and the abstract, there is a gap between our physical selves, the map and the place that is represented. This paper explores the relationship between the map and the imagination, the imagined and the acts of representation and translation.

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Fig. 6.1. You Are Here

The relationship between mapping and the imagined is a long and potentially contestable one. The evolution of maps and the skills of cartography are essentially sense making activities in relation to our understanding and creation of space and place. They are situated in humanities desire to know and to own; they were a means to articulate man's place in the world. As Norman Thrower states in his introduction to *Maps & Civilisation* (1999), 'As a branch of human endeavour, cartography has a long and interesting history that well reflects the state of cultural activity, as we all as the perception of the world, of different periods' (p. 1). The subsequent maps reflect the link between our increasing knowledge of the world and our ability to discover new and unknown places. The also reflect our increasing technological and cultural developments that enable these discoveries. As navigational devices, maps help us to make sense of the unknown and the imagined, the legendry and the conquered. The evolution of the form of the map is as much political as it is scientific (Hartley 2001). The map was and continues to be the record of the world, and as boundaries extend, new worlds are discovered or merge and with that, so does the official discourse of place and ownership. How this world is represented, what is acceptable, fashionable or possible informs this evolution and the official record of history (Akerman & Karrow 2007, Thrower 1999).

6.2 Imagination

There is no doubt that there is a strong connection between maps, creative practice and creative expression (Woodward 1982). Whether it is the visual arts or literature,

mapping our place in the world is an enticing practice for many creative souls. In a contemporary context, often this is realised in creative works that can be classified as interpretive maps; these are maps that comment on the nature of the world and lived experience through image and text. Artists and writers use these maps as a form of social commentary where the logic and simple communication/representation techniques help to make the complex tangible. There are also those who produce 'memory maps' (Davis 2004) these are spatial articulations of individual or collective knowing about what has been, a visualisation of cultural heritage. In this way the map becomes more than a spatial record, whilst also being a holder of history; personal or communal; past and present (including the immediate past).

Numerous publications have been produced across different discipline domains each endeavouring to articulate the connection between mapping and the imagination. From Katherine Harman's *You are Here: Personal Geographies* (2004), exploration of art and cartography, to Peter Turchi's *Maps of the Imagination: the writer as cartographer* (2004), to name two noted publications from recent times. Authors, researchers and theorists have been seduced by the form of the map and the practice of map making (these are not explorations of cartography, nor necessarily about geospatially correct information) and endeavoured to build bridges between creativity (the imagination) and the map. In this discussion I wish to shift the focus from such interpretations of the imagination and maps; and propose that rather than interpreting 'maps of the imagined' as being something of the mind that is linked to a world of fantasy or creative production, instead we consider how maps become mediators between the other (the unknown place) and the self. In this way the map becomes a conduit for the imagined experience of place.

The terms imagine, imagined and imagination are often misunderstood or used in free association with other terms that attempt to define that, which takes place within the mind. Philosopher Edward Casey (2002) has undertaken one of the few extensive phenomenological explorations of imagining, the findings of which are fundamental to this discussion. Often confused with the acts of perceiving, remembering or predicting, Casey argues that imagining is limited and bound by intention (p.5). Unlike these other modalities (perceiving, remembering or predicting) it is always possible to imagine. There is no right or wrong in the imagined, and it is accessible anywhere, at anytime and it cannot fail. Each act of imagining is individual and cannot be held, each new act of imagining is just that, new; and if we want to engage with it again, then it must be re-imagined or remembered. Casey (p.10) argues that it is essential that imagining should not be misunderstood to be an act of perceptual illusion (where we mistake one perceived object for another), hallucination (when the non-existent is thought to be real) or any other form of fantasy and delusion. For him imagining is a clear and intentional act that can be a response to some sort of external stimulus. Casey argues that imagining can be broken down into three particular forms or contexts (p. 44):

- Imaging (to imagine particular objects and events)
- Imagining that (this is where we imagine a particular state of affairs or action being obtained)
- Imagining how (how to do, think or feel something at a particular time or in a particular context/event)

These are all active states; they are deliberate and occur in a particular space and time, and there is a fine line between the actual and the imagined.

In order for this to occur it essential that the imaginer find the balance between spontaneity and controlledness, two traits that enable the imagination to exist. Even though they both cannot be present at the same time, and are contradictory by nature, it is the tension between them, as they exist near each other that helps manifest the imagined. '(The) potential presence of the lacking trait supports the imaginer's conviction that the two traits complement each other' (p. 63).

Imagination can emerge from the unexpected (spontaneous) or be deliberate (controlled). These imaginings are not real they are only in the mind of the imaginer. Triggered by something, someone or somewhere, these imaginings are full of potentiality and can be transposed from the internal world of the imagination to become the 'stuff' of some lived reality; at which time they are no longer imaginings.

Casey's definitions of the imagined and the act of imagining, are central to this discussion and are used to position the point of difference that I wish to propose regarding the potential of the map as an enabler of imaginings of new and unknown places. For I would argue, these imaginings can lead to new and unexpected encounters. Mitchell (2003, p. 409) in his novel *Cloud Atlas* takes the reader on a journey through time, space and place. He builds a convoluted atlas of love, desire, fear and loss. Within the narrative he constantly leaves the reader wondering where am I and when am I, with each chapter heading off towards the unknown whilst also seeming strangely familiar. Towards the end of the text Mitchell includes a list of five key 'things', presented as a list of points for the character to note and remember, you soon realise that these are a direct navigational guide for the reader to understand the *Cloud Atlas* they are (almost) finished with. Framed through the constructs of actual and virtual he states.

> *Symmetry demands an actual + virtual future, too. We imagine how next week, next year or 2225 will shape up – a virtual future constructed by wishes, prophesies + daydreams. This virtual future may influence the actual future, as in a self-fulfilling prophecy, but the actual future will eclipse our virtual one as surely as tomorrow eclipses today. Like Utopia, the actual future + the actual past exist only in the hazy distance, where they are no good to anyone.*

In this way Mitchell positions the imagined in the context of the virtual or the unreal. It could be argued that this is contradictory to Casey's definition, where although transient and immaterial, the imagined is grounded and accessible within the life

(real) world of the imaginer. To adopt such a perspective would be to have a limited interpretation of the virtual; for within the contemporary digital world, the virtual has come to have as much meaning as that which we name the actual, physical or real. Mitchell's definition shares Casey's concern for the balance between the spontaneous and the controlled, and the way in which the imaginer can use these to conceive, experience or create some other 'reality.' Within our lives, our imaginings are an essential aspect of who we are, where we are and how we might envisage things to be.

6.3 Place and Representation

The geographer Yi-Fu Tuan states that, '(d)rawing maps is indubitable evidence of the power to conceptualise spatial relations. It is possible to find one's way by dead reckoning and through long experience with little attempt to picture the overall spatial relations of localities… Cartographic ability presupposes not only a talent for abstraction and symbolization on the part of the primitive cartographer but also a comparable talent in the person who looks on, for he must know how to translate wriggly lines and dots back to real terrain' (1977, p. 76–77). Tuan argues that mapping and the ability to make maps is an essential skill of humans across all cultures. The forms and the symbology may differ but the intention is consistent. We understand and command space through visualisation and interpretation, and with familiarity this space transfers to become place (p. 75), and in so doing becomes the location of the lived world. The question then becomes within this discussion, can the maps of imagined locations have or become the familiar articulated as place?

I have argued elsewhere that creative acts and, material thinking in particular, can only ever occur in place (Vaughan 2004, 2008). Building on the work of Michel de Certeau (1984) I believe we can include the act of imagining, whether this be for specific creative production, interpretation or any other intentional experience, as a practice of everyday life. Imagining is creative; it enables us to be both here and temporarily somewhere else. In the minds eye we are lifted to another location, a virtual, imagined location, and whilst there encounter the people, qualities and things of this other place. Once there we can do, be or achieve that which is only limited by our ability to imagine. This is a practice that we are familiar with in the reading of literature and fictional maps. As discussed by Malpas (1999, p. 57), fictional maps such as those within Tolkien's *Lord of the Rings,* enable us through the act of tracing routes along line to translate the fictional to being tangibly real. However reading maps and atlases or using any number of way-finding devices, are acts of the everyday, and they both position us in the here and now and they can provide access to this wider domain of experience.

Conventionally maps re-present to us images or interpretations of place or locations this can be done through various references and interpretations. Often referred to as landscape, the content of geographical maps focus on '… an area often shaped by culturally and socially determinative features, including the shifting of whole peoples and languages, not to mention various economic and political forces' (Casey 2002, p. 265). Place is central to geography and place is infused with history and expectations. Although geography traditionally focuses on exact locations, geography and the representation or understanding of place is more than geospatial coordinates it also involves inhabitation. Based on this, Casey argues that the representations of place through image, whether through art or maps, should be articulated as a placescape (p.260). The combination of *scape* (shape and scope) and *place* (that which is represented, more than land or geology) and together they encompass all the elements of habitation and culture. It is the relationships between location, people, intentions and association that creates place. Maps enable us to engage with the complexity, the dialectic of placescapes. They draw us into the intimacy of local space, whilst also offering a worldview, achieved by placing the local in relation to the other.

When representing landscape we have the opportunity to exploit the ambiguous both in surface and depth, including that which is visible and invisible. Our ability to experience and sense place through the representation of landscape or location allows us to perceive and imagine what could be. There are many ways that we represent placescapes. This can be done through image, symbol or text. We represent place in stories, films, paintings, and maps, and all of these are narratives of experience. These narratives are spatial and temporal and they belong to both 'geological and cosmological orders of time' (Cassey 2002, p.275). Narratives of representation engage us in place, and they extend our experience of where we are.

6.4 Imagined Places

So far within this text we have explored the two elements of this discussion: imagination and the mapping/representation of place. These next sections will focus on what happens when we bring these two together in theory and practice. First, let us return to Casey's proposition that imaginings are only a moment away; for such is the nature of imagination that we can engage in the practice of creating narratives of experience, people or things at anytime. These imaginings are never wrong, incorrect or inappropriate and they exist only as long as they are present. To re-imagine something is to imagine it again, imaginings are always fresh and new, and full of potential. In addition to this place and its representation involves more than geospatial data. The representation of place includes socio-cultural components, which locates the place and its representation in time and in relation

to the individual. Therefore imagined places would involve an integration of these two, resulting in socio-cultural narratives of potentiality that exist in time and have meaning for the imaginer.

Often the imaginary places of the literature are fictional places, places of fantasy and outside of the world of the known. These can take many forms and have been used as creative explorations, or accounts of the world from our limited understandings. These include the fantastic narratives of the *Dictionary of Imaginary Places* (1999) that read as being almost true until the details of the story make it apparent that they can't be. More fundamental to the evolution of cartography and geospatial mapping, have been the stories of places far and near and the various ways of representing them across cultures and throughout history since ancient times. These places are fictional in that they have yet to be proven to exist and yet there is a common or limited belief that they do. (The numerous searches for the mythical great southern land is one such example, thought to exist but unable to be located and mapped.) This second form of imagined places and their representations tell or entice us into knowing, or wanting to know, more about the world and/or the cosmos. They are aligned with Casey's definition of imagining and the imagined. Maps of fictional places or memory maps are outside of this categorisation and are more in keeping with his categories of hallucination, memory or perception. Maps or representations of imagined places allow us to transform and transcend from the everyday present, to another location and as such create a connection to a distant imagined place.

6.5 The Imagined Encountered

I shall bring this text to a close through a reflection on a personal narrative of discovery and imagination. It is a narrative that outlines how the introduction to an imagined place can transform a life, and create a pattern for encounters to come. This introduction occurred through a mixed range of representations. These included text, image, event and oral history.

When I was a young girl in my early years of primary education, my classroom teacher worked to bring geography to life for her class through the creation of theme days that would focus on a particular place. These theme days were designed to give the children an emersive experience of place. Many countries were covered but only one stood out for me, this was Japan. From the idea of dressing up in my pyjama's pretending to wear kimono, to eating rice with sticks for lunch and hearing stories about earthquakes, samurais, ninja, cherry blossom and tea that was green, I was fascinated. This place was so foreign, so outside of my world I could barely imagine what it was. At the end of the day I went home, still thinking about this place and I went to the family bookshelves where I found an old atlas. This wasn't just any atlas that contained only pictures of terrain with place names; this atlas

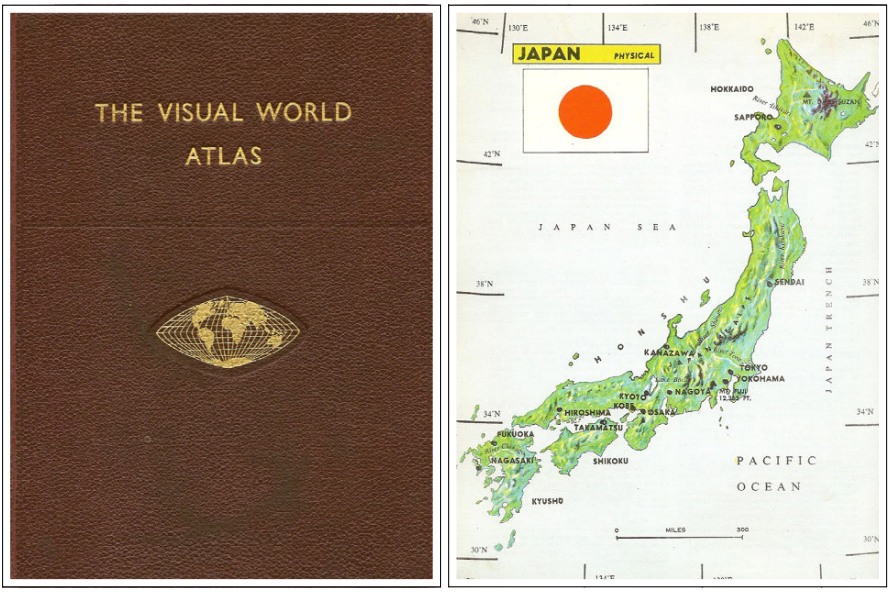

Fig. 6.2. The Visual World Atlas, 1964, Japan map detail

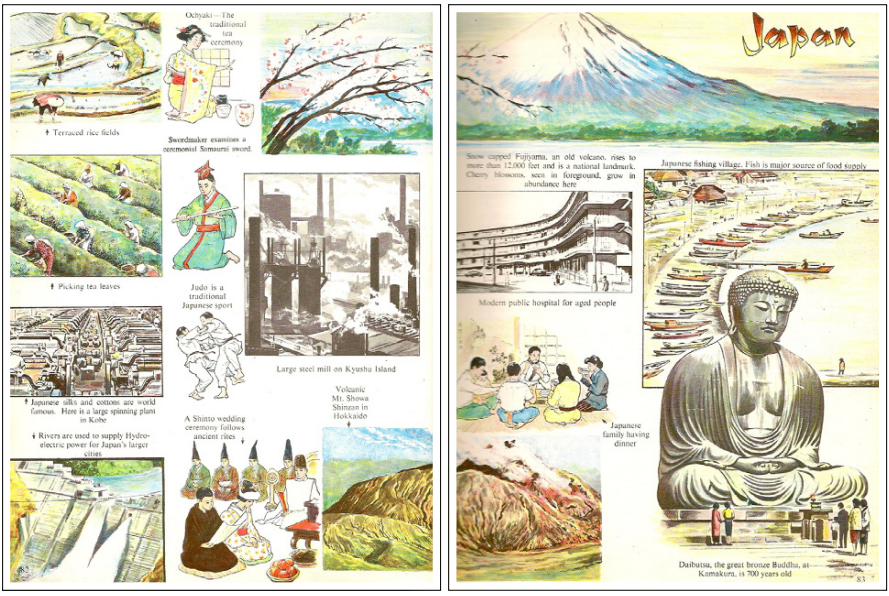

Fig. 6.2. Japan map and cultural details, The Visual World Atlas, 1964

had all that and more. Inside there were pages dedicated to each country telling me things I couldn't read or understand; but there amongst the foreign English words were images of geisha, Mt Fuji, temples and houses made of paper and wood. These

images, like the day, brought my mind to life, I could see this place, feel it, imagine being there, and I wished I was there. That night I had a dream; I dreamt I was in a city; a big foreign city, full of towering buildings all made of white paper. I could see these buildings, I could sense them sway and I knew (although no-one told me) that these buildings were made this way so that when an earthquake happens and the buildings fall, no one will be hurt, the paper would keep them safe. This is a dream I still encounter some decades later.

Although technically a dream is outside of the realm of imagining according to Casey, this series of events (the day at school, the stories, the dressing, the food and then the pictures in the atlas) all served as triggers that enabled me to imagine this foreign place. I was able to bring it to life, to translate the representation of the abstract into some sense of a distant known. This dream, the fascination with Japan and the atlas have stayed with me, since that day. Throughout my university years and my studies in art school Japan was always present, a subtle aesthetic or a deliberate investigation I continued to imagine Japan and the place that I thought it to be. Then on completion of my studies I finally went and for the first time, this imagined place became real. There was a shift from the virtual to the actual, and this foreign place took on all the meaning of a placescape (Casey 2002); the imagined other became home. Although it is now 20years since I returned from living there, my connection to Japan hasn't ended. It is still the place of my imagining, and that original atlas is still with me.

6.6 Conclusion

This practice of knowing place through representations of landscape and other socio-cultural referencing is not unique to me, and it is an important aspect of the design and making of way-finding references. Whether they are maps, atlases, guidebooks or the like, these devices enable us to travel without leaving home. Like other triggers of imagining, these publications take us somewhere without going and although they aspire to tell the reader the truth and inform them about some distant place, by nature they cannot. They are but representations; they cannot be supplementary experiences. Like my imagining of Japan and the dream that followed, the images that result are the experience, they are the bridge between me here and my desired there. These are experiences that exist within the imagination, triggered through reference material each new read creates a new possibility for what this foreign place can be; always pregnant with possibility of what it would be like to be there, to see or meet the people, to eat the food and encounter the things. Encompassing a balance between the two key elements of the imagination, of controlledness (the initial trigger and its reference material) and spontaneity (the unexpected connections that can occur within the mind).

The geography of imagined places is as rich as any place in the real or physical world. Like any placescape this terrain is socio-culturally determined and created, existing in space and time. Mapping these places occurs within the mind and each imagining is always new, unbounded by convention, yet emerging to or from it.

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Section II

Structural and Methodological Issues of MDG

Chapter 7

"Now and Then, Here and There … on Business": Mapping Social/Trade Networks on First Global Age

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Abstract

In a global world, the *geography of contacts, interactions and exchanges* is based, evermore, upon an isotropic world, where distance (or proximity) and accessibility don't seem to compromise the contacts and relations between human beings; new technologies play an unprecedented role in the territorial expression of network connections. Our aim is to address the question: to what extent did territory condition commercial performance, contacts and the networks' organization in the First Global Age? Under DynCoopNet Project, the study of cooperation and trade networks intends to provoke scientific debate to clarify this issue. In that sense, the scientific dialogue between history and geography is assumed as a key element in every step of the research. *Mapping* historical data related to commercial networks, assuming an intrinsic spatial component, implies spatial visualization in order to comprehend the nature of such networks, their design and topology, extension and intensity. However, when dealing with fuzzy and geographically non-systematic information, researcher's interpretations and data classification might misinform geotagging. Practical examples will be given and visualised, based on DynCoopNet (ESF-TECT/EUROCORES research project), as well as other works of the Portuguese research team.

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7.1 Introduction

This paper is a joint initiative of a geographer/cartographer and two historians, members of the research project DynCoopNet (acronym for "Dynamic Complexity of Cooperation-Based Self-Organizing Commercial Networks in the First Global Age") approved by the European Science Foundation's programme EUROCORES (European Collaborative Research), as a project of the TECT (The Evolution of Cooperation and Trading) programme.

It aims to deal with some practical problems that arise from the multidisciplinary specificity of this project in which visualization of historical data assumes an important role. We'll attempt to centre this paper on the discussion of crucial problems that come up from:

a. The transference of the historical sources semantics of the qualitative data to the objectivity of geotagged references;
b. The implications in visualizing and representing historical and spatial dynamics;
c. The implications resulting from the spatial models (distance and similarity) available to visualize and represent historical and spatial dynamics in networks (spatialization vs. mapping);
d. The implications of reciprocal transferences between agent attributes and space attributes.

As the paper seeks to be an informed discussion of premises or subject matters within the context of the abovementioned DynCoopNet project, we'll summarise its main assumptions, according to the DynCoopNet project description guide-lines (2006).

This multi-national and multi-disciplinary collaborative research project (CRP) – DynCoopNet – addresses the EUROCORES Scheme program TECT through the evaluation of cooperation patterns among merchants and between merchants and other social groups, with particular focus on commercial networks formed in the global domains of Iberian monarchies, 1400–1800.

As primary theoretical assumptions, the project assumes that a) the world economy of the First Global Age (1400–1800) was a *dynamic, open, complex, non-linear system;* b) *diversity among geographic locations* constitutes an aspect of the system's complexity, which requires that data be georeferenced in order to *analyze geographic contexts and understand connections among places;* c) in this first global world, the *history of any* place can't be understood without *examining how it was connected to a wide range of locations and to the system* as a whole; and d) *cooperation between agents remotely located bind them together,* which can be expressed by the existence of self-organized and sustainable commercial networks..

Through a convergence of methods unusual in the historical social sciences, the CRP intends to reveal the mechanisms of cooperation that permitted merchants and other social agents to set up and uphold often long-distance networks. After defining the characteristics and roles of cooperation that were established in the early days of the First Global Age, the CRP will identify and analyze the emergence of innovative forms of commercial relationships in order to understand the system's transformation to a world economy in which agent-based cooperation was assumed as an essential means to support network connections**.**

The strategy and work plan of the DynCoopNet collaborative research community aims to: a) *assess and document the nature of cooperative behaviour* that shaped the self-organizing commercial networks linking various locations during the first global age; b) assess and map the *evolution of cooperation in self-organizing commercial networks* over various *temporal scales at local, regional and global geographical levels;* and c) *reconstitute both these networks and their dynamics* through mathematical resources and mathematical modelling, whenever they are able to fill gaps and reconstitute models that the empirical work of historians reveals unable to accomplish.

To reach these goals, DynCoopNet will make use of data gathering specifically directed toward understanding the evolution of cooperation and the structure and dynamics of commercial networks of the First Global Age. That will result from the exploratory work on different (in nature and typology) documentary sources of the sixteenth and seventeenth centuries. Most of it is qualitative information, expressed on complex and frequently unclear semantics. As far as the Portuguese team concerns, we'll try to address the theoretical framework of the project through an empirical work centred on Simon Ruiz, a New-Christian merchant from Medina del Campo (Castile, Spain), whose commercial and financial company archive is kept at the Valladolid Provincial Archive[1]. Hopefully we'll benefit from the existence of extended serial data gathered on sources of two kinds: bills of exchange

[1] Simon Ruiz was a merchant from Castille, whose expression as businessman went beyond Iberian frontiers, reaching all European trade circuits, as can be proved by his correspondence being extended all over Europe – Lisbon, Porto, Valencia, Genoa, Rouen, Rome, Venice, Lyon, and establishing a complex network of agents. Born in 1525/1526 in Belorado, Burgos, Spain, among an inexpressive wool merchant family, he began his career as a businessman with 25 years old, as a middleman of Ivon Rocaz, a Nantes' trader of cloth from Bretagne, who sent him some of his product to be sell in the Medina del Campo fair. The relevance of this market, considered as a neuralgic point of people, goods and credit , encouraged Simon Ruiz, who succeed through an intensive participation in business acting as a representative to other commercial partnerships, He seems to begin by placing individuals of his trust in key points of the network, as well as engaging a network of informants in important trade places, while trading textiles, but also olive oil, spices, indigo, salt or wheat. Simon Ruiz also invested in the trade with Spanish Indies (the West Indies), by establishing a trade company centred in Seville, but the severe income decrease in 1567 and 1568 made him focusing his investments mostly in France, Flanders and the ports of Bilbao, Alicante and Italy (DynCoopNetPortuguse teamreport, October 2008).

and merchant correspondence. The team seeks to promote a systematic data gathering able to answer multidisciplinary demands and methodologies, such as GIS and mathematical modelling. To achieve this end, DynCoopNet Portuguese team will create a database, inspired by the social networks theories and assumptions. It will be based on *TimeLink* software[2], which architecture follows an agent-based data registration, centred on individuals, aiming to assemble elements related to their *identification,* their *location* (in time and space), their *personal attributes* (including their status in familial, professional, political, economics, religious and cultural spheres), their economic *functions,* as well as social, familial and political ones, and significantly, their *connections*. Records for each individual and for each link established between individuals will be drawn together. However, systematic data and structured historical information about individuals' relationships are very difficult to get; and that explains part of the major problems we'll have to resolve.

The central research targets of the analytical framework will be as follows: a) reconstitution of networks; b) appraisal of network models: networks topology, connectivity and density; c) identification of variables which interfere in the model; d) identification of cooperative behaviours and their connection with the enterprise objectives; e) space -time representation of cooperation networks and its evolution in time; and f) appraisal of the spatial nodules and spatial connections of the networks, essaying to identify some main attributes of space and its influential projections on the networks under study and vice-versa. (DynCoopNet Portuguese team report October 2008)[3].

From the beginning, the team proposed to use GIS technology and methodologies to structure, manage, analyze, and model geospatial, temporal, and historical components of cooperative trading information, in the assumption that that technical knowledge would enable georeferencing information based on associated locations, as well as the visualization of networks' diachronic evolutions and cooperative behaviours. Weare assuming that GIS offers a data integration engine and is a visualization tool that brings together layers of information necessary to understand the high levels of cooperation and transformation of the world economic system throughout the First Global Age (Owens 2007, Yuan 2008). At a conceptual and computational level, GIS methodologies seemed to offer ontological and semantic approaches to define entities of interest and discern their cooperative relationships. However, checking its adequacy to our aims and the kind of records we work with, we concluded that the current GIS technology has only limited potential to handle

[2] *TimeLink* is a computer tool specially developed to support micro-historical research with a strong emphasis on network analysis and prosopography. The system is been developed at the University of Coimbra and has been used in different types of research. Recently it was used to create a database that congregates Parish records of a Portuguese town named Óbidos, from the 16th to the 18th centuries, containing more than 100.000 biographical references. Cf. http://mhk.fl.uc.pt.

[3] *DynCoopNet* team internal working paper. Available at http://dyncoopnet-pt.org

time evolution. In fact, GIS is able to explore and define precisely geotagged space elements, but is not so proficient with fuzzy and diffused references, nor with space-time intersections. On the otherhand, we can also ask what GIS expects from historians and historical data? This massive data container, capable of absorbing and processing huge amounts of information and managing it in such ways that human expertise hardly ever reach es, expects precision and consistency, specially when it comes to spatial data. Therefore, we proceeded to look for new approaches that we expect can be helpful for us in dealing with this dilemma.

The workshop held in Madrid, in September 2008 was a major event in the project. The discussion was based on different perspectives presented by geographic information scientists, historical geographers, cartographers, geomatics engineers, and computer scientists. The presentations[4] and the panel discussion of the workshop, coordinated by Monica Wachowicz, were structured "… on the basis of the three "spaces" paradigm proposed by Ernst Cassirer (1874–1945), a philosopher of the Marburg school, who described a learning process as a truly dynamic activity within the mind of the human experience of spaces and time. The spaces may be conceived in different forms: an observed space through sensors and senses *(perceptual space),* an abstract model of space *(symbolic space),* or a higher level of concepts incorporated in an abstract internal space *(cognitive space)"* (Madrid Workshop Report 2008)[5]. The workshop also aimed to review, specify and discuss the *theory, methodologies and tools* able to be applied to the strategy and work plan of the DynCoopNet Project. Through the development of geo-computational models (such as agent-based modelling or the fuzzy rule-based modelling), the dynamic and complex mechanisms of cooperative trading should also be revealed (Cf. Owens, Coppola, Szidarovsky 2008). For now, we won't focus on this approach.

In fact, the CRP proposes to make heavy use of geo-visualization methods in the form of statistics, animation, and visual analytics to explore spatial and temporal distributions and relationships among trading groups and trading locations. Spatial analysis techniques will be used to assess the similarity of the social and economic settings of locations. Based on the similarity of assessment, these techniques will be employed to investigate how geographic relationships among locations are related to the institutional, economic and cultural environments of these places and how those relationships promoted or hampered cooperative trading. Models of dynamic social networks will be evaluated by their appropriateness to trade cooperation modelling and by their aptness to test the mechanisms by which cooperative relationships were established and maintained (DynCoopNet project description guide-lines 2006).

[4] *Workshop* Presentations available at http://mapas.topografia.upm.es/Dyncoopnet/presentation.html.

[5] *Scientific Report of ESF.* Eurocores Workshop. Visualisation and Space-Time Representation of Dynamic, Non-Linear, Spatial Data in DynCoopNet and other TECT projects *(Technical University of Madrid, 25–26 September 2008).*

Geotagged representations emerge, thus, as a main purpose of our project. However, some problems seem to arise compromising the accomplishment of this goal.

7.2 Challenges to Solve, Problems to Discuss

7.2.1 From Semantics to Geotagged Visualisation

> *Many of the spatio-temporal data sets being generated today are from Earth Observation Systems, geo-positioning and tracking, mobile sensors, outcomes of models, and many other sources. Scientists are currently facing the challenges related to the great increase of data volume of spatio-temporal databases due to improvements in data acquisition, validation, archiving, and distribution (e.g. instruments, sensors, computational resources, information infrastructures, and volunteer geoinformation). In contrast, historical data sets are gathered in a sporadic manner, and the similarities, differences, inconsistencies and deductions among these data sets are not known.*
>
> (Madrid Workshop Report 2008, p. 5–6)

In line with this opinion we need to present the historical sources we use. We are working with qualitative and written texts, produced in the sixteenth century. They are very heterogeneous texts that we must recover, assemble, systematize and turn into databases' fields and cells. Then, we must handle the data using statistical tools and visualize it by using spacio-temporal methodologies and instruments. To give an idea of the data extension, we expect to collect about 10.000 bills of exchange and 12.000 commercial letters, which will be turned into cc. 50.000 digitalized images. A glimpse of the nature and content of the sources may be visualized in *Figures 7.1* and *7.2*.

Facing these contingencies of data gathering, the difficulty to overtake the obstacles imposed by the nature of the sources and the absence of standard data or rigorous information layouts are overwhelming, as we will see. That's why we seek for practical answers that enable us to build space-time representations that can be scientifically validated and explored.

The next examples will give us an idea of the intricate obstacles we are facing. Let's focus on those that seem to be the simplest ones. Geographical references in the sources are heterogeneous, either very specific or vague. We may be dealing (and most of the time we are), within the same *documental corpora,* with a roll of geographic references that will oscillate from Porto, Lisbon, Genoa, Barcelona to Galicia, Flanders, Brabant, Baltic ports or even Brazil or East Indias… It seems quite clearly a scale issue, not the scale of the map itself but the geographical disaggrega-

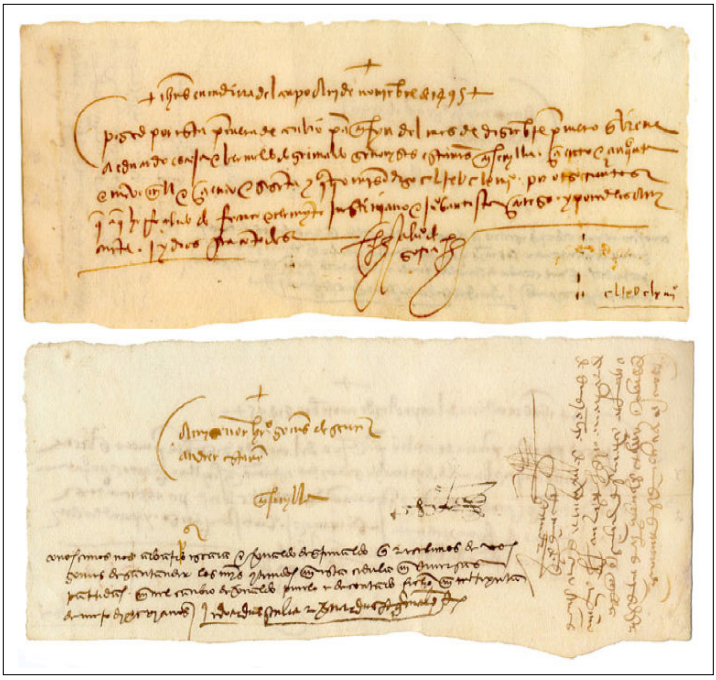

Fig. 7.1. Bills of Exchange (Source: Medina del Campo, 3 de noviembre de 1495. Archivo de la Real Chancillería de Valladolid – Pleitos civiles. Pérez Alonso (f). Caja 104-1, pieza 23. In www.museoferias.net.)

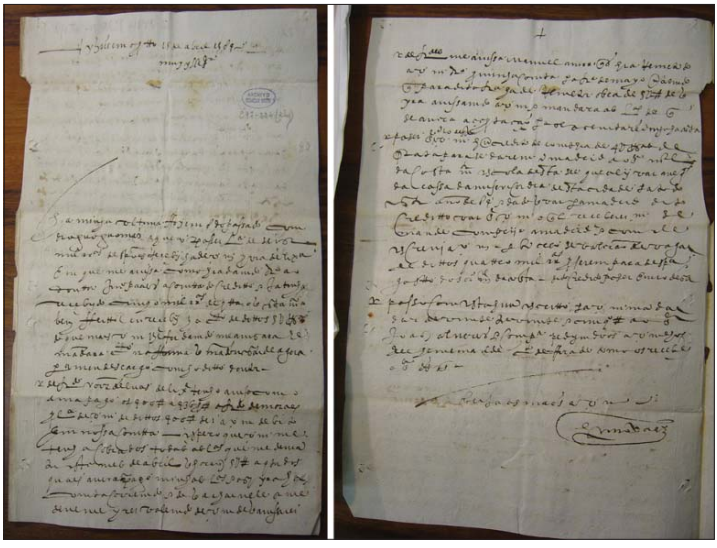

Fig. 7.2. Commercial Letters (Source: Archivo provincial de Valladolid. Simón Ruiz Archive. Comercial Letters. C-97 (224))

tion of the data. One may find references to seaports or cities, along with references to broader regions or even countries or continents! This inconsistency compromises the balance and equilibrium among the spatial references and expressions of the phenomena projected onto them, not to speak of serious historical inaccuracy. The combination of micro and macro references or, in other words, the use of different spatial units to accommodate geodata – even if cartographically accepted – will demand a lot of creativity from the mapmaker and, even so, erroneous/misguided information may be transmitted to an inexperienced map-reader.

In fact, under the sphere of mapmaking and visualization, during the process of historical source exploration and systematization of geodata, the coexistence of precise and vague place mentions is a significant problem when it comes to providing a researcher and/or map reader with a detailed, accurate but simultaneously broad depiction of a given phenomena. In the case of mentions from members of a small Portuguese seaport who died abroad, what shall we do with statements like "dead in the Atlantic coming back home", or "dead in Brazil", or "dead nearby saint Tome" (Polónia 2007, vol. II, p. 333–334)?

Besides the immediate problem of historical evolution of the toponymy, or even its extinction, not to mention the difficulties in reading and interpreting sixteenth-century handwriting, we must also be aware that under the scope of an international research project we intend to merge geographical databases collected by each team into a major catalogue. It means that risks of overlapped, unlinked or unrelated georeferences must be minimized. The worldwide geographical databases, such as Geonames,[6] available on-line and generally employed to geotag historical references don't, in fact, respond satisfactorily to our time and space categorisation requirements. Is it acceptable that we take in charge the arrangement and conversion of historical identification of places? Should we convert them to the present covenanted classification? Keep the local designation? Use a universal one? The establishment of a world scale place codification able to assign to each place a primary key/code would prevent such disorder, which is easier to say than to do.

Even if we hypothetically consider that heterogeneity of concrete geographical references is resolved, we face an additional difficulty when we have to deal with boundaries. The same toponymy may refer either to a specific place or to an administrative or even natural, but, definitely, broader circumscription. The geographic implications of such sometimes imperceptible nuance might also compromise the assignment of data to a geographical feature and, in consequence, compromise the architecture of the geodatabase and further map reading and analyses.

A brief and particular reflection on geographical circumscriptions as features will emphasise supplementary problems. Whenever the spatial unit is graphically expressed as a point on a surface (e g. a seaport city, a commercial trade fair, etc.)

[6] http://www.geonames.org/.

the location might be assumed to have survived… However, at a local scale and micro analyses, some places might have disappeared, changed their names or even changed their location (as it happens in the case of seaport villages which for some natural reason might have been displaced for safer positions).

This also led us to the question of circumscriptions graphically expressed as areas: shall we design and consider those we have nowadays and currently in use or those that existed in the historical period we are dealing with (and so, drawn as they were shaped)? In our research and publications, we always believed that the correct option was the use of the ones defined in the historical times we are studying, even if it demands an extra effort and additional (parallel) inquiry on such reconstitution of space. But the dilemma remains: how to uniform those circumscriptions in a world-wide level and in global spaces such as the Iberian Peninsula, Europe as a whole or Brazil, India, or the Spanish Indies? The challenge is, again, overwhelming.

Summing up, decisions about the spatial level of data representation (local, Iberian, European, Worldwide territories), the choice between the past or present territorial locations/extensions of geofeatures, or even the idiom that should be used to identify those features, will always have to be discussed and agreed between multiple and multidisciplinary teams.

There is more to say about this topic, now regarding the selective and cautious analysis and evaluation process that historical/spatial researchers usually have to pursue when exploring the sources they work with. An assessment is needed when a sample is all that was obtained, and can be more or less representative of the data. That means that resulting data available after the critical reading and demanding validation process, being both historical and geographical, must be evaluated and integrated (or declined). This process will have implications on the mapping process as well; ones need to recognize if after such a scrupulous filtering and validation, the remaining data would have enough consistency to be mapped. If transferred onto a map, will it be sufficiently representative of the entire phenomena? When questioning and debating the scientific consistency and uniformity of the variables to map, indispensable for the validation of the data to represent, geotagging seems to be a lesser problem.

And what about the standardization of geographical representations based in such diverse sources that involve so heterogeneous geographical references, so diverse typology of historical data and so chronologically extended periods? The evolutionary character of data is of the utmost importance, especially when considering 400 years of dynamic evolution in spatial patterns of the phenomena under study.

Lingering on the discussion about the implications of the transference process from the historical sources semantics to visualization: shall we assume the simplest representation of historical phenomena or, on the contrary, be receptive to the historical complexity of dynamics that makes each event almost unique? Simplicity

or complexity of data representation? In some cases, simplification of the collected information would facilitate data analyses and subsequent mapping. Finding the limits under which information might be dispensable could always be a practice in order to simplify visualisation but only if that doesn't mean compromising the geographical lectures of variables. Spatial filtering may obscure fine detail information that is often of interest (Tobler 2003, Slocum 1998).

Most of thematic maps portraying movement or flows are based on a two entrance table, where origin and destination clarify the demands of such displacements. So, cartographers solved their problems on visualizing the spatial transference of goods, capital, people, ideas, etc. with flow maps, and with a *from-to* relationship (Dent 1999). After years persuading historians to systematise their approach to their sources, actually we came to realize that, in some, or even in most of the cases, precious geographic references were conferred secondary importance or even lost when focusing their attention on explicit retrieval of geo facts. A geographically trained ability and sensitivity in reading an historical source assumed a determinant role on its exploration.

An interesting case for discussion could be found on Barros's work (2007). In this exercise, this historian pretends to expose how a simple (simplistic) geographical two-entry database (origin and destination[7]) would camouflage important and significant geographical lectures of phenomena. With Nogueira, he constructed the map on *Figure 7.3,* "Vila Flor's merchants and the clothing transportation from Segovia to Porto", an explicit example of how a direct and non-reflected approach on historical sources might lead to imprecise registers of movements and, consequently, to misguided representation on map of those same movements upon space.

A merchant somewhere in Vila Flor (Portugal) is on business. Exploring his contacts network, he is committed to transport merchandise from Segovia (Spain) to Porto (Portugal). What might seem to be, in space – and map – an easy drawing has, actually, serious considerations. The first one: shall we place him in Vila Flor, where he is from, or in Segovia, the departure point of the merchant circuit? This displacement of geographical features will be more detailed and discussed in point 2.3 of this paper. For now, other evidence arises from further depiction of the source. An apparently and tempting simple and straight connection between Segovia and Porto became, in fact, a journey through Spanish markets: from Segovia the merchandise headed Northeast to Medina del Campo, then went trough Tordesilhas, Ourense and eastwards, until it reached the port of Redondela, where the merchandise was shipped to Porto by the Atlantic!!! The map's new outcome is amazing. Ones can never neglect the spatial readings, interpretations and contributes that this larger

[7] This can be identified with points A, B, B, A celebrated by Braudel and systematized by David Igual Luis *Itinerarios comerciales en el espacio meridional mediterráneo de la Baja Edad Media* in "Itinerários medievales e identidad hispánica (XXVII Semana de Estudios Medievales – Estella), Pamplona, Gobierno de Navarra, 2001, pp. 113–158.

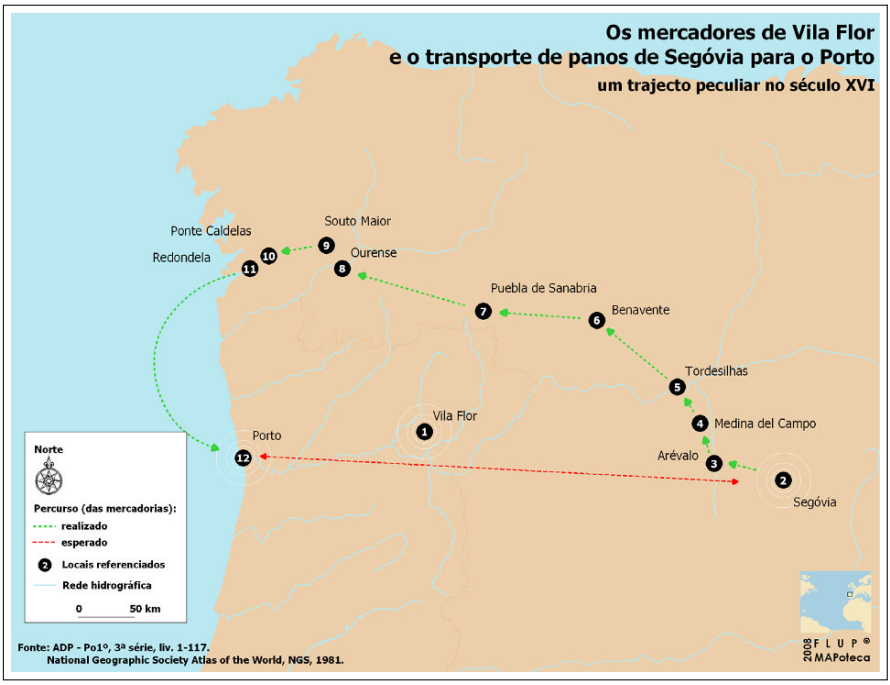

Fig. 7.3. "Vila Flor's merchants and the clothing transportation from Segovia to Porto": when logical simplicity gives place to a peculiar journey of merchandise with historical peculiarities on map. (Source: Barros, 2007.)

episode – and map – bring to local/region histories. The option for simplicity, and the absence of the most complex itinerary described on the source would exclude places that were, in fact, part of a trade route that could be, or not, a commonly repeated one[8] (which has to be confirmed by historians).

Another example makes it clearer. Gathering data from notary registers of ship freights, the historian may use a two entrance table, where origin and destination clarify maritime displacement, giving origin to a map flow *(Figure 7.4a)*. Or, in alternative, he can include all the stops and scales of the trip *(Figure 7.4b)* giving thus another projection of places that would be totally forgotten (invisible because not considered) on the previous mapping representation. The trips from Portugal to Brazil are a good example, since they were almost never direct ones. Mentioning only the departure and arrival points we would almost totally exclude the West coast of Africa, a territory that nourished the slave trade. Brazilian trade routes were, in fact, not bidirectional ones, but triangular or even more complex ones, involving departing points in Portugal, a call in Madeira, Cape Vert or Canaries to board wine,

[8] In fact it seems that it was not, although this episode alerted us to further research. By that time the Douro River channel was a privileged route and, at a first glance, it would have been logical to think that these textiles were transported that way.

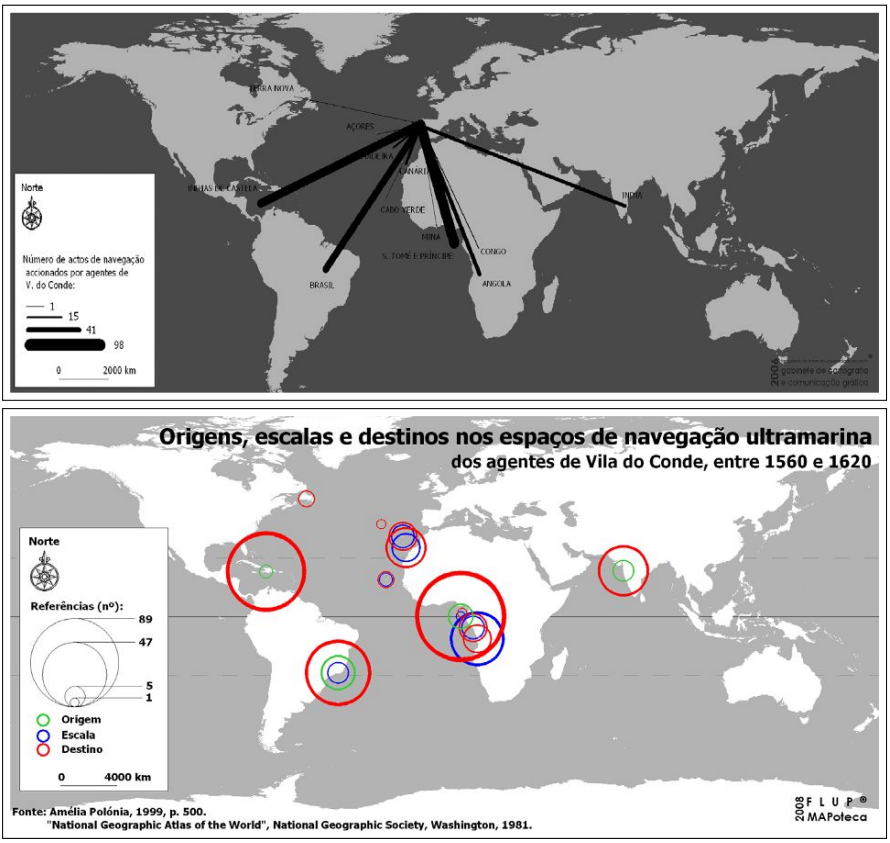

Fig. 7.4. (a, top) Flow map on navigation routes between Vila do Conde and overseas hubs (b, bottom) Another mapping solution, considering scales of journeys (Source: Polónia, 2007)

another one in Africa, where wine was exchanged for slaves, a third one in Brazil, and a return to Portugal, with sugar, cotton and other colonial commodities. This typical itinerary could also include, during the period under study, a potential trip from Brazil to Spanish Indies, where more slaves disembarked. To represent all this complexity would a flow map be the right one, or the right choice? Should the proposal of *Figure 7.4a* be appropriate? Or should a cartographic solution like the one adopted in *Figure 7.4b* be more precise?

Regardless all this disquiet, we are regularly constructing *perceptual maps* – those in which the space is produced and read (or vice-versa) through sensors and senses of third parties, those we can criticise (in a strict scientific historical sense) and filter, but not substitute by a more rigorous representation; our maps will always balance between the sources' producers focus, their aptitude or incapacity for accuracy, to the clear cut (or not) representations of reality and the interpretation furnished by historians and cartographers.

Besides, historical documentary sources might contain and represent different images of reality. They repeatedly do. The data explorer sets his aims and establishes and defines the details as well as the focus of the space and then produces different versions of the same reality. The visualization of the same overseas journey, whether described by a sailor, a merchant, a captain or a ship-scribe will have different written narrative and, consequently, different opportunities of exploration and interpretation. Sailors will portray it with all the details about departing ports, scales (commercial or logistics), times spent in ports of call, weather, wind, travel accidents, and so on … For the same travel, a merchant would describe it referring the departing and arrival point, with much more data on the business, products, prices, and analysing or referring to seaports, mentioning details generally disregarded by the sailor.

From this approach, frequently merely sensorial, therefore not controlled by the rational or even by a technical regard, the data transfer to a map, which can be a symbolic or a cognitive representation becomes a problem for historians and for mapmakers. This discussion led us to further reflection: as mapmakers, are we producing scientific and technically accurate maps or, on the contrary, are we just the materializing agents of pre-assumed mental conceptualizations of spatial (co) relations? Are we mere intermediaries of the sensorial, perceptual or even affective maps of our ancestors? Additionally, projecting abstract models of space, and then constructing a symbolic space, will amplify our problems. Essaying a higher level of conceptualization incorporated in an analytical map or in a cartogram – that would provide us with a cognitive apprehension of the space – leaves us, however, facing even much more delicate and difficult challenges.

7.2.2 What's the Right Choice to Visualize Historical Dynamics?

> *"Creating effective flow maps through a careful and thoughtful design plan represents one of the more difficult challenges for the map designer"* (Dent 1999).

Experience shows that flow maps are the privileged map solution to plot movement between places, which can be a complex assignment (Dent 1999).

Resuming the previously debate on the difficulties of *mapping different geographies* what's the most correct solution to visualize trade networks? We are aware that they depend essentially on movement (of commodities and trade agents itinerancy) and on connections... but, is it fair to think that flow maps present the more accurate map solution to visualize trade networks? At this point, it might be useful to introduce an unpretentious discussion on *how to map* such movements and advocate cartographic solutions for it.

We just stated that flow maps are the most common and generalized technique to illustrate spatial movement. But critics on flow maps are also frequent among

cartographers and map readers. Some would say that computerized flow maps are actually not as effective as the hand-made ones… A consensual explanation would rely on computer assisted cartography: the dissemination and easy access to desktop mapping software by researchers and academics able them to easily manage and map additional amounts of information. Although those resources provide appealing visualizations, it must be said they frequently disturb our perception of spatial behaviour and flawed patterns of variables under study. Nevertheless, they remain as widespread solution to portrait movements.

Waldo Tobler must be acknowledge as, the first scientist to develop software for displaying migration flows (Slocum 1999). Since then, numerous techniques have been developed and tested in order to overcome problems with flow maps visualization.

Visualizing network flow and topology is challenging; first of all, since the movements are numerous, displaying a large number of connections with lines often results in visual clutter (Phan 2005). Then, if there is proximity among origin points and/or among destination points then the cartographic output will denounce the confluence or even overlaying, along the same axis, of different expressions or intensities of fluxes. In that case, to isolate a specific interpretation of a two point's connection would turn out to be almost impossible. These are some of the reasons why flow maps demand a lot of control on map design and are considered complex graphic structures (Dent 1999, p. 221).

A geographically centred critic is the linear linkage automatically created by most mapping software packages, neglecting the circumstances of spatial reality. Two points in space became connected, different sizes and values might infer the intensities, and arrows can indicate the movement's direction. However, and taking the example of commodities transportation from Porto to Mumbai, a straight line connection between these two seaports would cross the Mediterranean and the Middle East … So, within an historical context, especially when some historical sources allow us to create an even more precise design of commercial sea routes and maritime corridors,[9] those flows represented ought to be projected upon these pre-known routes. The same should be said about terrestrial trails: they have to embrace the same principle. A number of networks flow represent organizational aspects of the activities although at the expense of not showing actual geographical routes (Dent 1999, p. 233) and other geographical features relevant on those contexts.

Besides flow maps, a different cartographic solution may lead to the use of choropleth maps with shading or colours. Assenting with Tobler (2003), these do not actually show movement. Instead they show a change of state which is not the same thing as movement.

[9] Some interesting results obtained under the scope of DynCoopNet researches are providing us with the paths of ships on some sectors of oceans.

*

Currently, flow maps are criticised for generalization , and some authors (Raisz 1962, pp. 218–220) even classify them as cartograms. Dent (1999) would prefer to call flow maps *linear cartograms,* to distinguish these ones from *value-by-area cartograms.* But the core question remains: most of them rip off geographical aspects, namely location, in the search for a clear image. Map generalizations, displacement of nodes, purging of what is considered non-significant data (already mentioned in this paper) are some of the artifices employed.

In the pursuit of new solutions, a spatialization model applied to networks displays could be regarded as a possible answer (Frabikant at al. 2004). Doantam Phan and other Stanford team members (2005) advocate satisfactory results on visualization of flows based on hierarchical clustering to create a flow tree that connects a source (the root) to a set of destinations (the leaves). By preserving branching substructure across flow maps with different roots that share a common set of nodes this Stanford group minimize edge crossings and distort node positions while maintaining their relative position (Phan 2005).

The concept of spatialization (Fabrikant et al. 2004) that relies on dimension reduction techniques and layout algorithms to project relatedness in non-spatial data content, leads to numerous experiences on networks displaying flows. Distance-similarity metaphor coined by Daniel Montello's team (Montello 2003) using node-link displays e.g. multidimensional scaling plots, could, in fact, be an answer to visualize, in an abstract space, our merchants' networks. Based on nonmetric and non geographical references of proximity, using a network topology that avoid geotagged points, this model would allow us to visualize hierarchical, radial, or even fuzzy networks extension and even to measure the relative "distance" and "similarity" between agents (our very own target). Such model solves some of our problems, although it wouldn't fill our *commitment with* geographical *space,* since physical, financial, commercial or political geography is lost.

*

Other graphic solutions might bring interesting visualizations of movement. An inventive cartographic design approach (Kraak & Ormeling, 2003) is claimed to depict events.

Nodes as units will prevent misguided interpretations about the spatial significance of a point and will clear maps from that imperceptible, indiscernible jumble of lines that produce nothing but a conflictive and *noisy image* of movements. We have been testing and using symbol maps onto places portraying the qualitative or quantitative expressions of the phenomena combined with map design graphic artefacts to embed map with movement/dynamic that can produce readable spatial patterns (Dent 1999, p. 231). Some lines (similarly designed) could be added to map to enforce main connections and directions. This would mean that network nodes could congregate

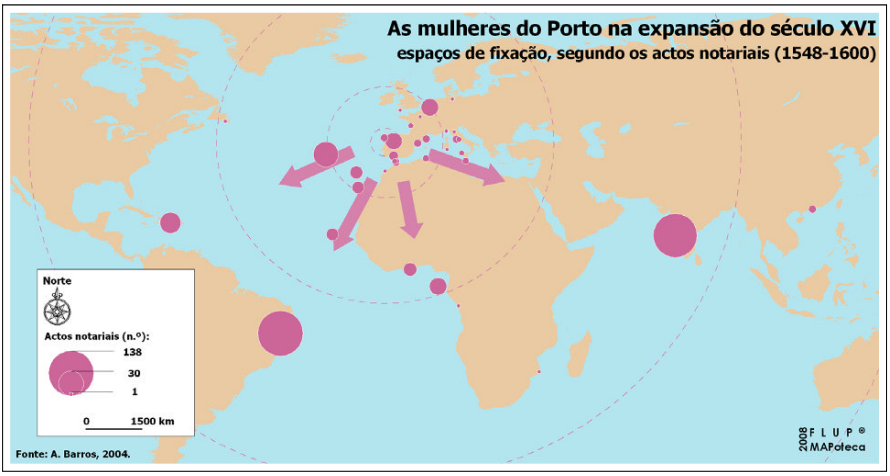

Fig. 7.5. "Porto's women presence during sixteenth's overseas expansion" (Source: Barros, 2004).

and display data and graphic information of the role they play. Spatial interaction is guaranteed even with no jammed lines, even if the mapmaker might need to create some illustrative graphic magic to confer movement to data….

Spatialization might achieve interesting results when we are trying to trace commercial contacts, to understand place hierarchies… At a cognitive level, the map-reader will even be capable of constructing a mental structured image of the phenomena *mapped*. It might even produce a cognitively adequate and aesthetically pleasant display. But, offering privileges to the geometry of position, and instead manipulating or even sacrificing the geographic location, results in the exclusion of some territorial readings and appraisal. If we address the questions: where are those places? Where are our merchants? Why are they at a specific location? then our commitment with the space will be fulfilled. This question gets additional importance and relevance if we consider the transference of attributes among space and merchants/agents.

Base maps containing geographical information (such as road systems, natural features, etc.) are essential in order to enhance space reading and explain nodal connections. Even historical maps, objects of georeferenced operations, should then be considered an important input in GIS databases; they frequently nourish crucial information for the compilation of geographical historical data and for the understanding of results obtained or tested in map. Furthermore, in a GIS georeferenced environment, operations such as overlaying different features (or even more complex GIS operations) will allow retrieval of more significant results.

Geographical space has, in fact, attributes we don't want to miss, or we risk overlooking important if not determining information. It could be essential to produce cognitive interpretations of the historical dynamics under study. Networks are

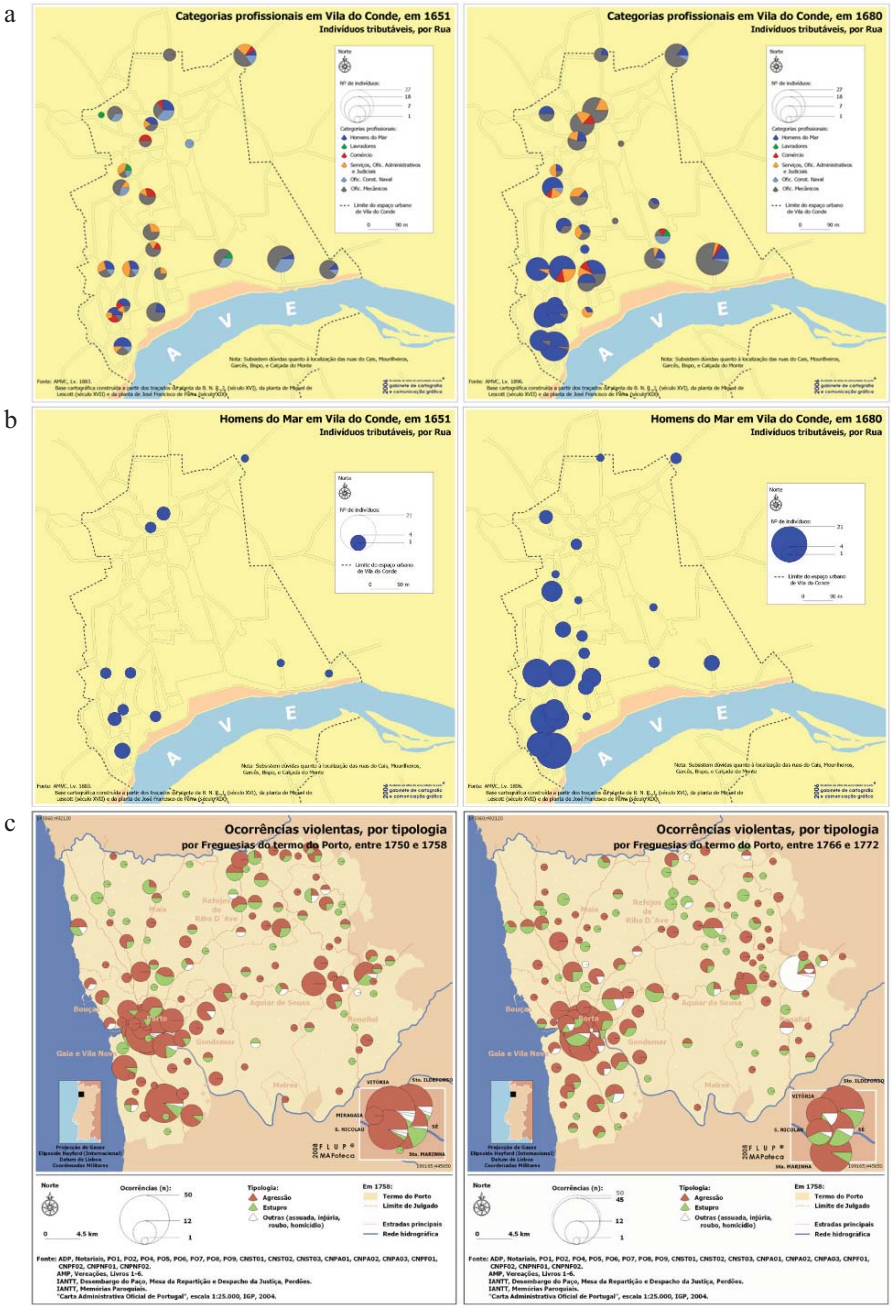

Fig. 7.6. Examples of how, even at micro-scales (urban), geographical detailed maps could prevail over cartograms and other abstractions of space: (a) "Professions in Vila do Conde in 1651 and 1680" (Source: Pereira 2006), (b) Seaman in Vila do Conde in 1651 and 1680" (Source: Pereira 2006), (c) "Violence episodes, by typology, in 1750–1758 and 1766–1772" (Source: Ribeiro 2007)

established between individuals sited in different places. Their location is strategic in order to understand their business centrality or marginality, the access to maritime routes, to financial markets, to diplomatic, political, and influential centres. Thus, we wish to map networks, not project them into an abstract space but into a concrete environment. Even if we consider that the use of geographical maps may be replaced by cartograms in a micro-spatial level of analysis, we can respond that at a local and micro scale, distribution of agents in a small village, allocation of mechanic crafts by streets; patterns of violent practices by urban areas produces relevant historical analytical insights, able to clarify, to deepen or even to create cognitive understanding of the past *(Figure 7.4)*.

GIS application to urban historical studies has the potential of building, according to Philip Abrams, the urban places as a social form in which "the essential properties of layer systems of social relations are grossly concentrated and intensified – to the point where residential size, density and heterogeneity, the formal characteristics of the town, appear to be in themselves constituent properties of at distinct social orders" (Abrams 1978, p. 10).

7.2.3 Spatial Models (Proximity and Similarity Principles) on Networks Visualization: Between Mapping and Spatialization

Despite all their celebrated potentialities, cartograms may not fulfil the analytical and conceptual historical findings' visualization requirements. From Tobler's first geography law[10] (Tobler 1970) to the cognitive version that inducted the proximity/similarity principle (Fabrikant et al. 2004), we realize that new modelling experiences have been proposed. Like the one presented by Montello (Montello et al. 2003) which states that closer things are more similar than distant things… We believe that this geographical conceptualization might not match our experience. Concrete examples may be given. If we take he case of New-Christian merchant communities, we might find that important and decisive cultural, economical, religious similarities among merchants doing business in geographically distant locations are stronger, and create more permanent and structured networks than the effective proximity to other merchant or financial groups. In fact, when we look at the merchant sociological panorama in the First Global Age, we discover that being physically distant one from each other, doesn't mean, in any moment, that they are not closely tied by strong familial and business bonds. Within these communities, cultural and religious archetypes are structural elements of closeness, despite the physical distance. If we wish to map such network connections we'll probably produce a distorted visualization of geography. Centred on a cognitive representation of human agents' proximity, ultimately we could find that Lima (Peru) is closer

[10] "Everything is related to everything else, but near things are more related than distant things"

to Medina del Campo (Spain) than Medina to Barcelona (both in Spain). This said the cognitive representation of this reality would result in distorted maps. The similarity principle would affect the proximity principle at such a point that remoteness becomes closeness.

Visualization would have to express what we intend to be a new approach to space representation. We intend to project a sociological space, an economical setting, a religious framework. Does this mean that we should avoid mapping and prefer spatialization solutions? We don't think so. Networks and connections between nodes need geographies in order to be wholly understood. The existence of trade, financial markets and business hubs, and connecting these centres with the presence (or absence) of Inquisition courts and Inquisition representatives, for instance, become central variables to be mapped. In this sense, maps are needed when one intends to understand geospatial patterns and relationships (Krrak & Ormeling 2003), because we simply can't separate relationships from spatial attributes.

In the close relation established between individuals and geography (economic, social, financial, political, cultural, and religious) another topic of discussion emerges: the reciprocal transferences between agent attributes and space attributes.

7.2.4 Reciprocal Transferences. Projections between Agent Attributes and Space Attributes

Moving on to another challenge, we would argue that mapping historical data doesn't always reflect in fact, not even regularly, real importance given to space. We usually map statistic frequencies of data, projected on some geotagged targets, without real and appropriate concern about space and its interactions with individuals or historical dynamics. This is a major problem and we have to deal with. Our database is framed by an agent based approach: we decided that our data gathering would have the economic/social agent as a base of our registers. According to this approach, space references are dependent on the agent register. In this way, we are departing from the theoretical assumption that the agent frames the space with his action. But we easily achieve the understanding that the agent is a very mobile creature: he's born in one place, marries in another, the head office of his business is in a different one, and he develops his activities in diverse places and commercial hubs. How to deal with it? How to connect an individual to a territory in this so mobile world in which the main characteristic of the networks under study is precisely the dynamism, the complexity and self-organized schemes, most of the time unruly and undisciplined? How to project the action of men and the networks in which they are main agents? Centrality and eccentricity are core issues in this discussion. A merchant who's company's headquarters are in Medina del Campo, but acts all over Europe, and takes Madrid as his main business centre must be georeferenced

to Medina del Campo? A merchant who has representatives all over Europe should or shouldn't be geotagged in relation to those places?

Let's focus on the case of seaports studies. We support that the success of a seaport as an economic centre does not depend only on its status as overseas traffic centre or as a platform for incoming colonial merchandise. Ports only make sense when set firmly within the economic fabric of their country, region, and overseas connections. For that reason, complementarities with the domestic economy and with an extended hinterland are vital as well (Polónia & Amorim 2007). And here we have a new problem to deal with: how to represent, in spatial terms, these connections, if the sources only give us mere references to the seaport and its revenues?

These theoretical insights leave us to face another decisive question: is it possible that a seaport precinct loses protagonism over time, without losing centrality? This is not a random inquiry; this was the case of some Southern European seaports, especially those of the Italian maritime republics. As harbours, they had lost prominence and status. Although traffic was dramatically reduced in those ports they did not lose their role as centres of economic growth because they still could count on their merchant communities and their ability to invest in trade activity and in flourishing international networks.They became indeed the largest and most privileged foreign "nations" in Lisbon and Seville, acting as central traders in overseas ventures (Polónia & Amorim 2007). In fact, even though Italian seaports lost centrality within the Atlantic trade complex, their merchants, bankers and capital sustained a vital position in the world economy despite that maritime marginalisation.

From a different perspective, Hamburg was an attractive hub for European agents, and business, as well as a logistic centre that provided seamen, raw materials, ships, capital and, most important, a flag to all of those who, being at war could not otherwise pursue traditional trade connections. The Hanseatic port of Hamburg was, simultaneously, an economic and financial centre, and its vitality and economic wealth depended over time on foreign capital and economic agents, even if its domestic dynamics were also critical (Polónia& Amorim 2007). How to deal with this projections and retroprojections of seaports and trade agents specificities?

What to do with the revenues of the *Casa de la Contratación* in Seville which are managed by Italian merchants? Should they be attached to Seville and the Spanish crown or be distributed, in our maps, by the Italian cities, headquarters of their business Companies? What to do with the Hamburg fleet freighted by Dutch, French, German or British subjects? Should they be summed up and graphically gathered in Hamburg, since all of them use its convenient flag, or otherwise be graphically attached to the hubs of residence of each one of the merchants that freight the ships? Answering these questions will determine the cartographic outputs and its interpretations.

In fact, we are assuming that the agents' activity defines the dynamism of one given space, but won't the converse be true? The profile of Seville as overseas head

port or of Burgos has insurance market or even Medina del Campo as financial axis and Madrid as political centre, are influential in the attraction of merchant companies and foreign communities. The fact that Lima (Peru) became the Inquisition Central Court in Spanish America was a determinant in the disintegration of the New-Christian community settled there. In terms of natural features knowing that a point in a map is a seaport (navigable or silted), accessed by river, located in a mountain or plain area, would be essential for the interpretation of the economic dynamics and level of activity of the networks established there (Knowles 2002). In the same line of thought, the presence of a bridge, being on a crossroad or in a local regional or overseas harbour becomes determinant. This means that the spatial characteristics can as well be influential on the constitution, density and topology of merchants' networks.

Understanding this reciprocal interaction between agents and space, led us to conceive space itself as an entity, and conferring it the same status as the individuals. Proceeding to the *identification* of space with a place name; *location* (with a geotagged reference), *attributes* (geographical, economic, social, religious …), and its *functions* (as a financial market, a fair, a seaport, an insurance centre …) and *connections,* space will be taken as a central protagonist of our story. This perception will enable us to cross agent activities with space features; then to discuss the intensity and permeability of social agents and space interactions. We are now far away from the simple and wise aim of visualizing trade and social networks in space… even if we don't give up on it…This starting point will lead us to two major challenges: the first, related to the graphic semiology needed to expose and read the attributes of space; and then a second one, related to the potential of data retrieval. Based on this scheme, GIS tool could be maximized through spatial equations and modelling able to (re)built historical knowledge of realities of the First Global Age. From documental corpora semantics to mathematical modelling a long and difficult path has to be completed. Open debate will enable some problem solving …

7.3 Conclusion

As historical questions drive a significant part of the inquiry of the DynCoopNet project, we are simultaneously conscious of the permeability between historical and geographical approaches as an essential methodology to follow. The bulk of evidence, or the evidence that provides the study's key analytical framework, is structured and analyzed within one or more databases that record both location and time.

If there's no doubt that geographical information provides a good share of the historical evidence, it's no less true that historical dynamics provides a good share of geographical evidence. And if geographical information systems are an indis-

pensable tool to gather, structure and analyse geodata, the academic community involved in spatial studies, specially the ones dealing with historical data, must be aware of the historical data implications and limitations that can obstruct the most ambitious projects. Authors present key historical arguments in maps, particularly maps that visualize previously unknown or unexamined spatial relationships or patterns of change over time. This amplifies our responsibility as mapmakers; conscious of the capability of maps – documents themselves – to capture readers attention with such graphically powerful spatial message and influence their mental construction and conceptualization of territorial structure and organization on the one hand, and the originality and rarity of these themes on a map on the other; every single point, line or area we draw is a legacy to future readings of the past.

We strongly believe that diversity among geographic locations constitutes an aspect of the system's complexity, which requires a strong commitment to the geographical context and georeferenced data in order to analyze geographic contexts and understand connections among places.

Maps might be assumed to be key documents to visualize those spatial relations.

Space and time are core elements of the research work we are developing. More complex relations are established by the mutual and reciprocal connections between individuals, geographical and historical contexts. The three of them are entities of a system and their attributes define and are defined by each other. The cognitive apprehension of these interactions is based on complex models, which some are pre-established, and others are subject to an accurate trial in progress.

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Chapter 8

Evolution of Digital Map Libraries towards Virtual Map Rooms: New Challenges for Historical Research

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Abstract

Over the past two years the number of initiatives and projects in the field of Digital Map Libraries (DML) have greatly increased. The aim of many of these projects is to uncover methods and methodologies that enable people to access old maps through geoportals and to thereby link the cartographic collections held in different libraries and archives. It is forseen that the geographic component of maps that will be common and enabling link to such integration of collections. The remote access capability of web located resources through optimized searches has had a great repercussions for both researchers and the academic world. In addition, to a new type of work practice for the map librarians, based on the online cataloguing and geo-referencing, there will also be significant impact on the map artefacts themselves. For example such a shift in collection access will particularly impact collection safety and preservation, preventing manipulations, damage, deterioration and thefts from happening. This paper describes the state-of-the-art DML initiatives, emphasizing their technological evolution within the new institutional framework. From the results obtained, a new generation of Virtual Map Rooms is presented for the integrated access to the Spatial Data Infrastructures (SDI) thanks to the design of new crosswalks between geographic and bibliographic metadata profiles. Moreover, new analytic and online geo-processing tools will be developed, thereby supplementing the present-day digital access to the entire cartographic heritage with a new query and work virtual space.

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8.1 Introduction

The digital management of geographic information is relatively nascent and further advancement is expected in response to the development of a 'new society' based on geographic knowledge. The Internet is fundamental to this, and it is a powerful tool that enables different online communication options for geographic approaches to knowledge and information.

Historians and documentary experts are not exempt from this rapid change in practice and increased focus on geospatial data, as such they are increasingly seeking remote access to vast amounts of information that can be compiled in a single place to facilitate access and comparison within their broader areas of investigation. Ths increased activity has many implications. For example cultural institutions are making certain deals and taking decisions in order to access information in a new way, as well as across the environmental field resulting in developments such as the INSPIRE Directive. Conseuently these groups have established a number of well-defined international standards, and they have assembled catalogues using similar data harvesting techniques that will enable them to search geoportals provide tools in order to visualize, explore and download information.

The aim Digital Map Libraries is to provide access to old maps through a single geoportal with distributed access to thousands of maps stored in the cartographic collections held in different libraries and archives, whilst maintaining the geographic component as a common link. Traditionally old maps were reserved to people with very specific interests, but now geographic technologies are helping the whole society to easily re-discover old cartography.

The IFLA Geography and Map Libraries Section (2008) has taken into account the many changes that have occurred since that time in the structure and operation of map libraries and collections. This perspective is supported in their Strategic Plan where it states that they seek to create a Virtual Map Room with information from a world perspective for all aspects of map collection to updating the world directory of map collections.

This paper describes the evolution of Digital Map Libraries (DML) until now, stressing the challenges in the design of the next generation of Virtual Map Rooms.

8.2 Early Initiatives

There have been several cooperative projects which aim to facilitate the widespread distribution of historical cartographic collections on the Web held in various national and international institutions through geographic localization tools. It is the case of

Fig. 8.1. AfriTerra Project 2002, viewed November 2008, http://www.afriterra.org

the AfriTerra Project (2002), a large archive of 10,000 maps and historical books of the African continent in the Web, the purpose of this project is to create a site to share the study of this peculiar type of cartography, mixing art, science and history in a single portal *(Figure 8.1)*.

The DHM – Digital Historical Map (2001) was a European project that developed an interesting methodology to present the cartographic collections of various institutions of Sweden, Denmark and Germany through the Internet by visually referencing the region they represent *(Figure 8.2)*.

The Digital Archive of Portuguese Urban Cartography (2002) is another good example of cooperative project among different national institutions, including adequate tools of cataloguing, search and historical cartographic visualization with modern cartography *(Figure 8.3)*. Large scale plans and maps only combine with a very small scale present-day cartography, although good enough for the thematic of the maps.

Scientific advances are made through international, informative forums and meetings in which these new technologies, as applied to historical cartography, are presented and discussed. The Electronic Cultural Atlas Initiative (2001) is certainly the most relevant, followed by the recently created Commission on Digital Technologies in Cartographic Heritage (2007) belonging to the International Cartographic Association. Besides, many visualization tools and digital technologies have been developed, such as the TimeMap OpenSource software (2001) from the University of Sydney. This tool allows for the sharing of historical information through clearinghouses which store Dublin Core-standardized metadata, these

Fig. 8.2. Digital Historical Map Project, INFO2000 EU Programme, viewed November 2008, http://www.dhm.uni-greifswald.de

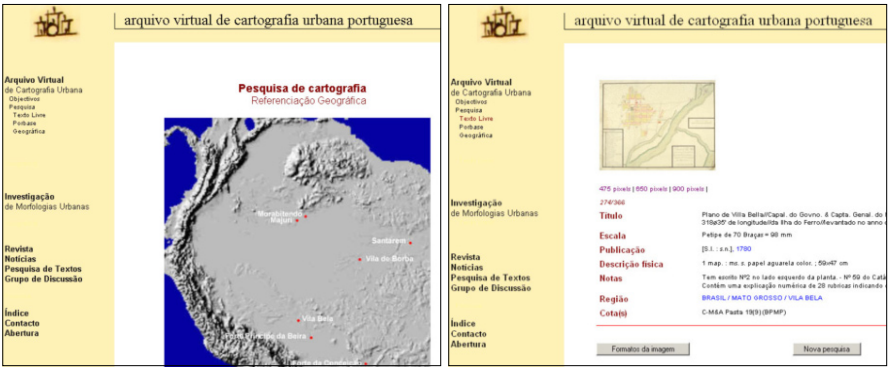

Fig. 8.3. Digital Archive of Portuguese Urban Cartography Project, Arquivo Virtual de Cartografia Urbana Portuguesa 2002, viewed November 2008, http://urban.iscte.pt

include interesting visualization tools specifically devised to relate spatial and temporal information *(Figure 8.4)*.

In addition to these are also international organizations gathering together map library professionals who could support the setting up of discussions and exchange of knowledge and policies to follow in the acquisition, conservation, cataloguing and dissemination of public cartographic collections (LIBER, TEL, ISCEM, etc.).

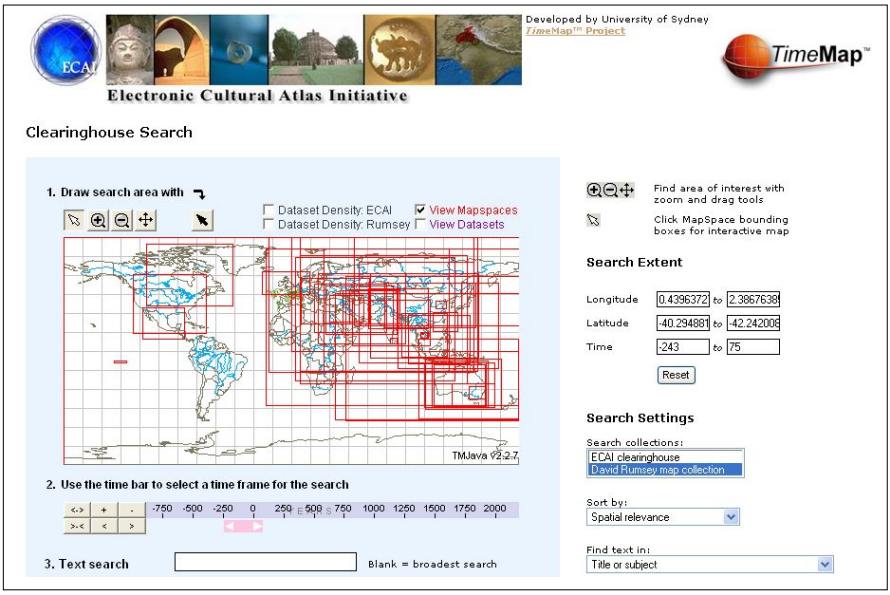

Fig. 8.4. TimeMap Opensource 2001, University of Sidney, viewed November 2008, http://www.timemap.net

8.3 Considerations in Digital Map Libraries (DML)

With such a diverse range of projects and portals under development, it would seem useful to have a tool that allows for remote access to a GI repository from a single website. This solution would facilitate access to information and the comparison of some documents located in different servers, providing access to collections through the creation of cataloguing and visualization Web tools. Therefore, there is a need for ensuring access to all available information remotely through a Digital Map Library (DML) abiding by the Spatial Data Infrastructure (SDI) guidelines.

There are useful and basic similarities between the global reality of an SDI as a distributed geoportal and a DML. These include conformance to standards (e.g. geographic metadata: ISO 19115 (2003), Dublin Core (2003)); agreements (e.g. local, regional, national or international level; INSPIRE Directive (2005)); and services (e.g. Open Geospatial Consortium (1994): Web Map Service, Web Feature Service, Catalogue Service on Web, etc).

Spatial Data Infrastructures need not only be metadata, data sets, spatial services and interoperable technologies, but also include agreements to share information, whilst also coordinating and monitoring the processes. There are a number of technological and policy considerations that need to be taken into account apart from the characteristics common to all SDIs in any thematic field. Thus, cartographic

heritage contained in the DMLs stands out as an exceptional case within the generic frame of an SDI. (Fernández-Wyttenbach et al. 2007)

Maps catalogued in libraries are usually described according to generic bibliographic metadata schemata such as the MARC standards (1980) (UNIMARC, MARC21, IBERMARC, etc.). They are not always comprehensible by traditional geoportals which use geographic standard templates, and as a result, it is necessary to define the appropriate gateways for these descriptive profiles to be interoperable among themselves.

Undertaking the publication of historical cartography on the Internet via SDI entails securing a crosswalk between the MARC and the ISO 19115 format. Governmental initiatives (Montaner 2009) and methodologies (Nogueras-Iso et al. 2004) have already been described, by getting rid of the use of some successive chains between crosswalks since an inordinate loss of information may occur along the different steps.

The risk of deformation to documents of historical interest against the advantages of their publication together with other data in the Web must be taken into account during the geo-referencing process. This includes consideration of the distinct kinds of users which will utilize cartographic collections for different purposes. However, in the case of massive access to information, this geo-referencing is also intuitive and easy, even for non-skilled map librarians to carry out. Consequently, in a specific geoportal in cartographic heritage, some usability recommendations should be taken into account when designing navigation browsers in the Digital Map Libraries (Fernández-Wyttenbach et al. 2008).

The use of multilingual thesauri and gazetteers, which support metadata creation and the development of ergonomic search interfaces for data and service catalogues is necessary. They may be used during metadata automatic indexing as a term is related to a geographic extension. (Pedrosa et al. 2008)

8.4 Online Projects

Some specific experiments have been carried out in this field, where the aim has been to include the DML services in a local SDI prototype. In the case of the DML of the Canary Islands, (2006) the creation of an Internet portal with access to a Map Server and a catalogue containing the scarcely accessible historical maps and plans of the Canary Islands was studied in depth. Visualization and query tools were used from standardized OGC Services (WMS, WFS, CSW), allowing visualization and comparison of any maps as well as access to their metadata *(Figure 8.5)*.

An initial approach to visualization methodology consists of working with the approximate coordinates of the map corners (bounding box) or just a point in the

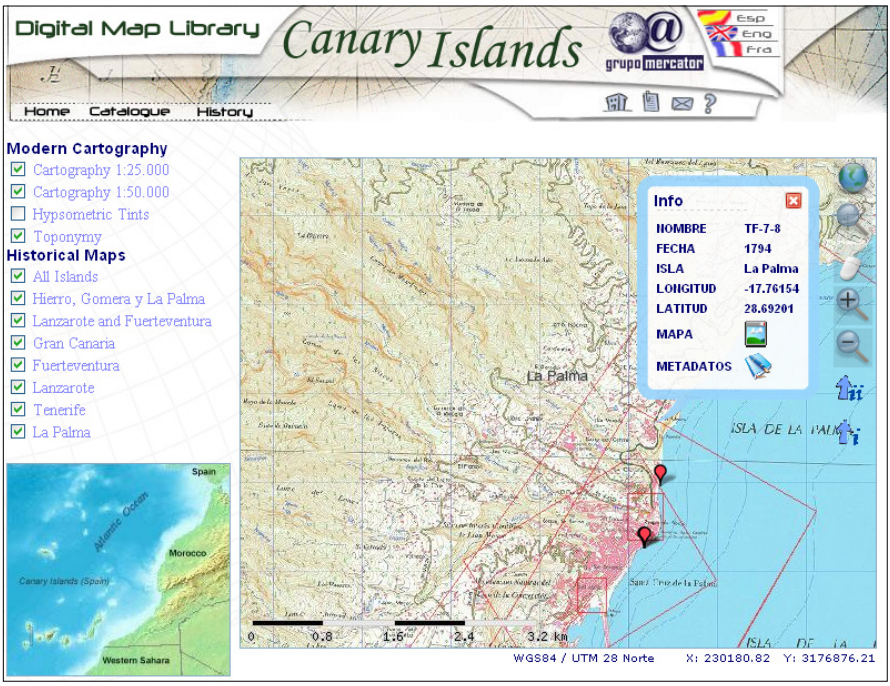

Fig. 8.5. Digital Map Library of the Canary Islands 2006, Technical University of Madrid, viewed November 2008, http://www.digitalmaplibrary.org

Fig. 8.6. Pop-up window to browse through an old map, Fernández-Wyttenbach, A, Ballari, D & Manso-Callejo, M 2006, 'Digital Map Library of the Canary Islands', e-Perimetron: International Web Journal on Sciences and Technologies Affined to History Of Cartography and Maps, vol.1, no. 4, pp. 262–273

Fig. 8.7. Browsing through the distributed European Libraries with DIGMAP tools, DIGMAP Project 2006, ECP-2005-CULT-038042, Programme eContentplus, European Commission, viewed November 2008, http://www.digmap.eu

case of large scale plans. This application allows different types of search with the approximate contour of each map and over the cartographic base *(Figure 8.6)*. (Fernández-Wyttenbach, Ballari, & Manso-Callejo 2006)

DIGMAP (2006) (Discovering our Past World with Digitized Maps) is a project co-funded by the European Commission, it was completed in November 2008.

The information sources for this project consist of catalogues and digital libraries of the project partners, public OAI-PMH data providers (1999), gazetteers, and any other relevant source of information available in the Internet. The information architecture followed open data models, namely those already defined or to be defined by the OGC – Open Geospatial Consortium, IFLA – International Federation of Library Associations and Institutions, as well as other relevant international organisations. The software solutions produced were to be reused in other digital libraries, for standalone services, or as components integrated with other digital libraries (Borbinha et al. 2007).

The metadata of the collections harvested, and the descriptions created locally, can be post-processed for consolidation and enrichment. This enriched metadata is then used to provide sophisticated browsing and searching services projecting the maps in the geographic space they cover *(Figure 8.7)*. Within the DIGMAP project, a geo-temporal Web gazetteer service provides access to names of places, historical periods, and associated information. Moreover, this assists in the recognition and disambiguation of geo-temporal expressions over text, as well as in

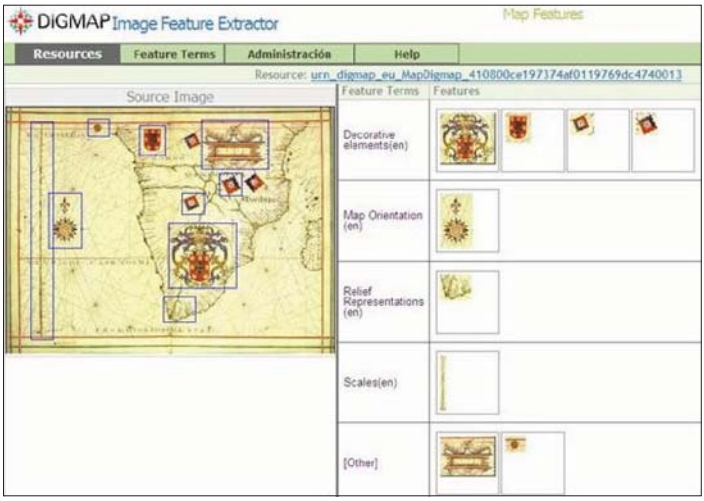

Fig. 8.8. Automatic feature extractor for map iconography developed by DIGMAP, Martins, B, Manguinhas, H, Borbinha, J & Siabato, W 2009 'A geo-temporal information extraction service for processing descriptive metadata in digital libraries', e-Perimetron. International Web Journal on Sciences and Technologies Affined to History Of Cartography and Maps, vol. 4, no. 1, pp. 25–37

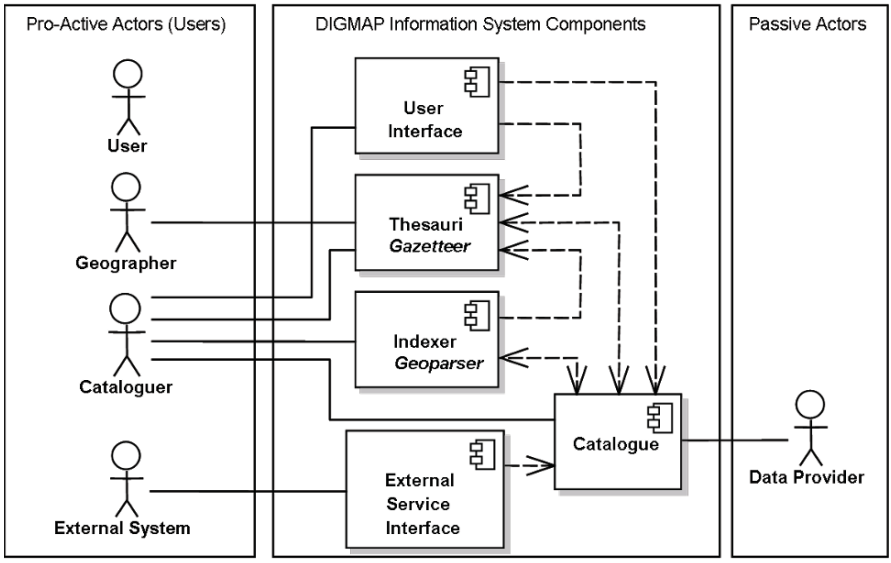

Fig. 8.9. Overview of the DIGMAP environment, Borbinha, J, Pedrosa, G, Gil, J, Martins, B, Freire, N, Dobreva, M & Fernández-Wyttenbach, A 2007, 'Digital Libraries and Digitised Maps: An Early Overview of the DIGMAP Project' in Asian Digital Libraries. Looking Back 10 Years and Forging New Frontiers, Lecture Notes in Computer Science, vol. 4822/2007, ed. Springer, pp. 383–386.

resource searching and indexing (Martins et al. 2009). It is also possible to create descriptions of new resources in DIGMAP through a specialized editor, which is especially relevant for isolated on-line pagers or images; and afterwards, to process images of digitized resources to extract relevant iconographic information. This last functionality is particularly attractive for emphasising peculiar contents existing in old maps *(Figure 8.8)*.

This deployment model *(Figure 8.9)* is expected to help both the promotion of cartographic resources and the global collaborative policies for reference, description, cataloguing, indexing and classification of ancient maps. In this sense, the project is fully aligned with the vision "European Digital Library" as expressed in the "i2010 digital libraries" initiative, of the European Commission; further known as EUROPEANA (2008). Finally, DIGMAP pursue the purpose to become the main international information source and reference service for old maps and related bibliography.

8.5 Towards Virtual Map Rooms

Virtual reality is a field of computer graphics derived from the visionary work described by Sutherland 40 years ago (Sutherland 1965). It was then suggested that a screen should be considered as a window upon a virtual world, a challenge put forward for research workers in that field. Therefore the challenge was that this world's representation should be as close as possible to the reality surrounding us, not only in its physical aspect, but also including characteristics such as sound, response and interaction capability, even reaching a level of perception of reality such as we know it.

Nowadays we could even talk about smell perceptions if experiments were conducted using transport protocols specifically designed to that aim ('Virtual Reality Conquers Sense of Taste' 2003). At this level of detail map librarians would not appreciate any difference between an old map held in the map cabinet and one of the virtual map library, when recognizing the same smell. If a representation of simulated reality is achieved at this level of detail, an active participation could be ensured in a virtual environment in which every user could undoubtedly recognize the reality he/she is used to.

At this point it is convenient to establish the difference between immersive and non-immersive environments. As connoted by their names, the former enable the user to feel completely surrounded by the objects making up the environment, wherefore the user has to count on additional elements such as headsets, gloves, mechanical arms and other external accessories allowing the user interaction with the virtual elements. The latter bring forward a representation of reality in which the

user relates to the environment as a mere watcher with possibilities of change and/or interaction. Which of these approaches is selected will depend on the aim of the project for which a type of environment is chosen for implementation; the scope and possibilities of each are well defined.

In the case of virtual map libraries, a non-immersive environment should be adequate. At present the hardware and software technology is sufficiently developed for implementation of either type with high quality features. The immersive systems involve a greater cost of implementation and utilization than the others. In most cases the representation of reality and the interaction with it is enough.

8.6 New Concerns and Ideas

Such new approaches bring with them new questions and concerns, for example the interaction between users and the control of the resources that will make up the map library. If a database is queried, the record will be available for new queries and it will be replicated in views as many times as requests were made; likewise the map may be replicated in the system and could be examined as many times as necessary. As may be realized, it must be taken into account that modelling a reality as a virtual environment does not necessarily follow the same parameters as the conventional data access systems; the virtual environment should provide the avatar (i.e. virtual user) with tools, elements and interfaces in order that it can interact in different ways with the virtual system and resources.

The interaction problem begins with the data access and it continues when the data are shared: could a user display a map to another visitor and start a discussion about it? The answer should be yes, since in reality it is an entirely possible action. And considering a map librarian, what professional background should he need to catalogue virtual resources? A broad range of results are possible, however, as is the case for every model, reality must be outlined and framed in order that the result will be viable and functional.

Sometimes taking advantage of already defined virtual spaces may be the solution. The David Rumsey Historical Map Collection (2003) is a pioneering repository of over 18,460 online maps, which examines history from a uniquely geographic outlook; an example worth mentioning is the 100 maps that can be visualized, from the famous cooperative Google Earth 3D Globe Project (2006) *(Figure 8.10)*.

This year David Rumsey's antique maps feature an innovative build in the virtual world: "Giving Maps a Second Life with Digital Technologies" *(Figure 8.11)*. Visitors can view maps, and receive free maps and other digital souvenirs. They can toggle between 2D, 3D and globe displays. (Naone 2008)

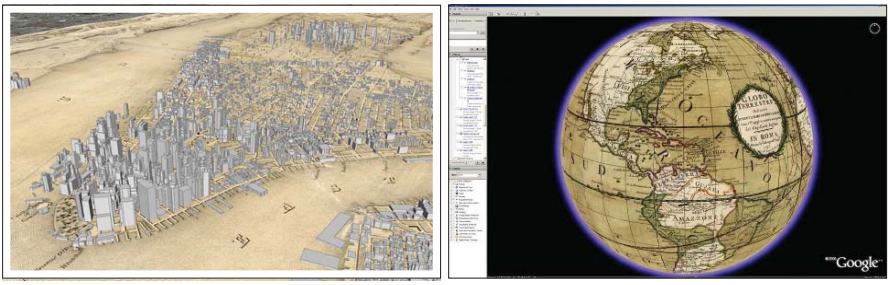

Fig. 8.10. Historical map application in Google Earth 3D Globe. David Rumsey Historical Map Collection 2003, viewed November 2008, http://www.davidrumsey.com, Google Earth 3D Globe 2006, viewed November 2008, http://earth.google.com

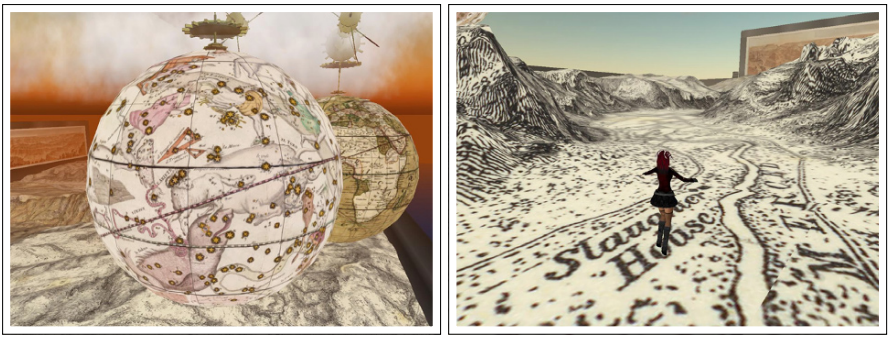

Fig. 8.11. Rediscovering David Rumsey collection through Second Live 3D virtual world (Rasmuson 2009). Rasmuson, K, Collection: Travels in Second Life. Rumsey Maps, Flickr®, viewed March 2009, http://www.flickr.com/photos/karasmuson/sets/72157603878007925/, Second Life® 3D virtual world 2009, viewed March 2009, http://www.secondlife.com

8.7 Conclusions and Future Work

Considering the study of the initiatives carried out so far, it may be assumed that it is necessary to fuse together many of the ideas that have been developed separately (distributed access, tools for query and analysis, geographic navigation, virtual spaces …) and where possible to improve them.

In Spain the CartoVIRTUAL Project commenced in November 2008 with the aim of creating a specialized virtual map library within three years, with OpenSource searching services and access to historical content. The developments of DIGMAP will be part of this, thereby providing solutions for the Spanish map libraries with the purpose of promoting the cartographic heritage and supporting research as well as library and document information systems. Beyond the distributed access to all resources and the simple visualization, the project intends to provide new virtual

tools for the analysis and query of documents, favouring the safekeeping of documents and restricting their physical access. As such, a method will be sought for the digitization, geo-referencing, cataloguing, publishing, querying and visualization of historical cartographic documents within the historical map libraries through the Internet.

This project intends to design a methodology and develop a prototype for a distributed virtual historical map library, that has the advantages of real map libraries, is based on advanced online measurement and geo-referencing tools (Jenny, Weber & Hurni 2007) integrated into a virtual environment, whilst providing the capability of comparative analysis between two or more maps. To that end, the project will take advantage of the Open Geospatial Consortium and SDI services, the direct crosswalks developed between geographic and bibliographic metadata profiles, and the dissemination and advancement of forums of interest.

The resources come from the various map libraries of the IBERCARTO Working Group in Spanish-Portuguese Map Libraries Consortium (2004), which is made up of 40 map libraries from Spain and Portugal. The aim is to bring together all professionals working in public institutions -such as libraries, archives and universities. The main objective will be the step-by-step incorporation of all map libraries from local facilities through the acquisition, conservation, cataloguing and dissemination of cartographic collections.

Once viability is ascertained, the project will move towards the creation of an institutional prototype of a national virtual map library; this will be a geoportal providing access to the Spanish historical map libraries, museums and archives. This portal will offer different possibilities, licenses and measurement tools in keeping with every user profile – scholars, research workers, professionals or just amateurs.

The success and sustainability of the project will depend to a great extent on the strategy of awareness through the forums of interest and channels of scientific dissemination. In addition, human qualification programmes will have to be designed for the establishment and maintenance of a virtual map library. Finally, the last step will be taken towards Latin America, with the furtherance of a Latin American Association of Historical Map Libraries along the lines of IBERCARTO, allowing the development of the necessary policy in order for these virtual environments of query, analysis and massive access to steer a course to new horizons.

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Chapter 9

Information Architecture of the "Cultural History Information System of the Western Himalaya"

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Abstract

The *Cultural History Information System* (CHIS) project, one of seven sub-projects within an Austrian National Research Network research project, was designed and built to perform as a collaborative spatially enabled system for archiving, analyzing and visualizing datasets of the cultural history of the Western Himalaya from the 8th Century. The design and implementation of CHIS followed a user-centred development approach. The concept of Information Architecture (Wodtke 2003) was used to structure and order content and functionalities to achieve both high efficiency and usability of the system. This paper describes the basic considerations as well as the procedural steps of the design and development process of CHIS.

9.1 Introduction

As part of the research undertaken within the overall National Research Network project the *Cultural History Information System* sub-project, through working with the interdisciplinary aspects of the various partner projects involved, strived to apply a more holistic view on the overall cultural history of a wide region (including Afghanistan, Pakistan, India and China). The aim was to achieve this by using cartography both as a fostering as well as associative factor.

One of the most important tasks of modern cartographic visualization is the distinct and transparent presentation of digital data, the intuitive design of tools and the possibility of interaction with the user. As well, there are other aspects that have

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been identified as demanding further research. For example, in 2001, Kraak defined three major objectives for the future of cartography:

- Tool development;
- Geospatial data access; and
- Effectiveness.

In recent years, online mapping applications have shown an increase usage. As well, the dimensions of Internet map use have expanded from simple clickable graphics to interactive, ubiquitous cartographic information systems (Peterson 2007).

In traditional cartographic terminology, an atlas is defined as a target and purpose oriented systematic set of maps in the form of a book or as a screen presentation (Bollmann et al. 2002). This principle also applies to the development of an online information system with strong cartographic focus, such as the example discussed in this chapter – CHIS.

A clear separation has however to be made to distinguish Geographic Information Systems (GIS) from Cartographic Information Systems (CIS). Geographic Information Systems (GIS) and Cartographic Information Systems (MMCIS) handle geographic information. They deal with maps and can be operated in an online environment. Whereas a GIS enables the capturing, modelling, manipulation, retrieval, analysis and presentation of geographic data, the emphasis of a CIS is primarily on the high-quality presentation of these data. Likewise, a CIS often refers to a certain area or topic in conjunction with a given purpose and has an additional narrative faculty (Ormeling 1995). A CIS pays more attention to the design of the visualization of geoinformation and offers both high cartographic quality as well as a user-friendly interface. GIS are becoming increasingly user-friendly, but technical training and expert knowledge are still needed for spatial data operations.

Various conceptual factors are essential for the implementation of a Cartographic Information System. Especially the planning of the overall structure of content and interactivity of the product needs to be noted.

Taking into consideration the differences between a GIS and a CIS, basic requirements for a Cartographic Information System have to be considered. Among the most important differences are seen to be:

- High quality cartographic representation;
- Pre-processed information;
- Processing and manipulation of topographic and thematic data within defined usage limits; and
- Interaction possibilities.

Cartographic online products are regarded as digital tools for the cognition of geoinformation. Online products in the field of geo-information and cartography show some remarkable differences to printed maps. Its usage is an (inter)active process,

presenting the user more than static maps by offering a whole information and visualization environment.

The visualization of digital information as well as the provision and design of tools are the most important targets of such an application. Suitable measures and propositions for the implementation of these tasks have to be considered as well as the evaluation of functionality within an interactive cartographic application.

The optimal solution however seems to be to combine the benefits of a CIS with GIS-like functionalities, hidden under the user interface surface. The basic objectives of a CIS can therefore be describes as following:

- Online geo-oriented information system;
- Map-centered;
- Multimedia content;
- Search capabilities; and
- Strict object hierarchy and structure

From the users' perspective, when working with a CIS, the aspect of information is at the centre of attention. The workflow of mostly inexperienced users is not as structured, compared to experienced users working with a GIS. Questions are posted randomly, so interaction and navigation has to be simple and intuitive. Individual analysis is of minor importance. Information has to be pre-processed and appropriately formatted to ensure efficient information retrieval.

This approach demands specific system requirements. They must:

- Be easy to follow and intuitive workflows, linear information structure;
- Provide extensive search functionalities;
- Generate replies to individual enquiries;
- Allow the system to be used as reference; and
- Display information primarily as simple thematic maps.

Transferring the above mentioned requirements into the definition of specific objectives was the primary goal of the initial phase of the CHIS development process. On the software side, the strategy needed to be translated into content through the creation of functional specifications: a description of the feature set of the product. On the information space side, scope takes the form of content requirements: a description of the various content elements that will be required. The questions to answer were: 'What are we building?', 'What are we not building?' and 'What resources do we need to build it?'. Defining the scope of functionalities and content through precise objectives was essential to fulfil all necessary prerequisites of the application.

9.2 Objectives of the Cultural History Information System

The basic idea of the *Cultural History Information System of the Western Himalaya* was to create an information system of the cultural history of the Western Himalaya from the 8th century. In its strict definition, a geographic information system is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth (Burrough et.al 1998). In this special case, the CHIS system is intended to not only remain on this level of workflow, but enable the user to retrieve answers and thereby use the system for active research purposes. CHIS is not intended to replace and/or change the common and approved working methods of those domain experts using the system, who are mainly from a cultural historical discipline. In fact, CHIS aims to be a platform to assist in information gathering and provision for domain experts.

The design and implementation of CHIS followed a user-centred development approach. The concept of Information Architecture (Wodtke 2003) was used to structure and order content and functionalities to achieve both high efficiency and usability for the system.

9.2.1 Target Group Definition

A series of interview rounds (Kinberger 2007) were undertaken to identify potential target groups and their needs. Possible user scenarios were established to simulate the users' workflow. Very in the development it was decided that CHIS would focus primarily on two target groups:

- Cultural Historians: Experts working in the field of Tibetan cultural history and associated fields. These users will be seen as the CHIS core target user group, represented by members of the National Research Network project partners.
- The general public: The system must however be able to give an informative overview to the general public, by delivering pre-processed information. For this purpose, the information incorporated must be prepared by experts, both cultural historians and cartographers.

Further conceptional steps of the development of CHIS would focus on serving these two target groups.

9.2.2 Content and Functional Scope

Following the definition of the users of CHIS, the basic and fundamental functional scope as well as the content of CHIS was defined. At a very coarse level the system has multiple tasks, among them the most essential being:

- Information storage;
- Information management;
- Information display; and
- User interaction

These basic tasks had to be linked to the special prerequisites of the target groups. Besides gaining a better appreciation about the way the different project subgroups work, the following essential questions were asked during the project partners' interviews:

- What are the questions, you would like to answer, utilizing the CHIS? and
- How would you like to address information within the CHIS?

The answers led to three basic statements:

- Where are particular objects?
- Is there a spatial or thematic relationship between these objects? and
- Are there other objects within a certain distance?

These three statements had a clear connection to the use of geographic information, which resulted in a set of functional objectives:

- Geographic information context is the core issue of the overall system;
- Graphic visualization, in form of maps or other cartographic representations will be in the conceptual center of the application;
- All user actions results in a graphical visualization of the information retrieved.

Most of the information used in CHIS was already known and already widely used by domain experts. The goal of CHIS is therefore not to create "another" archive of cultural information artifacts, but to provide new tool that would assist in achieving different insights into data already collected and additional data that would be collected in the future as part of on-going research.

Following the general objective of a CIS, mentioned in the introduction, the specific content and functional scope objectives of CHIS can be described as being:

- An online geo-oriented information system:
  CHIS is an online application, based on a three-tier system architecture, consisting of a back end database(s) layer, an intermediate application layer and a graphical front end. CHIS will utilize both locally-stored information as well as connect to external data sources. The additional functionality that CHIS provides compared to existing information systems is its extensive use of geographic information to underpin all other data elements.
- Map-centered:
  All objects stored in CHIS have a spatial component. This objective is not only necessary for the presentation, but also for simple analysis methods (e.g. point-

in-polygon, distance measurements). CHIS is a map-centered system. The map functions as an interface to the underlying information. All query and search results are displayed directly on a map. Special focus within the implementation of CHIS is on creating a series of high quality topographic base maps. These function as both a reference and an underlying layer for all visualization requirements. Maps in various scales – ranging from small-scale overview maps to large-scale plots of things like temples or villages – were developed and integrated into the system.

- Multimedia content:
  CHIS involves several external data sources (mostly those of project partners). These sources offer a wide range of different multimedia content, such as pictures, audio and videos files. Most of the artifacts in CHIS are stored along with these multimedia files.
- Search capabilities:
  One of the major benefits of a digital information system is its capability to retrieve information by querying available data. The information in CHIS is stored in a network-like structure. This enables the user to perform enhanced search procedures, not only by thematic, but also by geographic context. Search procedures can be performed at different levels of granularity and/or combine different dimensions of the information space.
- Strict object hierarchy and structure:
  The data structure of CHIS was designed with due consideration of a clear and strict hierarchy of the objects that would need to be stored. Although CHIS is not strictly an object-oriented system, all information items were stored as objects along with their respective metadata. Objects can be ordered, structured, linked to each other and put into a hierarchy. By this approach, objects are logically connected to each other. This is essential for information management and retrieval.

Objects are stored by their status as well as associated parameters. These parameters function as metadata of the virtual representation of the real object. Queries within CHIS always search the metadata. Virtual objects are linked against each other via their metadata parameters.

All objects in CHIS must have a spatial and temporal indicator. A series of thematic parameters are included with these two basic parameters,. It was deemed to be essential to homogenize these parameters among all object categories to avoid system incompatibilities.

Graphic visualization, in form of maps or other cartographic representations is at the conceptual centre of the application. Graphic visualizations are present in the form of a basic map window, as well as other map displays throughout the system (e.g. map thumbnails).

All user actions results in a graphical visualization of the information retrieved. As previously mentioned, maps and other graphic visualizations are the output of any user interaction. This concept was reinforced by feedback received from the participants in the preliminary interview rounds.

9.3 Information Architecture

Unlike many existing examples of digital information collections in the field of cultural heritage, the CHIS puts great focus on the two main characteristics of geodata – space and time. This resulted in a system that is able to connect the stored items based on a variety of parameters (contextual, spatial and temporal). The special challenge of this project was to bring different data sources together to facilitate a holistic view of the information. Apart from overcoming technical obstacles to develop the product, the overall homogenization and generalization of the heterogeneous information items was crucial. The (carto)graphical visualization of all available information is the central theme of the system information architecture. All information items are connected via a centralized mapping representation, giving the user the ability to understand the connections between objects in an efficient and holistic way.

The CHIS information architecture was built as a three-layer architecture *(Figure 9.1)*. The basis of the system is the "Information archive layer", holding all objects raw data, along with its metadata. Built on this base, the "Preprocessed views layer" offers the user the possibility to retrieve pre-processed and pre-defined information. As the top level, the "Target application layer" focuses on thematically and/or geographically limited solutions. The CHIS can be regarded as an information portal, comprised of the sum of the individual layers.

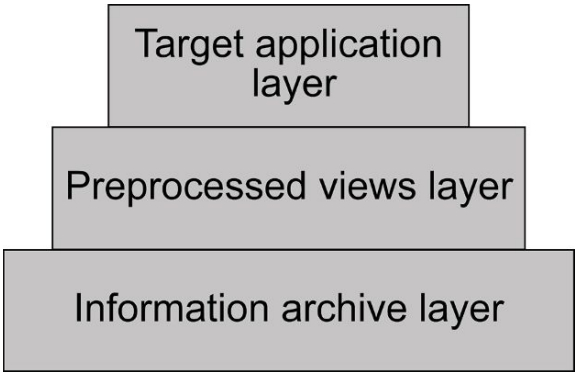

Fig. 9.1. Three layer information architecture of CHIS

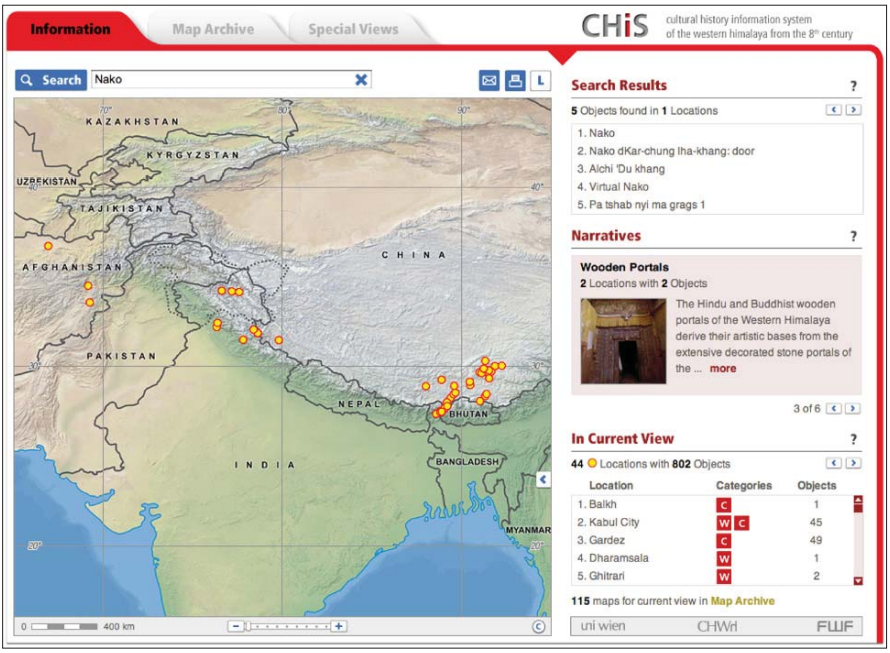

Fig. 9.2. Portal site of CHIS, source: http://www.univie.ac.at/chis

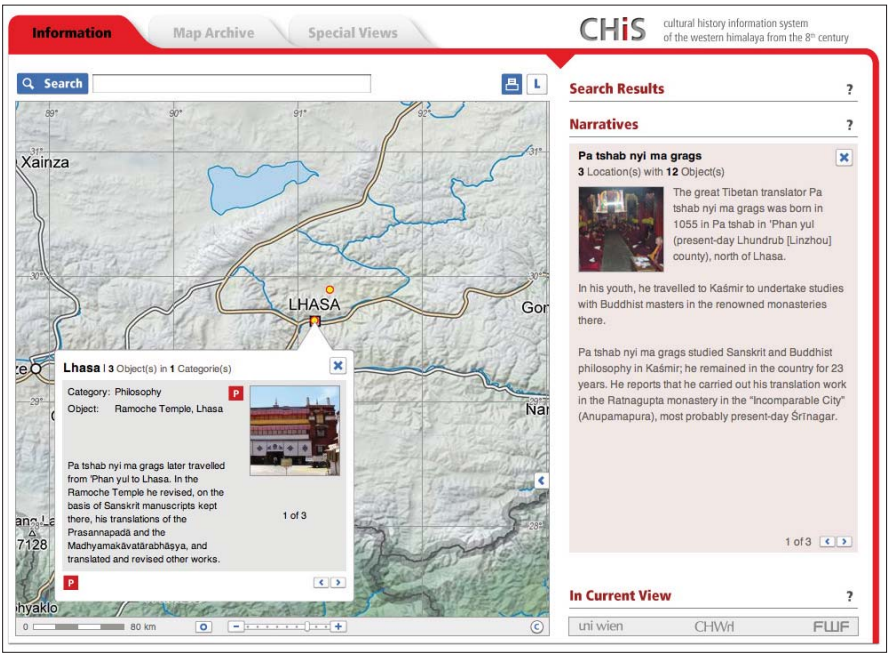

Fig. 9.3. The narrative principle within CHIS, source: http://www.univie.ac.at/chis

9.3.1 Information Archive Layer

The term ‘archive’ is defined as being a “repository holding documents or other material, usually those of historical and/or rare value. Also referred to as “Special Collections” (UB 2009). Although CHIS is not an archive in its strictest definition, it is built on an archive-like architecture, referred to as an “information archive layer”. This approach is a clear outcome of the target group’s requirement to have easy access to the raw data of individual objects. This layer stores all information items in a well-defined data structure. Besides storing data, the direct retrieval of the raw data was a major requirement of this layer. This is facilitated through a graphic user interface, offering different system approaches, such as database or map search functionalities. Portions of the information space can be selected, browsed as well as brought into a personal structure. *Figure 9.2* shows the current status of the ‘Cultural History Information System of the Western Himalaya’.

Besides the possibility to browse the map for further information, all relevant information within the current area displayed is shown in the section “In Current View”. In addition to this, CHIS offers functionalities beyond the standard information archive layer.

9.3.2 Preprocessed Views Layer

Besides access to raw data via the “Information archive layer”, the CHIS provides the possibility to work with preprocessed information. A collection of information items, that were edited and formatted by experts is provided as a ‘narrative’ within the system. A narrative *(Figure 9.3)* functions as a wrapper around the information archive layer by utilizing the archive functionalities. To the user however, when working with narratives, these functional operations are not visible.

Narratives enhance the system usability in multiple ways, such as providing the general public with preprocessed information views, which avoid complicated and/or complex data queries. Users can save queries in the information archive layer by creating individual, personal narratives. Furthermore, narratives support the portal idea of CHIS by presenting up-to-date information in an efficient way.

9.3.3 Target Application Layer

Built “on top” of the preprocessed views layer, special applications, dependent on specific data availability enrich the information system by offering new and innovative ways of dealing with multi-disciplinary information. These solutions focus on specific topics and vary in their technical implementation from symbol maps, dasymetric maps, animated maps and 3D visualizations with multimedia context (e.g.

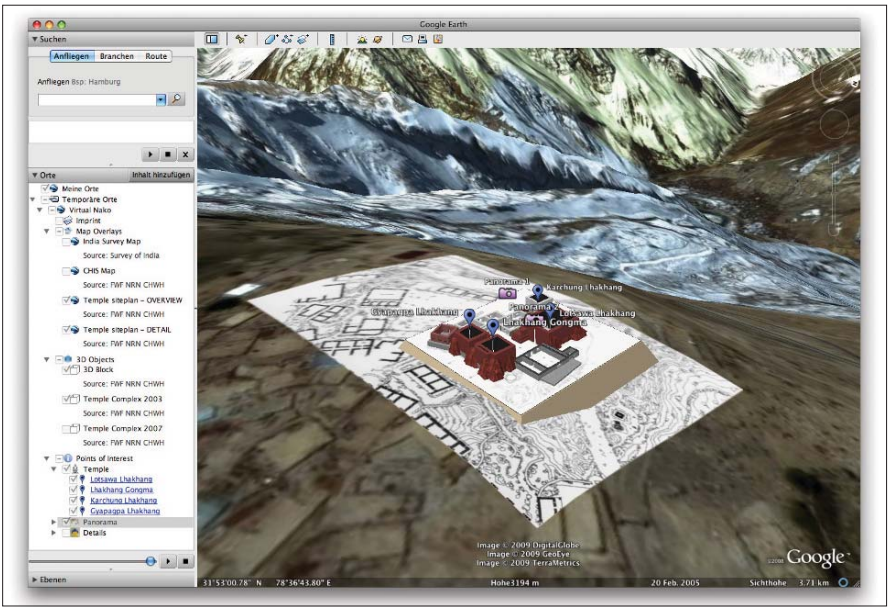

Fig. 9.4. 3-D visualization of the Nako temple complex in Google Earth. Source: http://www.univie.ac.at/chis

geotagged movies in Google Earth). Special topics, such as pilgrim routes or temple architecture, can be processed outside the 'boundaries' of the underlying layers.

One example of this type of application isVirtual Nako, shown in *Figure 9.4,* which was built for a 'special' target application. It is a multimedia representation of the Nako temple complex in *Google Earth.* It contains 3D models of the temples and buildings, map overlays from different sources (such as the Survey of India (So, 2009)), architectural plans (NRPP 2009), points of interest with various information of the temple complex and interactive panoramas.

9.3.4 Interface and Navigation Design

Following the layout of the CHIS information architecture, the interface and navigation design had to be specified. From the current status of the development, principle conclusions regarding the system approach, the information query procedures and the map window functionalities were determined.

9.3.4.1 CHIS Portal

As described previously, CHIS is presented as a cultural history information portal to the user. Unlike the hierarchical structure of the CHIS information architecture

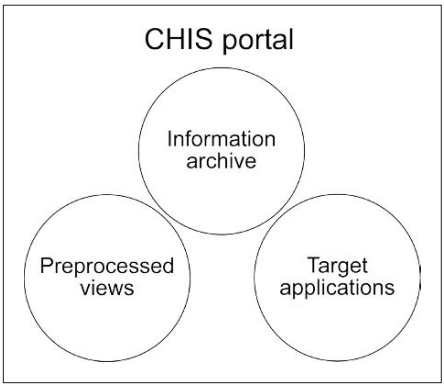

Fig. 9.5. Components of the CHIS portal

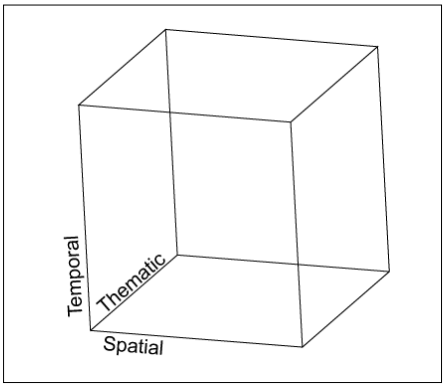

Fig. 9.6. Three dimensions of information scope in CHIS

and its layers, the user will be able to access all three application layers directly from the system entry point. The archive, preprocessed views and target applications can be seen as equal parts of the system as shown in *Figure 9.5*.

Through this approach, the user is able to decide the granularity of information needed by choosing one of the three components of the portal. Users from the general public can browse through the system on a rather coarse level, whereas domain experts from cultural history can get detailed information on the artifacts stored.

9.3.4.2 Information Query Procedures

Queries in the CHIS can be based on a variety of three scopes of information: space, time and theme. As described above, all objects in the CHIS must have spatial, temporal and thematic metadata. Based upon this information, gazetteers have been established to cover all possible data characteristics:

- Spatial gazetteer: Hierarchical structure of geographic entities within the area of investigation;
- Temporal gazetteer: Linear sequence of time, limited to years; and
- Thematic gazetteer: Description of thematic object information, based on object categories and domain keywords.

All objects were arranged in categories, representing the individual thematic domains of the project partners (e.g. paintings, manuscripts). Every category is associated with a series of keywords, labeling the basic cornerstones of the thematic domain.

Figure 9.6 shows the three dimensions of the CHIS information space – Temporal, Thematic and Spatial. Every object is defined by its position in this three-dimensional cube.

The basic information query procedure is undertaken using a Google-like search form. The text string entered is compared to the domain keywords, object categories as well as the overall objects metadata within the system. Besides the basic query, an advanced search option enables the user to browse different gazetteers and thereby limit the search range.

9.3.4.3 Map Window Functionalities

Although the cartographic visualization of all information is a main objective of the system, the interaction functionalities of the map window are as restricted as possible to keep the system complexity at a low level. From the user requirements to CHIS, a set of map window functionalities have been defined:

- Map, overview map;
- Zoom step buttons to change the scale without clicking in the map (the center of the map is preserved);
- Pull down menu with predefined zoom areas;
- Layers can be turned on/off (for each layer, the legend is shown);
- Direct information retrieval by mouse-over and/or map brushing;
- The map can be saved as image and used in a presentation.

It was intended to keep the interaction on the map as intuitive as possible. Simple mouse-over with 'information pop-up balloons' or brushing the map and highlighting the corresponding information in associated diagrams, timelines or tables – and vice-versa – seemed appropriate (Monmonier 1989).

A series of tools have been designed and developed to fulfill the prerequisites of the system architecture. To get an impression of the method of operation of these tools, prototype versions were created and have been constantly evaluated. These preliminary versions reflected both the experience from already existing systems as well as the project partners input during the overall development process.

9.4 Outlook

While CHIS is still intended to remain a multidimensional, interdisciplinary cartographic information system with the ability to store, analyze and visualize spatio-temporal thematic data, additional functionalities need to be incorporated, such as the investigation of how interactive decision-support tools provided by CHIS can be personalized and individualized and the exploration of social semantic mapping using Web 2.0 (O'Reilly 2004).

9.5 Conclusion

The development of a focussed CHIS information architecture was achieved by following a clear line of system design, beginning by identifying target groups and defining the functionalities and scope of the system. Through this process, the development of CHIS was deemed to be very effective, since all development steps were based on a structured design process. As a consequence, the CHIS could be adapted to the needs of the target user groups. Different system approaches at various levels of detail were necessary and were implemented to simplify the system access for all user groups.

CHIS proved to be a useful resource to the research communitythat deal with the cultural history of the Western Himalaya from the 8th Century. The decision to follow a user-centred development process led to an efficient and sustainable system, which is able to be enhanced and further developed.

The *Cultural History Information System of the Western Himalaya* (CHIS) can be accessed via this URL: http://www.univie.ac.at/chis

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Chapter 10

User-Centred Design of a Web-Based Cartographic Information System for Cultural History

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Abstract

This paper deals with user and usability research related to the field of cartography. In the first part of the paper 'success' is defined in the context of online mapping applications. The need for user and usability research is supported by the provision of the results from a literature review. Then the paper elaborates on the term 'usability' and what this term means in a cartographic context. Next, the concept of user-centred design is introduced and methods of usability engineering are discussed. This is followed by a description of usability aspects of selected mapping applications that have been developed as gateways to cultural history disciplines. Finally the application design and usability of the CHIS – the Cultural History Information System for the Western Himalaya and the benefits arising from following a user-centred design approach are outlined.

10.1 Introduction

By exploiting the potential of the World Wide Web and other communication technologies cartographic products have become almost instantaneously available and available on-demand. It can be said that maps provided by contemporary publishing technologies have become ubiquitous. The large increase in map users due to the application of Web technologies illustrates a renaissance in how the general public considers maps should be delivered. But this comes with new challenges – users of these new cartographic products have different attitudes, diverse professional and

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personal qualifications, and their requirements and expectations may differ strongly. Therefore the need to conduct user research in this discipline is paramount.

Compared to the era of paper cartography technology applied to new mapping applications now generates a multitude of new ways to visualize spatial data (cp. Cartwright et al. 2001). This includes interactive mapping applications, multimedia products, maps on mobile devices and, increasingly, the mapping of 'different' geographies. From a technological point of view the possibilities seem endless.

But, these new applications offer new challenges to the cartographic community. Interdisciplinary projects like the CHIS project illustrate the value that cartography and GIScience can add to projects developed outside the geospatial discipline, as will be demonstrated in this paper.

10.2 Defining the Criteria for Successful Mapping Applications

As with all new users, when addressing the varying contexts of map use and the new ways of cartographic representations, we heed to ask the question: How can we assure that maps and mapping applications produced, provide added value for users and map makers and therefore can deem those maps to be 'successful'?

To answer this question it is important to understand the components that constitute 'success' in the field of mapping applications. In many cases for private mapping companies, success can be defined relatively easily – a successful product earns the company good money. But there is more to cartography than just making money out of mapping applications. Besides efficient project execution (delivering on time, to budget and meeting pre-assigned specifications (Pinkerton 2003)) the end product's impact on users, number of users and user satisfaction are the major issues when it comes to defining the success of a product.

In scientific cartography it is harder to define what constitutes a successful application. At universities and research organizations high-quality online applications are being developed with novel and sometimes highly experimental functions. The quality of cartographic visualisations and subsequent re-defining of communication processes are at the core of these endeavours. However, the applications developed might feature a degree of complexity that is exceedingly difficult for non-experts to master.

Scientific progress and the application and examination of new methods and techniques are important issues. Unfortunately, in many cases the *"Ghee-Whiz attitude"* (Cartwright & Hunter 2001) dominates map application design, where new visualization methods and technical possibilities are implemented without questioning their significance for cartographic communication. In many cases new

functionalities and new ways of visualizing data are developed, without regard to the application's effectiveness, efficiency, usability and user experience.

10.3 The Need for User and Usability Research

Cartography has a tradition in researching cognitive and perceptual aspects of map use as well as communication processes. The user was first considered in cartographic science by Robinson (1952). The discipline has changed drastically since the move from paper to digital cartography. Thus design criteria and complementary evaluation methods have had to be adapted or developed to be applied to the new types of distributed or ubiquitous mapping products. Meng (2004, p.7) points out that *"[map] usability tests hitherto mainly concern the effectiveness and efficiency of map use. [... while the map] does not necessarily satisfy all the user requirements"*.

There is demand for objective user and *usability* studies to be applied to new visualization methods, functionalities and interface designs in mapping applications. It is also necessary for establishing paradigms for conducting these studies in a standardized way. This has been proposed by several researchers, including Nivala (2005), Van Elzakker (2005), MacEachren and Kraak (2001).

We have to determine whether these new visualization methods are needed, usable and lead to effective cartographic communication. This is especially true for visualizations of representational spaces (cp. Kinberger, elsewhere in this book), because they can quickly cause a higher cognitive load than when known forms of maps are employed. Therefore it is essential to conduct studies that consider the respective users of such mapping applications. Nevertheless it sometimes happens, that map application designers feel uncomfortable to implement thorough user studies, due to the consequences (and limitations) that might arise concerning system requirements and system design. The implementation of a *User-Centred Design* approach on future cartographic products could be a possibility for ensuring that user requirements are met and the map applications are usable for achieving the intended goals (Nivala 2007).

10.4 Usability

The International Organization for Standardization (ISO) defines usability as *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use"* (UsabilityNet, 2006, tools and methods – reference material). In his book on

Usability Engineering Nielsen (1993) provides a list of 5 elements through which the usability of a product can be defined. These are learnability, efficiency, memorability, errors (low error rate, easy error recovery) and user satisfaction. By balancing these components of usability it can be generally assured that the system is usable for a predefined set of users with predefined use needs. Balancing these elements of usability is a main task for application developers and is determined by user groups, their requirements and actual usage. Quesenbery (2004) argues that while a specialist might primarily need an application to be efficient for daily activities, a non-expert who seldom uses the application might need elements that focus on items like ease of learning, error tolerance and user acceptance.

10.5 User-Centred Design

The philosophy of user-centred design (UCD) originates from the research area of Human-Computer Interaction (HCI). It provides instructions on how to meet

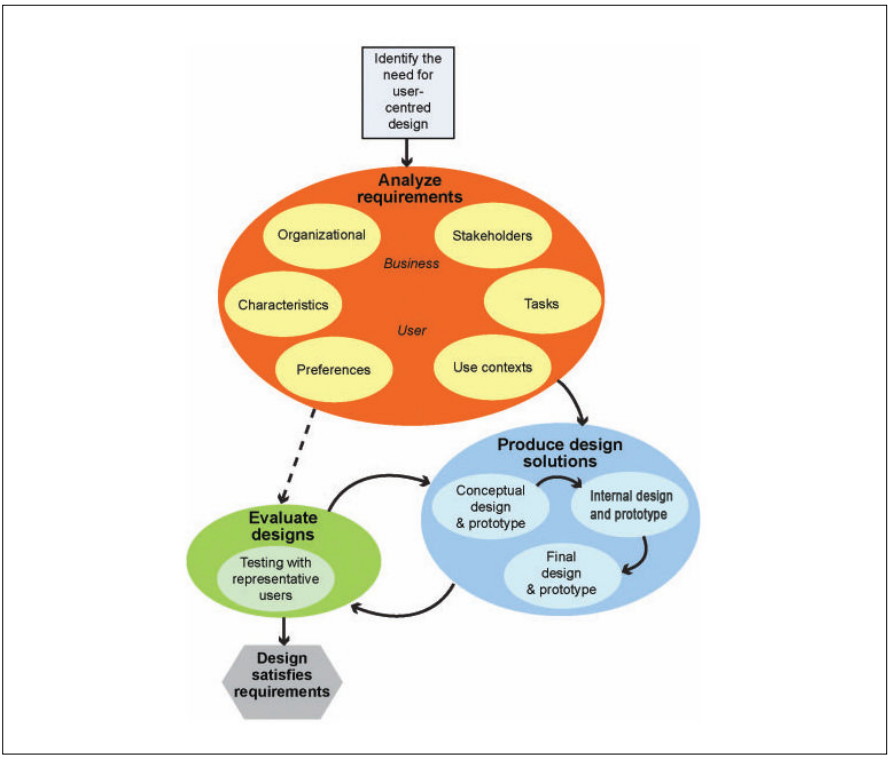

Fig. 10.1. The user-centred design process (UCD). Source: Van Elzakker, Delikostidis and Van Oosterom, 2008, p.140

user requirements and reach high quality product levels by incorporating the needs, wants and limitations of the end-users in various iterative design stages throughout the whole life cycle of interactive computer systems. The ISO 13407 standard (Human-centred design processes for interactive systems) describes UCD *"as a multi-disciplinary activity, which incorporates human factors and ergonomics knowledge and techniques with the objective of enhancing effectiveness and productivity, improving human working conditions, and counteracting the possible adverse effects of use on human health, safety and performance"* (UsabilityNet 2006, tools and methods – reference material).

The purpose of UCD approaches is to identify user groups, their requirements and to improve the overall application usability in regard to interfaces, user interaction and user specific visualisation methods. Applications are optimized around how people work, so that they do not have to change their habits to accommodate to functionalities that are incorporated into an application. By following a user-centred design approach, application developers should be able to almost guarantee an effective and efficient end-product with a high degree of user satisfaction.

As illustrated in *Figure 10.1,* user-centred design is an iterative process. The user and business requirements are identified in the first stage and design solutions are developed and evaluated in the second stage. This process is repeated until designs are produced that satisfy most or all of the users' and application requirements.

10.6 Current State of User Research in Cartographic/GIS Design Processes

In the last few years there has been a noticeable shift of focus in cartographic application design from technology-driven design approaches to user-centred design. In the area of highly complex Web-based information systems, for example online atlases, the user seems to have finally become the centre of attention. Examples like the Atlas of Canada (Kramers 2008), the Örok-Atlas Online (Pucher 2008) and the Pennsylvania Cancer Atlas (Bhowmick et al. 2008) demonstrate the utility that UCD approaches have for improving both, system design and usability.

Another field of cartography where user/usability research and user centred design have been applied rigorously in the past few years are map applications for mobile devices (cp. Van Elzakker, Delikostidis &Van Oosterom 2008 or Nivala & Sarjakoski 2007). This is a fact that is not surprising at all, since there is much commercial interest in such applications. These systems have to be designed to work properly in regard to user requirements and usability, especially in the use context of small displays and dynamic/mobile use, as bad user reviews would result in badly effecting device profile, and thus sales.

Several studies have been conducted about usability of GIS and the design of graphical user interfaces for software packages (cp. Haklay and Zafiri 2008 or Davies, Wood & Fountain 2005). Until now GIS has been mainly used in the domain of expert users. Thus the focus of application development became efficient working environments. Aspects like understandable error messages, error recovery, user experience, quick learnability and memorability *("Where do I find a certain tool and what happens when I use it?")* were neglected. Through the evolution of Web-based GI systems and the increasing interest in interdisciplinary projects, nowadays also non-expert users must be capable of working with these often highly complex systems. The latest advancements in GI software products and Web-based GI solutions illustrate that there has been an increased effort in making these products more usable as well as easier to comprehend.

Unfortunately there are many sub-domains of cartography and GI where the notion of user and usability research has advanced little. This is especially true for interdisciplinary cartographic and GI online applications serving cultural historic research.

Since January 2007 an interdisciplinary research network at the University of Vienna has been undertaking research on the Cultural History of the Western Himalayas. As part of this network the Department of Geography and Regional Research at the university is conducting research related to the design and implementation of a Web-based cartographic Cultural History Information System, the CHIS.

In the early planning stages of this application, focus group meetings and related interviews with project stakeholders led to the development of a list of online mapping applications that would support cultural historic research and documentation. These applications were those that the project stakeholders found to be useful, appealing or interesting in one or another way. Twenty-one applications from the compiled list were thoroughly reviewed by cartography experts, who concentrated on the scope of functionalities as well as their strengths and weaknesses from a usability viewpoint.

The research on these kindred projects revealed shortcomings in various areas of application design. Most of the applications explored, offered the potential to be useful and very informative packages. But, the rather poor implementations of some of the graphical user interfaces were definitely not conductive for what could be termed to be 'good' usability, especially in regard to efficiency and user experience. In some cases the users were confronted with highly complex functionalities strongly adding to the cognitive burden, whilst unessential for many use-cases. In certain cases the efficiency and effectiveness of cartographic communication as well as the quality of the base maps were neglected. The examination of these systems revealed that the prospective users, their requirements and use contexts, were not always at the center of design considerations. It appears that with some of these systems the application of a UCD approach with definition of user and system

requirements from the very start of these projects could have yielded different and in many cases more simplistic applications as a result.

10.7 UCD Approach in the Design of the Cultural History Information System (CHIS)

The CHIS is a Web-based cartographic information system for the Cultural History of the Western Himalaya that understands itself as a collaborative spatially enabled system for archiving, analyzing and visualising datasets of cultural history. Various databases of stationary and portable objects from the involved disciplines (Art History, Tibetan Manuscripts, Tibetan Inscriptions, Philosophy and Numismatics) are interconnected through their spatial localization, thus allowing interdisciplinary and more holistic insights on the cultural history of a wide, geographically and culturally diverse area. The geographic reality, topography and surrounding physical and man-made features, are taken into account by high quality base maps in several scale levels as well as geo-referenced scanned images of printed maps. Multimedia applications are embedded in the system as eye-catchers and to demonstrate the potential, which modern forms of cartographic communication can offer.

The design of the Cultural History Information System strictly followed a user-centred design approach. The Web-based system was what was considered to be a cutting-edge application for cartographic information systems in the field of cultural history. The objectives concerning usability and especially user experience were ambitious and could only be met by iterative design steps.

During the first stage of user-centred design the project stakeholders and future users were asked in focus groups to specify their expectations for such a system and how they would like to be able to use and query the spatial information provided. A list of user and organizational requirements were compiled, followed by a first system- design solution, developed on paper. In the subsequent interview rounds the expectations of the participating project partners and future users were discussed and the requirements adapted accordingly.

After the development of a first online prototype *(Figure 10.2)* a group of 10 prospective users was asked to work with the application and check if they encountered any usability problems. Afterwards they filled in a questionnaire containing 18 questions. The questionnaire covered:

- The user's background and experience with online GIS and cartographic products;
- How users accessed applications;
- How well they were managing to navigate through the maps that were delivered in the package and the application generally;

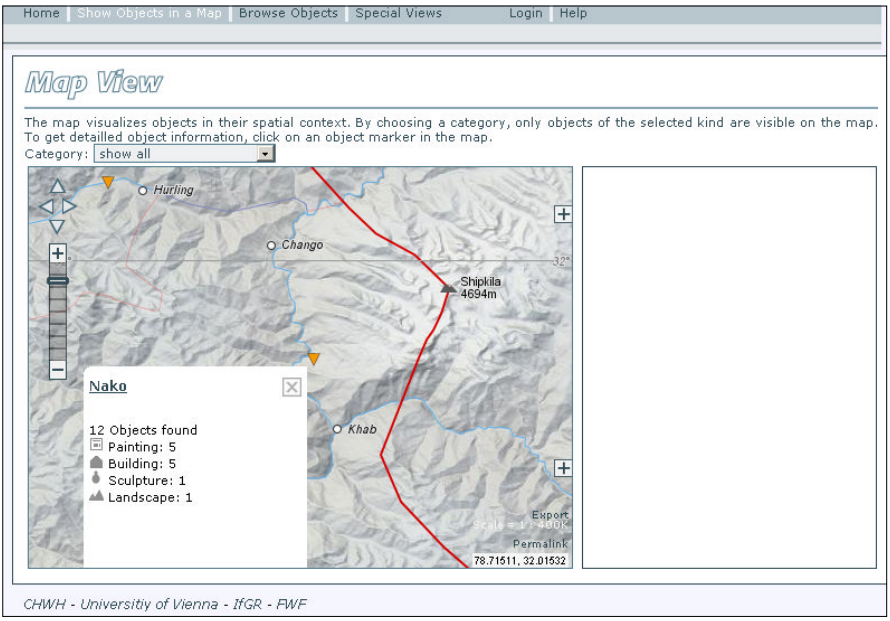

Fig. 10.2. First online prototype of the CHIS. Source: http://www.univie.ac.at/chis

- How they searched and browsed for geo-referenced objects;
- Their satisfaction with search outcomes and information content within the application; and
- Open comments about the overall application, functionalities and general user satisfaction.

This was followed by a discussion round with the same group. Here the outcomes from the user study questionnaire were discussed openly and additional design considerations were brought forward and discussed by the cartography group and project partners. The evaluation of the first prototype revealed a few usability problems that needed to be addressed in the further development of the application. The results led to a partial reconception of the system, including the following issues:

- Users with a background in disciplines researching cultural history had problems with parts of the system nomenclature, which was mainly originating from the domains of Cartography and Geographic Information Science. During the redesign of the application strong emphasis has been put on minimizing ambiguity of terms and concepts as well as making the system processes and structures more transparent to experts of other domains and the general public.
- Accuracy and richness of detail of the base maps were not adequate in some areas where the involved research groups had a special focus. As a result the concept for scale levels and topographic geodata provision for the base maps has been furthered.

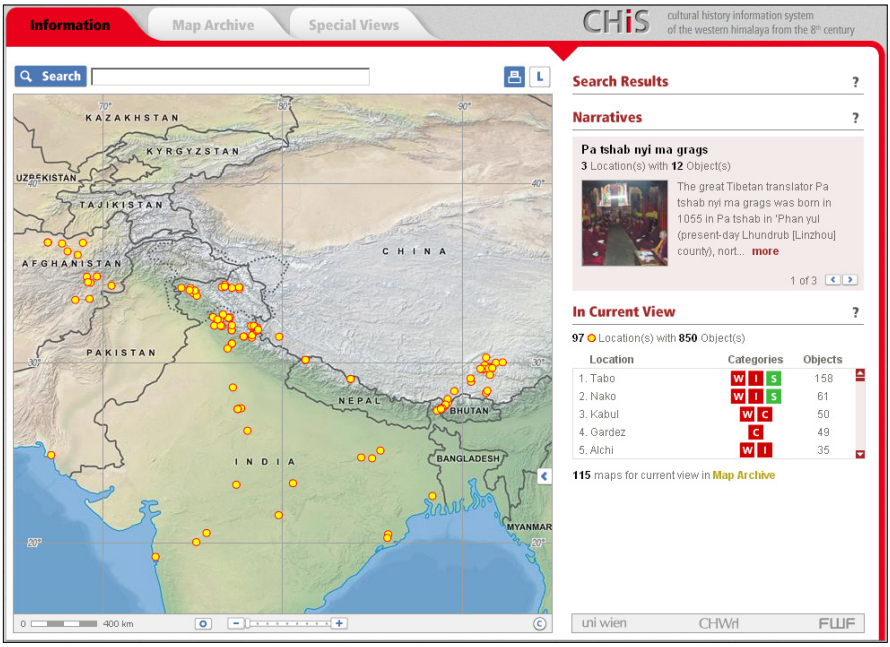

Fig. 10.3. Structure of CHIS alpha prototype. Source: http://www.univie.ac.at/chis

- The provision of integrated multimedia applications was appreciated by the respondents and development of further examples was encouraged.
- Hierarchical object catalogues were deemed unessential, the test users were in favour of easy-to-use search routines and (geo)graphical selection of cultural historic objects via the map.

As a result the object catalogues were abandoned and concepts for dynamically displaying object lists, based on the spatial extent of the map view were developed.

For the development of the alpha version of the system a number of publications on user experience and user-friendly design (e.g. Krug 2006, Galitz 2002) were reviewed by the application designers. Thus general principles of application design could be incorporated with special emphasis on the systematic use of colours for guiding the users through the system. *Figure 10.3* depicts the structure of the alpha prototype of the CHIS that has been online from July 2009.

Following a UCD approach the concept of the alpha version of CHIS has been further devolved in various areas to better provide good usability and a better user experience:

- The scope of functionalities was drastically reduced, while at the same time background functions designed to help the user in an intelligent way (by proposing additional material for maximum information provision) were enhanced;

- Narratives were added to help to guide users through the system, especially those who were unfamiliar with the disciplines from cultural history, to provide a more interesting and meaningful experience when using the system;
- Colour coded areas were provided to make the underlying system structure to be visible and therefore help to guide the user through the system;
- Strong emphasis was put on designing an aesthetic interface by using graphic variables to increase user acceptance;
- The addition of high quality cartographic visualisations, produced from the base data for five scale-levels with a different level of detail to ease cartographic communication processes and enhance user experience;
- Adding intuitive navigation elements which made the need to use 'help pages' for nearly all users obsolete; and
- Including multimedia views to show the possibilities that modern multimedia cartography offered.

The next evaluation round for the alpha prototype design is scheduled for late 2009, using online questionnaires so as to reach a potentially larger audience. The study will not only focus on the project partners, but also on probands from the general public interested in using the Cultural History Information System. This second evaluation round will be evaluating the design of the alpha version (cp. Fig.3) thereby trying to identify possible usability problems within the system. The questionnaires will feature future development options for the CHIS with the intention to collect opinions and compile a priority ranking on these extensions. A further goal for future system development is logging user-system interaction with the aim to automatically detect usability problems yet undiscovered.

10.8 Summary and Outlook

The advantages of following a UCD philosophy and testing usability are seen to be essential procedures to follow during the development of the Cultural History Information System (CHIS). The interdisciplinary project environment with heterogenous users and use-cases implied user involvement throughout all design stages. A thourough analysis of requirements and limitations during the planning stage facilitated target-oriented and efficient system development. Thus it can be expected that the ambitious objectives concerning usability and especially user experience can be met resulting in a cutting-edge application for cartographic information systems in the field of cultural history.

With regard to the 'mapping of different geographies' and the resulting applications, cartography needs to adapt concepts for evaluating the usability of the products designed and developed. Maps and cartographic applications that depict the

geographies related to historical artefacts, like the CHIS, will provide better tools if they are developed according to user-centred design and usability engineering knowledge.

Sometimes these maps do not have single communication goals but convey multiple meanings. They might be highly experimental and therefore sometimes hardly usable by the intended user group. For this kind of product it is hard to establish what users' expectations might be and what information they need from such applications. There is also a need for evaluating the techniques used to map the geography of historical artefacts, and to establish whether these depictions are useful and if they can facilitate communication between experts and to non-experts from outside the core research area who also need to understand what is being portrayed. However, some of these 'other maps' demanded by users of systems like the CHIS which has been outlined in this chapter, may be better products if they do not comply with any conventional standards and user expectations. They may work better if they work in a manner that does not accord to traditional cartographic or GIS products, but in a way that is attuned to the real needs of users of such systems.

Acknowledgements

This research is undertaken within an interdisciplinary project called *'The Cultural History of the Western Himalaya from the 8th Century'* which began in 2007 at the University of Vienna, Austria. This Austrian National Research Network (NRN), supported by the Austrian Science Fund, includes cartographers, art historians, numismatists, Buddhist philosophers, and Tibetan and Sanskrit philologists. The main objectives of the NRN are to intensify research on the cultural history of the Western Himalayas as well as to develop a map-based Cultural History Information System (CHIS) for sharing the outcomes with other experts and the interested public.

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Chapter 11

GIS for Numismatics – Methods of Analyses in the Interpretation of Coin Finds

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Abstract

This paper investigates the use of geographical information systems (GIS) in numismatics. Up to now, geographical information systems have rarely been used in numismatics, although neighboring disciplines such as archaeology have applied this technology successfully with many advantages. Some of the methods used by archaeologists can be applied to numismatics as well. The basis for every GIS application is geo-referenced data. This paper focuses on numismatic data and its applicability for use in a GIS. Data from the Austrian coin database dFMRÖ serves as an example. The limitations of this dataset concerning accuracy and precision, which are not up to the standards desired for usage within a GIS, will be highlighted. Subsequently the effects of data quality on the resulting models will be estimated. Predictive site modeling and least-cost paths serve as examples.

11.1 Introduction

Historic geoinformation systems demonstrate impressively the power and usefulness of geoinformatics and cartography for research in the humanities as well as for the visualization and communication of their scientific findings. Browsing, analyzing and viewing data by location and attributes simultaneously – as can be done with geographic information systems – offers new possibilities to historians and other experts from various disciplines. Not only do patterns within one set of data (such as the distribution of coin finds) become obvious, but so do spatial-temporal relationships with other data (e.g. Roman roads) and with topographic features existing in and surrounding the area.

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This paper investigates the suitability and application of methods proprietary to geographic information systems (GIS) in context with numismatics (the science of monetary systems, including coins). Up to now this special field of cultural-historical research only rarely takes advantage of the strengths and opportunities which GIS can offer.

The interpretation of coin finds is a subdiscipline of numismatics, which deals with the scientific description of coin finds and hoards. Here the function and occurrence of the coins in space and time is more important than the coin itself. (Alram 2006, p. 9) Since function and occurrence in space and time are clearly geographic attributes, it is assumed that GIS offers great potential for facilitating research in this discipline as it does in archaeology, which to a large part deals with the dispersal of research objects over space and time.

The research goals of archaeology are similar to those of numismatics. Archaeology studies past human life and culture on the basis of material remains. (Lang 2002) It can be argued that the interpretation of coin finds does the same thing, only it is limited to monetary systems. In the case of numismatics, the material remains are the coin finds themselves; the part of human life and culture that numismatists are interested in concerns monetary systems. In archaeology the use of GIS has been well received by scientists and is already wide spread. GIS was adopted by archaeologists early in its development, thus proven and comprehensive methods for the use of GIS in archaeology already exist, as Conolly and Lake (Conolly & Lake 2006) point out. Therefore, the use of GIS in archeology serves as a starting point for this investigation.

It is understood that some GIS methods used by archeologists – especially methods of analysis – can be adopted for the interpretation of coin finds with only minor modifications. The methods examined in this paper are those of ‘least-cost paths’ and ‘predictive site modeling’.

Coins of the Roman Age that were found in Styria, Austria, provide a basis for a case study. Data pertaining to these coins and their find sites are edited and maintained in a database. This digital collection, which coin finds as recent as 2005, constitutes the most up-to-date numismatic database in Austria. (Schachinger 2006)

This paper investigates some of the possibilities for applying GIS methods in numismatics and the challenges that arise from doing so. It shows that GIS can help in answering numismatists’ questions, such as “Where might other coins be found?” or “How did the coins get from their place of minting to the place of finding?” The paper focuses on the characteristics of numismatic data and how these affect data analysis.

11.2 Numismatic Data

A prerequisite for any GIS analysis is geo-referenced data. Assuming that the chosen method of analysis is appropriate for the task at hand, the quality and significance of the result depends on the properties and quality of the data source.

Numismatic data are in general not collected for use with GIS, since this technology is hardly ever used by numismatists. The spatial component of the data in particular has to be questioned critically before conducting analyses on the basis of this data.

11.2.1 Coin Finds

Objects in a GIS are representations of the conceptualization of reality. (Gruber 1993, Blaschke 2003) Therefore, it is necessary to investigate the conceptualization of the numismatic reality (restricted in this case to coin finds). The question then would be: What do numismatists mean when they talk about coin finds?

> *'**Coin find**: coin, which comes from a single find, a mass of finds or a hoard find. The term find implies that the found item was unknown and inaccessible for a longer period of time, therefore excludes coins in intentional safekeeping'* (Kahnt 2005, p. 145, translated)

As already mentioned, the function and occurrence of the coins in space and time is an important topic. (Alram 2006, p. 9) It is therefore necessary to know where and when the items of interest (in this case the coins) were lost or hidden. These two components – space and time – can be determined in various ways. There are multiple methods for dating the coins, but in general it is easier to identify the date of the minting of the coin than the point when it was lost or hidden. (Vondrovec 2005, p. 182)

If the coin remains unaffected by soil movement, the place of finding is the same as the place where the coin has been lost. There can be instances, however, where the soil in which the coin was found, has been moved. This can happen either through human action (e.g. building activities) or through natural ground movements, such as landslides. If there are no traces of such events, it is assumed that the place of finding is identical to the place of loss. (Reece 1996, p. 341)

In many cases the exact place of coin finds is not known. There can be various reasons for this. Sometimes coins change ownership between their date of finding and scientific cataloguing, which can lead to inaccurate and imprecise information about the find place. As a result, only very vague information is known, e.g., just the name of a whole valley. With older findings, data can only be obtained from older publications, which sometimes provide incorrect data. In the case of hoard finds, older publications do not always record every coin included in the hoard. In this

case, only the most important coins are recorded; the rest are simply put away into some depot. (Schachinger 2006, pp. 13)

Even if the place of finding is known, this information is not always recorded in databases or in coin catalogues. Exact coordinates are not deemed necessary for classical numismatic research. Thus, coin databases cannot be considered as spatial databases in the geo-information sense. For example, the Austrian coin database dFMRÖ (digitale Fundmünzen der römischen Zeit in Österreichs) as well as the German coin find database NUMIDAT contain the place of finding only as a text field. In most cases these text entries relate to known Roman remains or cadastral municipalities in which the coins were found. Exact coordinates, which are desirable for GIS-applications, are not available.

Further specialties of numismatic data are conclusive to the peculiarities of numismatic research. Even if data are complete in the sense of their quality (i.e. every found coin is recorded), the source material is never complete. Numismatists work under the assumption that not every coin which is there is also found. (Göbl 1978, p. 259) Nonetheless distributions of lost coins mirror to some extent the distribution of coins in circulation (Newton 2006)

11.2.2 The Austrian Coin Database dFMRÖ

The database dFMRÖ (digitale Fundmünzen der römischen Zeit in Österreich, digital coin finds of the Roman age in Austria) is the digital extension to the project FMRÖ (coin finds of the Roman age in Austria), which has been in existance since 1971 and which publishes coin finds in printed catalogues (Vondrovec 2007). Both projects are conducted at the Austrian Academy of Sciences (ÖAW, Österreichische Akademie der Wissenschaften).

For this research, a subset of the dFMRÖ data was utilized. The extract contains all relevant fields and records and consists of two tables related by an ID-field. One of the tables contains coin data *(Table 11.1);* the other contains data about the places of finding *(Table 11.2)*.

As *Table 11.2* shows, places of finding are given in text form only and coordinates are not included. In most cases, the find spot is the cadastral municipality in which the coin was found. Only a minority of records show more accurate information of the place of finding. Under these circumstances the data cannot be visualized in a GIS since the geometric reference is missing. The indication of detailed coordinates is a prerequisite for making the datasets usable in a GIS.

Table 11.1. Database table of coins (COINS)

Field name	Data type	description
MZ_ID	Number	ID of coin
PR_NAME	Text	Minting authority
NOM_NAME	Text	Name or value of the coin
MZST_NAME	Text	Mint
DAT_VON	Number	Earliest dating
DAT_BIS	Number	Latest dating
DAT_CA	Yes/No	Exact dating exact yes or no
GEWICHT	Number	Weight of the coin in g
STST	Number	Position of die
DM	Number	Diameter in mm
THES_FO_ID	Number	ID of place of finding (Link to table FO)
F_ZEIT	Text	Date of finding
Fundart	Text	Type of finding

Table 11.2. Database table of places of finding (FO)

Field name	Data type	Description
THES_REL_ID	Number	ID of place of finding (Link to table COINS)
PARENT_ID	Number	Higher-ranking ID (THES_REL_ID)
TERM	Text	Name of place of finding
TYP	Text	Type of entry (place of finding, municipality, district, …)
HIERARCHY_KEY	Text	hierarchical key

11.2.3 Linking the Numismatic Data to Geometric Data

As a first step for using the coin data in a GIS, it is necessary to reference this data to geometric data in a GIS-compatable format. The representation used for this investigation is designed for large to medium scale (1:50.000 to 1:500,000) representation.

Although in most cases the place of finding is only given as the name of cadastral municipalities, the data have been linked to the point dataset of the place names of Styria. This dataset is available from GIS-Steiermark, the GIS department of the provincial government of Styria, and can be downloaded from the department's homepage (Amt der Steiermärkischen Landesregierung 2009) in ESRI shape-file format. It is generalized for the use of a map scale of 1:50,000.

Point data is not the optimum for representation, especially when considering the size of the area under investigation, because in most cases the point will not be identical to the place of finding. In terms of data quality, this approach results in high precision but also low accuracy. Precision is a measure of the detail of the data, while accuracy measures how well the coded data match reality. Although the position of the points in the dataset can be determined very well (i.e. high

precision), the position does not represent the real places of finding very well (i.e. low accuracy).

Differences in the spelling of the names between the coin database and the point dataset and the lack of official numeric codes in the coin database made a manual link-up inevitable. Therefore the key-values (THES_REL_ID) from the coin database were assigned to the corresponding places in the geometric dataset. With some places of finding, names (e.g. field names) were in existance, thus enabling a more accurate positioning. These names have been identified and the coordinates have been measured in the digital version of the official Austrian map to the scale of 1:50,000 (Austrian Map 4.0 Fly). These points have then been added to the place dataset. The number of coins which were found at a specific place has great relevance for numismatists and can be calculated by querying the database. The result of this query is exported as an Excel table, which can then be linked to the point data by the key THES_REL_ID.

The results are 119 places of finding, with a total of 1520 coins found at these sites. *Figure 11.1* shows the location of the places of finding.

Especially the locations Kalsdorf bei Graz, Leibnitz and Gleisdorf show larger quantities of coin finds. This elevated concentration can be explained by the importance of these towns during the Roman age. Sources show that Leibnitz was the Roman town (municipium) Flavia Solva, and at Kalsdorf and Gleisdorf smaller Roman settlements (vici) were found. (Lohner n.d.).

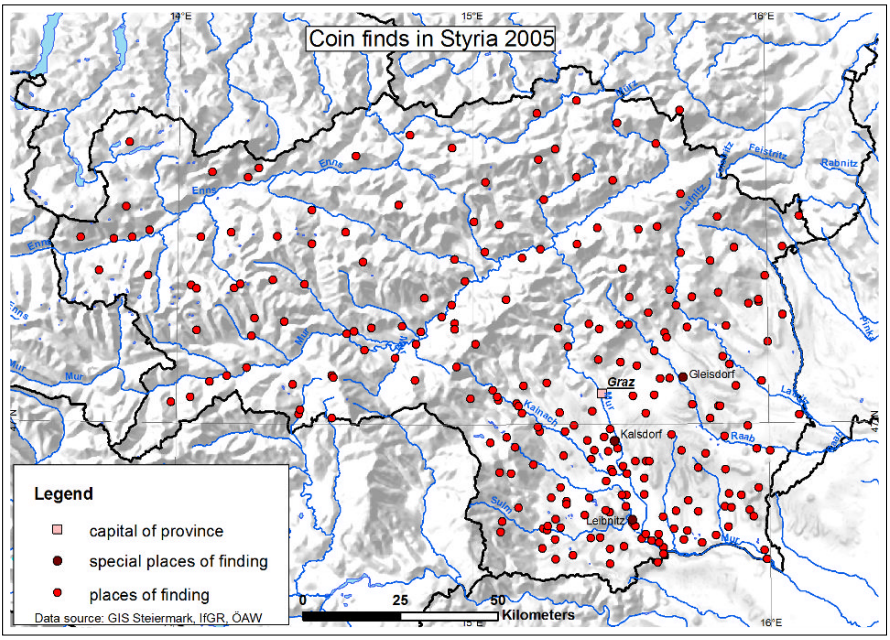

Fig. 11.1. Coin finds in Styria

11.3 Analysis

The aim of the analysis is the modeling of potential places of finding and trade routes during the Roman age. Predictive site modeling is the technique used for the modeling of potential places of finding. With this method historic properties (such as the place of finding for a coin) of a region previously not sampled can be predicted by statistical analyses of properties of known places of finding. The preferred statistical method for predictive modeling is logistic regression. (Conolly & Lake 2006, p. 179f, Kaufmann 2006, p. 272) The result of this analysis is a probability surface, which represents the probability of finding a coin at the corresponding location.

For finding the most probable route by which the coins were imported to a specific area, a least-cost path algorithm is used. Least-cost path algorithms are a method of finding the surface route that has the least cost (or time) accumulated from one point to another. The term cost does not necessarily mean financial cost, but can also be some composite measure which is not constant across the area of interest. (de Smith, Goodchild & Longley 2008) Often, especially in connection with movement, the term friction is used instead of cost. (Douglas 1994)

11.3.1 Predictive Site Modeling

Predictive site modeling is a technique for predicting historic properties that will be found in a region previously not sampled. (Kaufmann 2006, p. 272) Therefore, differentiation has to be made between areas where coins were found (sites) and areas where no coins were found (non-sites).

The attributes of these areas are then tested individually using statistical methods to determine if significant differentiation exists between sites and non-sites. The attributes which pass the tests are then included in the modeling process. The attributes are then weighted by determining regression coefficients for each attribute.

The datasets used in archaeology for this kind of modeling are often elevation data, soil data, hydrological data, geology maps and vegetation maps. (Conolly & Lake 2006, p. 180) From these datasets other datasets such as slope data or aspect data are derived. In this research elevation, slope, aspect, distance to nearest river and distance to nearest ancient road are used as input data, although only height and slope are significant enough to be included in the final model. The statistic analysis results in coefficients for each of the attributes of the input data, which are entered in a model equation. With this equation the probability surface can be calculated, which represents the probability for finding a coin at the corresponding location. It is also useful to determine a threshold probability to divide the surface into high and low probability zones.

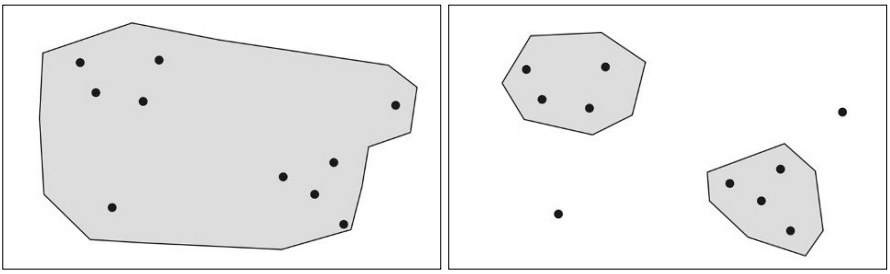

Fig. 11.2. Accuracy and precision. The model on the left is 100% accurate; all sites are in the high probability zone (grey). The right model is more precise, but less accurate. (Verhagen 2008, Fig.1, p. 286)

The quality of the model is strongly dependant on the correctness of the attribute data and even more so on the accuracy of the positioning. This is a major problem when building predictive models from available numismatic data. Since we do not know where the coin was found exactly, the attribute value for building the model would almost inevitably be wrong. As the attribute values can strongly vary even with neighboring locations, inaccuracies in the data have rather drastic effects on the model considering that these inaccuracies occur at nearly every point in the dataset. One way of reducing the impact of these inaccuracies would be to remove attributes from the modeling process, which vary considerably even within small areas, but these attributes would most likely be the ones which differentiate very significantly between sites and non-sites. If the representation of the places of finding were polygons instead of points, a mean attribute value would have to be calculated, but the problems would be the same.

As a result, the model has to be interpreted carefully. Another option is to tune the model by adjusting the threshold probability to decrease its precision to get a more accurate result. (see *Figure 11.2)*

11.3.2 Least-Cost Paths

The basis for the computation of a least-cost path is a cost-of-passage map or friction map, which is usually a raster representation of the area of interest. Each raster cell is assigned a value that describes the cost of traversing that cell. The cost can depend on many factors defined by the attributes of that cell (e.g. slope, land cover) but also on the mode of movement (e.g. walking, driving). (Conolly & Lake 2006, p. 215)

From such cost-of-passage maps, accumulated cost surfaces are computed. In order to do this, a starting point (raster cell) is defined. By using a spreading function, the accumulated cost for travelling from each cell back to the starting point is calculated. (Collischonn & Pilar 2000, p. 398)

As a last step in the modeling process, the endpoints of the paths are defined and the routes with the least cost between start and end points are calculated. There are various shortcomings of these algorithms (Conolly & Lake 2006, pp. 252); many of them are dealt with in research articles. (Collischonn & Pilar 2000, Yu, Lee & Munro-Stasiuk 2003, Gietl, Doneus & Fera 2008) Most of them are only relevant at larger scale but are negligible at medium or smaller scale. However, for this research only an approximation of a probable path is needed. Therefore it is sufficient to use the basic form of the algorithm.

The quality of a least-cost path depends to a large part on two factors. One is the resolution (or precision) of the cost of passage map. The second and more complex factor is the selection of attributes for determining the cost surface. The latter, however, influences the first factor since the resolution depends on the data available for the chosen attributes. The main attribute chosen for the cost surface is slope, which is derived from a digital elevation model (DEM). Thus, the resolution is also determined by the DEM used. The original resolution of the DEM provided by Austria's national mapping agency (Bundesamt für Eich- und Vermessungswesen) is 10 meters per pixel. It is reduced to a 25-meters-per-pixel resolution, which is sufficient for the task at hand and reduces calculation times. Rivers are also included in calculating the cost of passage, as well as heights above 1800 meters above sea level in order to simulate the rough terrain in high mountain areas

In order to get some idea of the usefulness of this analysis, a dataset of the known (e.g. through archeological findings) Roman road network in Austria is used. This dataset was provided by the Department for Prehistory and Early History at the University of Vienna. This dataset is not used in the modeling process; it is used only for comparing the results of the analysis to the archaeological findings.

Least-cost paths are calculated for four endpoints that were chosen arbitrarily. All four paths start from Flavia Solva (see *Figure 11.3)*. Especially in mountainous regions the calculated paths coincide with Roman roads. One of the calculated paths runs along the valley of the river Kainach. There is no known Roman road, but some coins were found in this valley. Although no archaeological evidence of roads exists, it can be concluded that the path along the river Kainach was used as a trading route during the Roman period.

11.4 Conclusion

This research project demonstrates the potential of interdisciplinary collaboration between geographical information science and numismatics. The collaboration aims at providing new inputs for the interpretation of coin finds and constitutes a step in introducing GIS to numismatics. Research results will be an integrated part

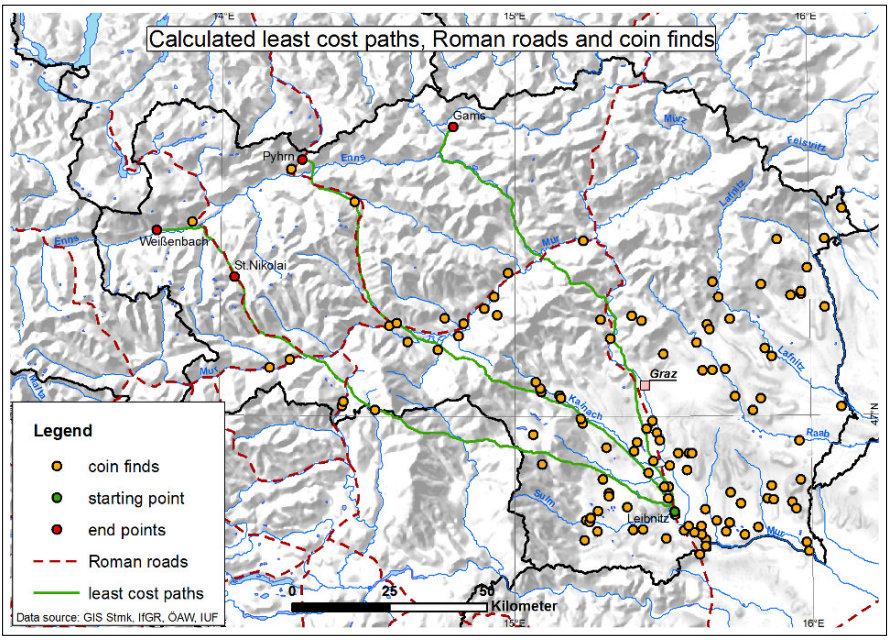

Fig. 11.3. Calculated least cost paths, Roman roads and coin finds.

of the CHIS, a cartographic cultural history information system in the context of the *Cultural History of the Western Himalaya from the 8th Century* (CHWH) National Research Network funded by the Austrian Science Fund (FWF)

However, it also became clear that the accuracy and precision of existing numismatic datasets in this case is not as high as would be desirable for a GIS to build significant large scale models with a high resolution. Since it is rather difficult to get more precise and accurate data about events in the past – such as the finding of a coin – ways have to be found to deal with this issue. Therefore, models built on the basis of this data have to be interpreted carefully. To determine how best to deal with this issue, further research is required.

Models based on a lower resolution (or smaller scale) such as the least-cost paths can nonetheless be built and yield good results.

Another outcome of the collaboration could also be an application for cartographic visualisation of coin finds in Austria, which would be an extension to the existing dFMRÖ database.

11.5 Acknowledgements

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Section III

Use Cases and Examples of MDG

Chapter 12

Le vie dello Swat[1]

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Abstract

The physical relationship between space and objects is certainly one of the key aspects for a correct understanding of historical, cultural and artistic phenomena. This is particularly true with the Buddhist rock sculptures that flourished in Swat (ancient Uḍḍiyāna, North-West Pakistan) in the 7th–8th century AD. They not only revive pilgrimage routes leading to the ancient Buddhist sacred areas –many of which were already falling into decay if not abandoned – but are closely bound up with the sacred space. In fact, the primary concern of the artists seems to have been to fit the works into a suitable natural theatre in such a way as to reflect the idea that the sacred place was entirely a work of nature. Accordingly, the figures carved into the rock had to appear as if they spontaneously emerged from it.

This artistic project may have drawn fresh vitality from the Indian concept of the *swayaṃbhū* (uncreated, self-existent) image, but certainly it is primarily indebted to the ancient religious world – characterised by an animistic and geomantic nature – which preceded Buddhism and Islam and still survives in the regions south of the Hindukush under the guise of popular beliefs.

12.1 Introduction

Giuseppe Tucci and, before him, Aurel Stein, experienced – partly perforce, partly, I guess, by a conscious choice – a way of traveling and exploring the world that

[1] The title (in English "The roads of Swat") is in homage to Giuseppe Tucci and to his book *La via dello Swat,* Roma 1963, a small literary masterpiece that, by combining scholarly accuracy and passionate communicativeness, made great scientific achievements available to a wide audience.

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probably no longer belongs to our way of approaching time and space, ever more technological, ever faster, ever more ravenous for new things. I say this with the melancholic admiration of the would-be disciple, because I happened to inherit – a bit uneasily, I admit – a work outlined by Stein (1929, 1930, *infra),* continued by Tucci (1958, *infra)* and only recently transformed into a systematic research project: the analytical study of the Buddhist rock sculpture that flourished in Swat (North-West Pakistan) in the 7th/8th century AD in the form of reliefs executed on rock walls as well as on roughly cut steles *(Figure 12.1).*

Fig. 12.1. Bodhisattvas, Panr (© IsIAO)

12.2 A Buddhist Sacred Land

In the geo-cultural map of the Buddhist world Swat occupies a special place. It corresponds to the ancient Uḍḍiyāna, a sacred land for Buddhists, particularly Tibetan Buddhists. According to the literary tradition, Uḍḍiyāna was the birth place of the great teacher Padmasaṃbhava, who – albeit reputed by some scholars to be only a legendary character – introduced Buddhism in Tibet in the 8th century AD, in a form that we can consider the foundation of the esoteric Vajrayāna school.

Uḍḍiyāna was well known at that time as a land of magic. Contributing greatly to this fame must have been the ever-active ferment of a religious substratum powerfully conditioned by human awe in the face of the forces of nature, whose caprices and energy could in turn be subdued with the use of magic. Given its non-formalised structure, this authocthonous substratum was never uprooted by Buddhism, but rather found its way into the Buddhist tradition itself by means of the Vajrayāna system (Tucci 1977, pp. 68–69).

12.3 Sculptures, Landscape and Pilgrimage

Given the chronological concurrence, we may presume that the same ideological sphere in which Padmasaṃbhava moved – an inextricable melding of magic and mysticism – may have represented the grounds for the flourishing of the rock sculptures. Nonetheless, this connection was by no means apparent when the research started. On the contrary, the rock sculptures were long thought as having been an expression of popular faith rather than the offspring of a sophisticated doctrine. This impression was aroused by some odd characteristics of the sculptures, such as the repetitiveness of subjects or the apparent incongruity of the stylistic features, which was attributed either to clumsy craftsmanship or disordered, progressive juxtapositions of figures.

Systematic surveys and analytical study have disclosed a totally different scenario, one that is quite unexpected.[2] If ever a physical relationship between space and objects proved to be a key aspect for the correct understanding of historical and cultural phenomena, this is the case of the rock sculptures of Swat, which contain such a relationship in their combination of macro- and micro-geography.

The nearly two hundred reliefs so far recorded show significant connections with the surrounding environment that suggest, rather than the spontaneous proliferation as was earlier supposed, a unified project based on strong theoretical grounds. With very few exceptions they are situated along the left tributaries of the river

[2] Partial results or specific iconographic aspects have been discussed elsewhere (Filigenzi 1997, 1999, 2000, 2000–2001, 2003, 2006).

Swat, geographically more favourable for urban settlements and, consequently, for sacred areas *(Figure 12.2)*.[3] It is rare to find individual examples in isolation; the most common pattern is a concentration of sculptures within a limited radius, often represented by the sacred areas themselves and the paths leading to them.[4]

Nevertheless, as archaeological and literary sources suggest,[5] this artistic flowering should not necessarily be taken as a sign of vitality of the associated sanctuaries, many of which were probably already falling into decay if not abandoned when the rock sculptures began to sprout around them. Some of them, however, either distinguished by particular sacredness or favoured by location on certain routes, received new attention, being restored, albeit modestly, or having rock sculptures added in the immediate surroundings. Occasionally the rock reliefs may have marked out spots that tradition specified as having been the scene of some miraculous event, although this is no longer recognisable as such. At least one case is, however, known to us, and that is Jare, where a large image of Padmapāṇi was set up near the point travellers forded the Swat River from the left bank to the right. This was a celebrated pilgrimage site, identified by Stein on the basis of evidence offered by the Chinese pilgrim Songyun, for here, as tradition had it, an impression of the spot where the Buddha had placed his *saṁghātī* to dry was conserved in a rock (Stein 1929, pp. 86–87 and p. 48; 1930, pp. 56–57; Tucci 1958, pp. 303–4)[6]. Here, the relief takes on a twofold function, signalling the sacred place and at the same time acting as an apotropaic image; travellers about to cross at a particularly turbulent stretch of the river would certainly have addressed their prayers to it *(ibid.)*.

No dedicatory inscriptions accompany the sculptures, nor does the iconographic repertoire contain the slightest reference to any possible donors, except in a few,

[3] As a matter of fact, archaeological reconnaissance shows that in historical times the most recurrent model of occupation of the territory is based on a multiradial typology, where a constellation of Buddhist monastic foundations – seemingly involved in relevant economic activities such as trade, water management and land exploitation – surround towns and rural settlements at an appropriate distance (cf. Olivieri 2008).

[4] In some cases we have conclusive evidence of this, the sacred areas being sufficiently well conserved to be identified as such if not already investigated through excavation, as for instance in the case of Butkara I, Newe Kalai and Shnaisha; in other cases the existence of sacred areas no longer conserved can be conjectured where the modern built-up area has developed over the earlier settlements, or where surface examination yields some evidence, scant as it might be.

[5] The Chinese pilgrim Xuanzang, who traversed the region in the 7th century AD, presents a gloomy picture of Buddhism in Swat. Although probably exaggerated, Xuanzang's statement (1400 old *saṁghārāmas* "generally waste and desolated"; see Beal 1969 [1884], p. 120) does suggest that in the 7th century AD the landscape must have been dotted by a number of monuments and monasteries in a state of decay.

[6] According to a legend recounted by Songyun (Beal 1969 [1884], xcv; Chavannes 1903, p. 409 f.) the Buddha's garments were drenched during a terrible storm of wind and rain unleashed by a *nāgarāja* irritated by the conversions the Buddha had achieved in the kingdom of Wu-ch'ang/U-chang (Uḍḍiyāna). Briefer versions of the legend, with differently combined details, are given by Faxian (Beal 1969 [1884], xxxi) and Xuanzang (Id.: 135).

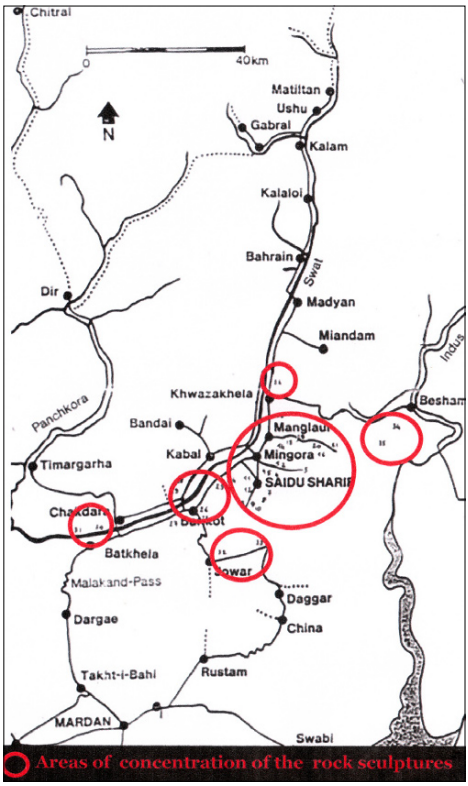

Fig. 12.2. Map of the distribution of the rock sculptures

rare cases where small figures of devotees are portrayed. These, however, display such generic features that their presence seems more an iconographic symbol than a memorial of any material act of donation[7]. This absence appears all the more significant when we consider that votive offerings are, for Buddhists, one of the most common means of accumulating merits. This is therefore further evidence that, rather than the chance juxtaposition of individual donations, the flowering of rock sculpture in Swat was the result of a systematic plan that was undertaken for the purpose of re-establishing the earlier sacred topography. Behind such a project we can only imagine the monastic community itself, which may well have worked on the actual execution of the reliefs,[8] probably with the support of devotees, although no record remains of names or faces.

[7] Donors appear on a stele depicting Maitreya (Filigenzi 1999: fig. 1) and a more complex relief, again on a stele, published by Tucci (1958, figures 14–15). A different case is represented by a stele depicting a *siddha* (Filigenzi 2003), where the two ancillary figures probably held a specific function.

[8] This is also the hypothesis advanced by Dani (1968–1969, pp. 253–54) with regard to an analogous production in Dir.

It was probably the ecumenical nature of the project and the unrestricted access to the images that dictated the type of iconographic repertory, so basic as to seem almost synoptic. The subjects are clearly among the most familiar of the popular theology of the period: the Buddha, the most celebrated Bodhisattvas, the most common attributes of the divinities and the most elementary meanings of the doctrine. The Vajrayāna tradition, which demands a high degree of intellectual commitment, is not absent here (as previously thought; see Tucci 1958, p. 284, 322) but is rather adjusted to fit the elementary dimension of the open-air setting.

But still, it took me a long time before I could understand, and love, the objects of my work. For an art historian this is a frustrating defeat, but I looked for years at these uncertain forms and they replied to my efforts with an obstinate silence, like awkward puppets. Finally, I got the point.

This rock art was much more than an economical way to mark a religious site and restore it to life; it became closely bound up with the sacred space, transforming the physical route leading there into the symbolic diagram of an inner pathway to spiritual palingenesis.[9] Although significant elements of the topographic course may have been lost over time due to changes brought about naturally or artificially, certain common characteristics associating place and sculptures still stand out. The sculptures' positioning was not merely determined by being along pilgrimage routes, but also by rather more sophisticated formal criteria that must have produced subtly calculated effects. In the first place, evident care was taken over where the sculptures where placed with regard to the landscape as a whole. In fact, the primary concern of the artists seems to have been to fit the works into a suitable natural theatre in such a way as to reflect the idea that the sacred place was entirely a work of nature. Accordingly, the figures carved into the rock had to appear as if they were spontaneously emerging from it, as if the artistry lay simply in unveiling forms that were already in existence.

In this organic pattern of artistic creation we can detect a close affinity with a concept that is still fairly widespread in the Indian milieu: the so-called *swayaṃbhū,* or uncreated, self-existent images. Here, the association between image and material support displays an intricate link to the land, a link that runs far deeper than a chance association justified by the presence of a site or a monument needing to be pointed out. The sculptures stand along the pilgrimage pathway as if they

[9] Although no textual evidence can be directly correlated to this specific network of pilgrimage routes and their mystical character, the underlying concept must have been not much dissimilar from living practices in the Tibetan Bonpo environment (cf. Ramble 2007), whose possible connection with the aboriginal beliefs of the northern regions of Pakistan could be now re- evaluated on more firm grounds after the recent discovery in Swat of a huge amount of non-Buddhist monuments (see below). The contribution of masters coming from modern-day Gilgit – a region lying very near to the Upper Swat – to the transformation of the primitive Tibetan Bon in a codified system was nonetheless already pointed out by Tucci (1958, p. 279, 282). For a more detailed discussion of these aspects I refer to Filigenzi (forthcoming).

are forming a subtle emotional counterpoint to it. Thus a sculpture may loom out unexpectedly from a semi-concealed corner, or stand just where one might expect, watchfully waiting, at an empty, barren spot, or might stand above, attracting the pilgrim's eye as if beckoning. The positions are inspired by the characteristics of the landscape, at one moment in an intimate, secluded corner, in the next in a broad space lying open to the horizon. But in every case it seems as if a forceful presence is being fused with the landscape. A true masterpiece fashioned by intuition and savage harmony is, for instance, the Padmapāṇi of Qal'a *(Figure 12.3),* inserted into the craggy mountain landscape neither too high nor too low, merging with the rock and yet an unmistakable form standing out this most solid of materials. The pursuit of rhythmically blending an image with its background influences the positioning – a massive soaring rock face, as in the case of the Buddha of Mingora, or a strangely smooth background for the Maitreya of Banjot or the Buddha of Shakorai *(Figure 12.4)*[10]*:* single images or complex scenes gently conform to the inanimate rock, converting it into an epiphany. The rock prompts, and the design complies: the image to be drawn from the rock is sought in its form and position. The two identical Padmapāṇi near Arabut *(Figure 12.5),* following the lines of stratification to achieve an appropriate position and dimensions within the perspective, symbolically express the idea of growth and rising to the heights; the Padmapāṇi of Kokarai *(Figure 12.6)* takes shape on a block beyond which a broad horizon opens out, as if a metaphor for the way ahead, opening up through the grace granted by the Bodhisattva; the reliefs of Jambil *(Figure 12.7)* emerge from the sloping spaces between the clefts in the rock as if pouring forth from it; the Padmapāṇi of Udegram, set in a sort of cube separated from the rock wall, looks as if it had been driven outwards by a supernatural force *(Figure 12.8);* the great polyhedral block of Sangota *(Figure 12.9)* displays not a throng of figures, but two striking individuals, one on each side, that seem stamped onto the bare surface of the smooth face; the Padmapāṇi of Shakorai *(Figure 12.10)* dominates from the top of a natural, funnel-shaped niche on a rock face so steep that the illusion of spontaneous existence appears extraordinarily concrete; [11] the Bodhisattvas of Kokarai *(Figure 12.11),* conforming to the lines of perspective running to the vanishing point on two converging blocks of white marble, seem to emerge from the deep recesses of the material, like bright rays from a hidden source of light. The distance between art and nature is reduced, if not totally annihilated, in order to unveil the spontaneous manifestation of the divine in the world.

[10] The relief was badly damaged in 2008 by Muslim fundamentalists.

[11] The overriding predominance of the figure of Avalokiteśvara/Padmapāṇi ("the lotus bearer") among the rock sculptures of Swat led Tucci to the conclusion that the Bodhisattva must have been seen as a protecting divinity or even a patron deity of the region (Tucci 1958, p. 323). But it is clear that the very function of the Bodhisattva – the Great compassionate helper who frees the path of obstacles and protects travellers in their physical and spiritual journeys – makes of him a true "divinity of pathways" perfectly suited to pilgrimage routes and their transformative power.

Fig. 12.3. Padmapāṇi, Qal'a (© IsIAO)

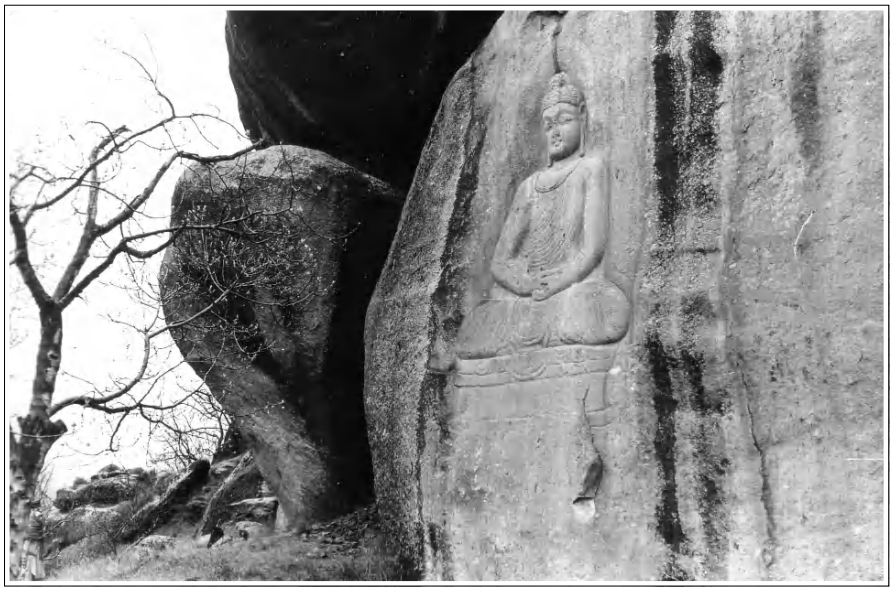

Fig. 12.4. Buddha, Shakorai (© IsIAO)

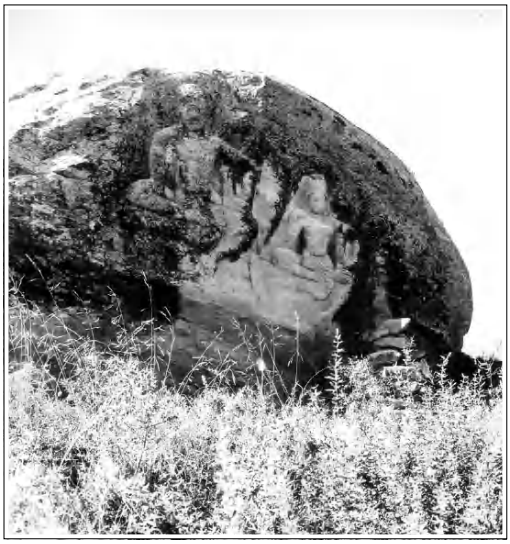

Fig. 12.5. Two Padmapāṇis, Arabut (© IsIAO)

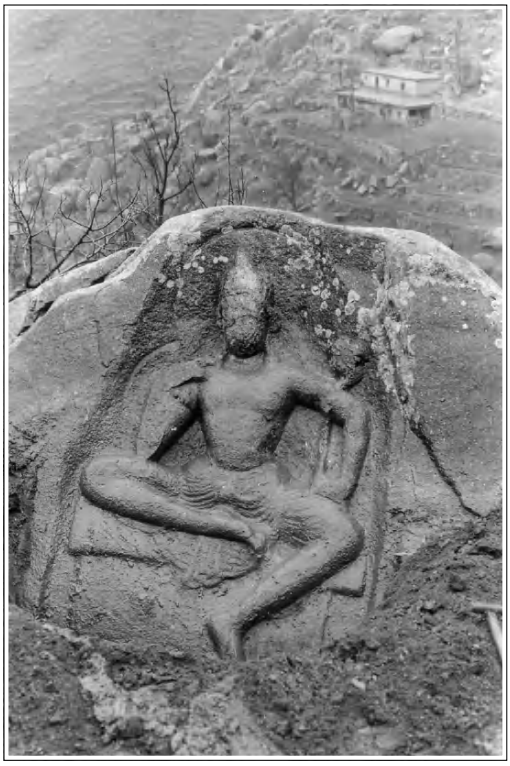

Fig. 12.6. Padmapāṇi, Kokarai (© IsIAO)

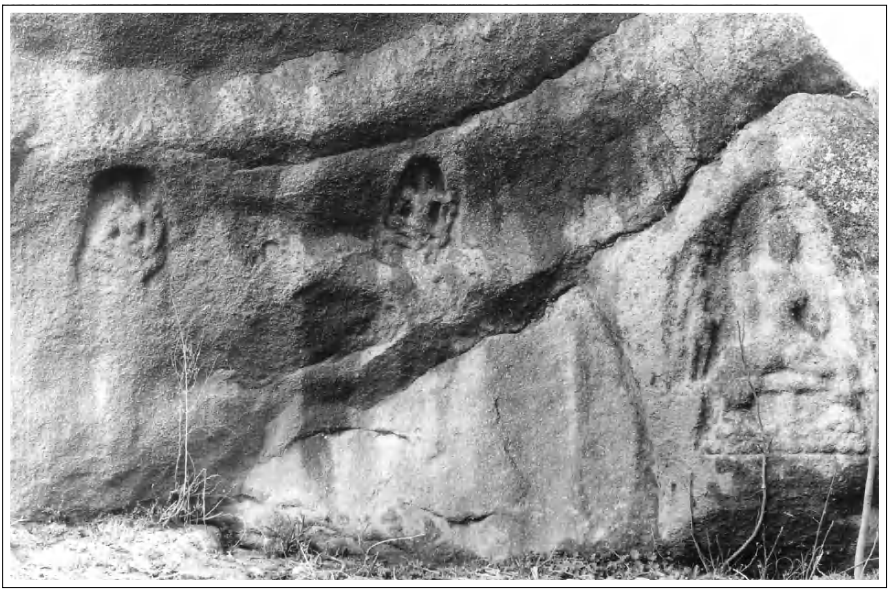

Fig. 12.7. Bodhisattvas, Jambil (© IsIAO)

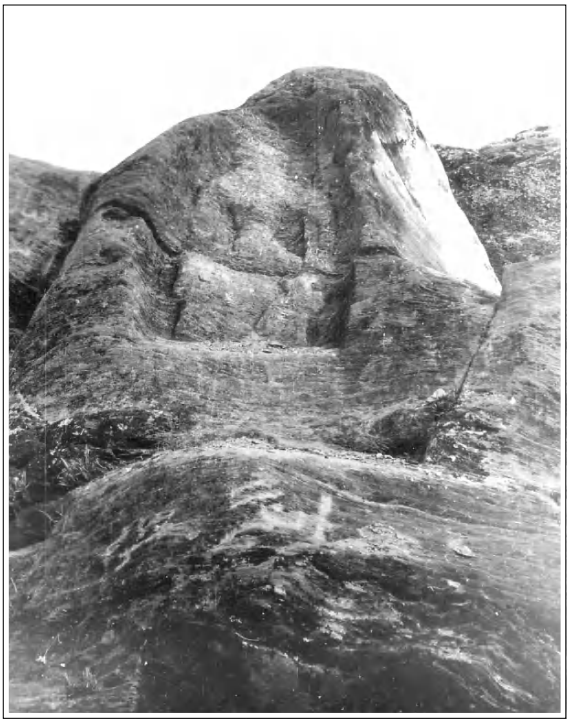

Fig. 12.8. Padmapāṇi, Udegram (© IsIAO)

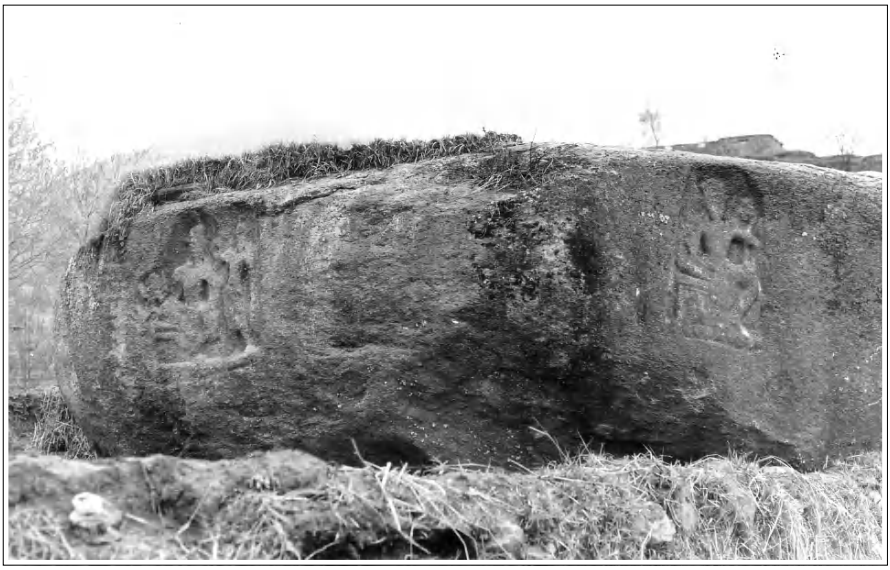

Fig. 12.9. Padmapāṇi (right); Padmapāṇi, Maitreya, flying figure (vidyādhara?) Sangota (© IsIAO)

Fig. 12.10. Padmapāṇi, Shakorai (© IsIAO)

Fig. 12.11. Bodhisattvas, Kokarai (© IsIAO)

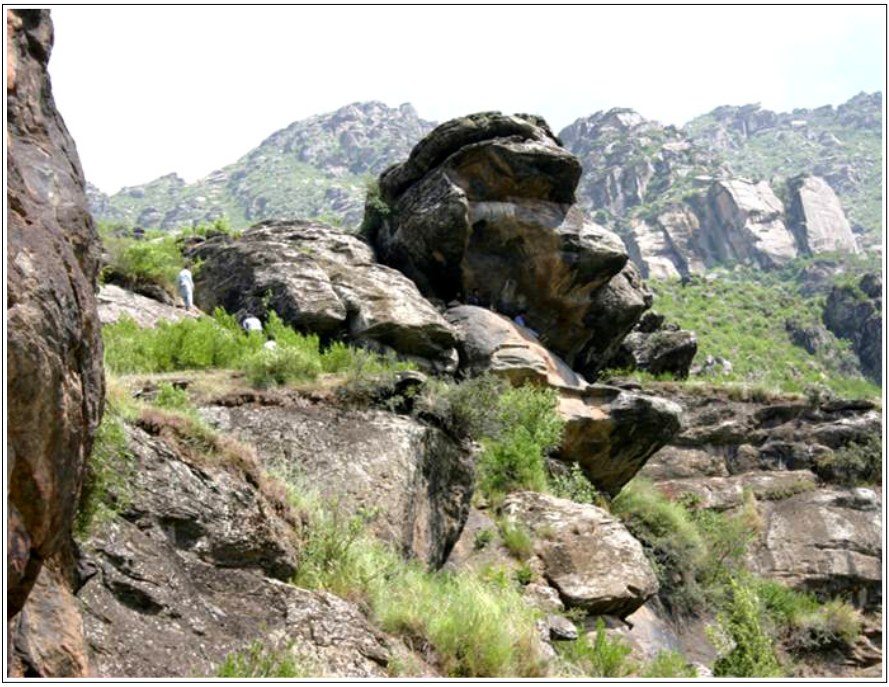

Fig. 12.12. The gigantic anthropomorfic rock dominating the site of Ghirai; all around, cup marks and wine-presses (© IsIAO)

The project may have drawn fresh vitality from the Indian concept of the *swayaṃbhū,* but certainly it is primarily indebted to the ancient religious world that preceded Buddhism and Islam and still survives in the regions south of the Hindukush under the guise of popular beliefs.

From this we can grasp that a sacred place par excellence is a site where the tremendous, inexhaustible force of nature concentrates and manifests itself spontaneously thanks to the chance encounter of favourable elements. In particular, since prehistoric times an important part of the social and religious history of the local people is written on the rock, which was and is perceived as a living entity. Indeed, the Buddhist rock art is only the tip of the iceberg. The discovery in Swat of a huge complex of non-Buddhist rock art that spans from pre-historic to late-antique times, including painted shelters, cup-marks, wine-presses (?) and natural sanctuaries *(Figure 12.12),*[12] encourages us to reconsider our notions about the cultural history of these regions, notions still too conditioned by sources related to the formalised authority of Buddhism and Islam. Paradoxically, our understanding of these prevailing systems will itself remain limited and divorced from the more complex world of the real life until other sources are taken into consideration. At the fringes of the hegemonic traditions there is a world to be explored: the world of other human societies and beliefs that, although never completely assimilated into the dominant cultures, permeated the latter with the incoercible strength of their animistic and geomantic nature.

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[12] I refer the reader to Olivieri & Vidale 2006 for a general reassessment of the evidence and a relevant bibliography.

List of Abbreviations

AMSV: Archaeological Map of the Swat Valley
FWF: Fonds zur Förderung der wissenschaftlichen Forschung
IsIAO: Istituto Italiano per l'Africa e l'Oriente (Italian Institute for Africa and the Orient)
IsMEO: Istituto Italiano per il Medio ed Estremo Oriente (Italian Institute for the Middle and Far East)
MASI: Memoirs of the Archaeological Survey of India
NFN: Nationale Forschungsnetzwerke
NWFP: Norh-West Frontier of Pakistan

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Chapter 13

DIFAB – A Databased Visual Archive of Byzantium and the Challenges of Indexing Historical Material Culture

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Abstract

The Digital Research Archive for Byzantium (DIFAB) is currently establishing a valuable tool for scholars in the field of Byzantine Studies while also aiming at interdisciplinary research. This paper introduces the specifities of the field, after which the project and working strategies are described. The long-established affinity of byzantinists to topography can be linked with a strong interest in new mapping technologies, of which the project DIFAB plans to make use. Technical aspects such as compliancy are discussed in their role as requisites for present and future interoperability and eventual co-operations. The currently established standards produce striking answers to certain problems, however there is still room for advancement. By illustrating the problems encountered so far, this paper serves as an attempt to contribute to their further development. The paper further argues the usefulness of mapping for Byzantine art history with possible analogies to other cultural/historical sciences and the innovative potential of historical databases due to their visualisability and the effect of serendipity.

13.1 Introduction

To define the idea of "Byzantium" proves to be more challenging than one might at first think. The term is applied to a vast empire that began with Constantine the Great in the fourth century encompassing the entire eastern Mediterranean and that ended with the conquest of the last holdout, Constantinople, by the Ottomans in

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Fig. 13.1. Map of Byzantium in 565 (Haldon 2005)

1453. Whereas the empire can be localised according to its fluctuating political borders *(Figures 13.1* and *13.2),* the cultural concept "Byzantium" entails a much broader sphere of influence especially when considering its continued legacy in successor states on the Balkan Peninsula and in Russia. As a result of continual change in these areas, urbanisation, and the fact that many Byzantine monuments lie above prior cultural layers which were often of more interest for archaeologists, images are in many cases the last remaining physical evidence of monuments that have often been greatly altered or completely destroyed.[1] These images thus play a crucial role in documenting the cultural history of Byzantium. As a result, early researchers were quick to realise the necessity of the correlation of a monument and its geographic location and often produced maps to this end. With the development of computer-based technologies, however, new questions and possibilities concerning the "mapping" of historical data have opened up. The intention of this paper is

[1] In many cases, remnants from Byzantium were destroyed either while searching for archeologically relevant ancient sites or during urban expansion without being properly documented beforehand. Interestingly, there have also been instances, such as the recent discovery of the harbour of Theodosius in Istanbul unearthed during construction work for the new underground, where urbanisation has revealed new findings. Further construction on the underground train continues to be delayed in order to enable proper archeological excavation, survey, and documentation of the entire site (Kocabaş 2008).

Fig. 13.2. Map of Byzantium and the Balkan states, ca. 1350 (Haldon 2005)

to present an innovative approach to mapping Byzantium by combining analogue visual material and digital technology, an approach embodied in the project DiFaB. After presenting the project, a discussion of various technical aspects of using a database, theoretical concerns, and potentially problematic issues are discussed and applied to the case study Kariye Camii in Istanbul.

13.2 DiFaB

The Digital Research Archive for Byzantium (DiFaB) is an interdisciplinary project initiated by Lioba Theis at the Department of Art History at the University of Vienna in 2006. The project offers a database of digitised and digital images related to the material culture of Byzantium and the broader sphere of its reception up to today with the intention of making this material easily available to the general scholarly community. To achieve this goal, a three-part strategy has been developed. The project is firstly building up a database that comprises different photographic collections related to the cultural heritage of Byzantium covering a timeframe from the beginnings of photography up to the present day. Secondly, the digital assets – in publication quality – are to be stored properly in order to preserve the data as if it were an "analogue" archive; and thirdly, the database must be suitable for scientific research. To achieve this goal, the entered metadata is required to be as detailed and widely usable as possible. The final step is to make the database openly accessible to the scientific community via the internet.

13.2.1 Curatorial Aspects of Collecting

The question of what to collect and digitise is very important in considering the effectiveness of a database such as DiFaB, as an important factor in the value of any database rests to a great extent on the number of assets it contains. The fundamental curatorial challenge lies in assembling sufficient visual material in a repository to document not only the great breadth of the geographic area encompassed by the cultural "Byzantium" but also to capture the history of these monuments within the context of the continually fluctuating borders of Byzantium and its succcessor states – the element of chronological "depth". Even in the relatively short span of the last 150 years, many changes on objects have been undertaken, which have decisively altered their historical evidence. One must also keep in mind that significant information about a three-dimensional object in particular physical surroundings cannot adequately be conveyed in one two-dimensional photographic image. This said, the ultimate goal is to collect as much remaining pictorial evidence of material culture as possible that has been severely altered, already destroyed or is in danger of destruction.

In concentrating on the volume of images, one must not neglect the quality of the individual image in the database. To ensure the quality of the comprehended facets and their accessibility, it is essential to follow certain procedures which are described further on in this paper.

Concerning the project DiFaB, the historic Photograph Collections of the Department of Art History at the University of Vienna and the private slides collec-

tion of the late German art historian Horst Hallensleben build the foundation of its assets. Moreover, several private collections of visual material from significant art historians – Josef Strzygowski, Otto Demus, Marcell Restle – are going to be incorporated into the project. A third pillar is formed by pictures taken on field missions by members of the project and the department in recent years. In view of the quantity of entered data within the database, the project is still in its beginnings. Nevertheless, further collections are needed, and thus a scenario for cooperations with different partners and the according technical procedures to achieve a broad basis of material have been developed.

13.2.2 Accessibility

Even the most comprehensive collection is of greater scholarly value only when made openly accessible for study. The accessibility depends on two key factors: one is a political issue concerning the decision whether or not to make the work of an institution openly and freely accessible to the public; the other deals with the issue of retrievability. The University of Vienna admits to Open Access for the present accessability, as well as to Open Standards and Open Source for future (technological) accessability. This is evident in the mindset of our project partner PHAIDRA, the university-based digital archiving system (PHAIDRA 2009). Their support offers a suitable basis for the work with metadata, which is indispensable for the continuing wide amenability of the digital assets. Accessible is only that which can be found, not only today but also in 50 years. The exact means of achieving this goal of long-term accessibility are described in detail below. Part of the strategy is to follow internationally approved rules; part is the switch from *digital asset management* to *permanent hosting and indexing* (PHAIDRA 2009) and part is a mapping strategy. Mapping represents an important aspect of questions concerning usability and visualisability, making circumstances visually perceivable and also offering assistance in the searching processes.

13.3 Technical Necessities in a Digitisation Project

13.3.1 Digitisation Process

As historical images – prints, negatives, slides – are physical objects, a large portion of the primary work in preparing the database is converting the analogue visual material into a digital counterpart. Upon starting a digitisation project it is important to make sure that this work is done with the highest degree of care and according to the highest technical standards, in order to get the most out of the physical image and

to secure the lasting effect of the process. To ensure interoperability and durability of the produced digital asset, it is indispensable to follow certain recommendations dictated by leading institutions such as the MINERVA-network for the co-ordination of digitisation activities of cultural and scientific content in various European national states. For a digitisation project mostly concerned with photographic material, the crucial issue is to preserve as much visual information as possible from the original image. Black-and-white prints should therefore be scanned with a resolution of 600 dpi and a minimum of 8 bit depth (MinervaEC Project 2008). For colour slides, a minimum resolution of 2400 dpi is recommended (MinervaEC Project 2008); in order to secure the entirety of the spatial resolution of high quality slide films, it has been decided to scan these images at 4000 dpi for the project DIFAB. As a colour slide contains considerably more information than the human eye can perceive, scanning with a 48 bit colour resolution is necessary to preserve it in high quality and to optimise its potential for future use. According to set standards and in the interest of future migration, the images are stored in the TIFF-baseline format, the only lossless non-proprietary file format that has been established worldwide and is thus suitable for archiving. Appropriately scanned and stored slide-images will have a good tolerance for adjusting exposure and colour-manipulation in order to be modified and used for publication purposes. The negative aspect of such image files produced in high resolution and depth is that they are very large, an issue which must be faced when aiming to ensure long-term archiving. For genuine digital photography, the same guidelines are applied concerning the file format; the pictures are taken first in the RAW-mode and subsequently converted into the archive-secure TIFF format.

One of the much sought-after goals of photography has always been to achieve an authentic reproduction of the colour and light perception of the human eye. To provide for this, colour management systems, such as colour standards, have been developed for closed workflow circuits – for example in publishing, when new photographic material is made under controlled circumstances – thereby establishing specific workflow regulations. These continue to be valid in the age of digital photography, although they have been adjusted to the new technology. The technical guidelines for digitising content (Dreyer 2002, MinervaEC Project 2008, Puglia et al 2004) fail to specify any regulations for a colour management workflow for obvious reasons: in the process of digitisation, a closed surrounding does not exist; the only certainty in regard to colour that can be recorded is not that at the time in which the picture was actually taken, but rather that at the moment of scanning. The result comprises the condition of the analogue medium and additionally the scanner and its calibration. Thus a possible way to handle the problem of colour management is provided by scanning an IT8-target prior to every scanning session to ensure that the condition of the scanned media can always be reconstructed at a later point.[2]

[2] The rendering of colour authenticity is a difficult issue in regards to the greater discourse of digitisation, the complete discussion of which unfortunately proves to be too complex to be included in the context of this paper.

13.3.2 Metadata

Having completed the digitisation process, the images are then inserted into the database, where they are coupled with metadata – literally "data about data", in the case of an image, title, description, etc. – which ensure that the digital assets can be retrieved, found by a wide base of users and can operate in different interfaces. In following the international Dublin Core norm[3], the metadata can easily be migrated and implemented into different environments, thus providing a technical interoperability with other systems. To achieve this transferability, it is crucial to use a controlled, standardised vocabulary in this process. With thesauri like those developed by the Getty Research Institute (Getty Vocabulary Program 2009), the entered metadata is rendered internationally compatible by interlinking commonly known vocabulary with special vocabulary as well as with a definite numerical identifier. The Getty TGN (Thesaurus of Geographic Names) for example provides every geographical entity with its name in the original language, synonyms in various other languages, different spellings, and even historical names, while at the same time connecting it with geographical entities in higher levels of hierarchy. Furthermore, and of utmost importance for data not originally provided with geographical information, the TGN provides machine-readable numerical coordinates for all geographical entities. Alternatively, digital photographs can be "geotagged" on site. For these pictures, the TGN has the potential to serve as a tool to convert machine-only readable numerics into linguistic-semantic information. The indexing could thus be automatised for these new images.

In the case study of the Kariye Camii in Istanbul *(Figures 13.3, 13.4* and *13.5a,b* and *Table 13.1),* in providing the digital asset with the metadata "Istanbul" through the TGN, it is connected to "Constantinople" – one of the historical names of the city in English – as well as "Turkey" – as an entity on a higher level of hierarchy. Simultaneously coordinates are provided (41 02 00 N, 28 57 00 E), a necessity for connecting the information with visualisation tools through a suitable interface. All of these aspects are of particular importance regarding the usability of a database.

13.4 Byzantine Studies and Topography

As mentioned in the introduction, the history of Byzantine Studies has always dealt with the question of space in relation to material culture. While at the end of the 19th century and the beginning of the 20th century, it was mostly historians who were concerned with questions of the ever-changing geographical reality of Byzantium especially in view of political and economic issues[4], art historians began to recognise the importance of geographical issues for the study of Byzantine art in

[3] The Dublin Core norm is developed by the Dublin Core Metadata Initiative (2009).
[4] See e.g. Hogarth (1920), Maull (1962), Ostrogorsky (1959), Philippson (1939), Ramsey (1890).

the second half of the last century. Researchers, such as Wolfgang Müller-Wiener (1977), who undertook the systematic examination and catalogisation of the standing monuments in Istanbul were occupied with their geographic placement and often produced maps to this end. This recognition of the importance of space may be due to two important points: 1. The borders and sphere of influence of the Byzantine Empire changed constantly during its existence of over 1100 years *(Figures 13.1* and *13.2),* thus it is indispensable to always bear in mind the relatedness of cultural monuments to specific places; and 2. the evidence that is left of Byzantine culture is very scarce. Only in situating the objects and monuments in space and time can a specific context be established and art historical research facilitated, especially in relation to questions of style.

Up to now, much of the research combining art historical and geographical (mostly topographical) questions have concentrated on Constantinople – modern Istanbul – as the capital of the Empire.[5] The dense evidence, either remaining or known from written sources, of some of the most impressive monuments of Byzantine art point to its capital city. As these monuments were successively destroyed, changed and/or rebuilt, considerations concerning the topography of the city were and still are a matter of documentation and specification, the detailed proof of which is of enormous relevance for further research.

The only project with the goal of documenting all remaining evidence within the scope of the Byzantine Empire as a geographical entity and creating an atlas of the Empire is the Tabula Imperii Byzantini, a project initiated by the Viennese Byzantinist Herbert Hunger in 1966 which continues to this day.[6] Nevertheless, an undertaking that enables the linkage of space, time and subject has not yet been attempted.

13.5 Cartography, History and Databases

Without a doubt, there is a difference between a database of genuine digital objects and one comprising facets which have been changed from their ontological status of material existence into a digitised one. The usual case for a database of historical artefacts (which every artwork is in a broader sense) is even more complicated, as one must handle both kinds of objects – original digital objects and digitised objects – in such a database. Surprisingly, the existing well-established standards

[5] See e.g. Guilland (1969), Janin (1964), Magdalino (2007), Müller-Wiener (1977), Van Millingen (1899).

[6] The volumes 1–10 and 12 of altogether 18 volumes have already been published. Accompanying these volumes are 7 further publications within the "Veröffentlichungen der Kommision der Tabula Imperii Byzantini" (Institut für Byzanzforschung 2009). Another essential contribution is Koder (2001).

do not offer useful hints on how to deal with this situation, as will be explained. A further challenge is the representation of time in databases, its relation to space and subject matter that has not yet been tackled, even though this construct could be extremely useful for scholarly purposes. Finding a solution to these problems is necessary in order to utilise this new collection of visual material and opening up the possibility of new approaches in research.

13.5.1 Referencing "Real World" or Digitised Media

The Digital Research Archive for Byzantium is working with PHAIDRA, as stated above, which employs the Learning Object Metadata (LOM) (IEEE 2002) standard for its archiving purposes. The LOM is fully complient with the Dublin Core Standards, but applies it to so-called learning objects. The LOM, as does the CanCore Standard (2009), offers a section entitled "life-cycle" that allows for the declaration of an entity (person or institution) linked to a role and date. Thus it is possible to assign who, for example, built a church in the 6th century, who photographed the building in the early 20th century, and who digitised the photograph in 2008; it is also always possible to update this information whenever any aspect contained in the metadata is changed. So far, this represents the furthest extent of the actual temporal capabilities of this database concept. It is possible to ask, who (person/institution) did what (role) when (date) with the object. Whether s/he was still acting in the "real world" or in a virtual surrounding manipulating digital data can only be assumed by looking at the date and role and through knowledge of a certain object. This lack of clear division between physical, historical and digital world is one problem; moreover there is the problem of the change of media to consider, which cannot be thoroughly discussed in the framework of this paper. In short, it is a problem in the metadata-structure which makes it hard to clearly state whether a piece of information refers to the actual digital object or to its real-world-antetype.[7] Aside from this uncertainty, the capabilities of documenting time also prove challenging.

13.5.2 A Temporal/Historical Database and Maps with Dublin Core?

There has been some development in the direction of temporal databases, of which relatively little is know outside of a smaller circle of computer specialists.

[7] The question is whether it is sensible to represent the material object – in our case study the Kariye Camii – by an extra facet as the "idea" of Kariye Camii. All metadata of this representation of the real-world-object would refer to the building (not to a medium, e.g. photograph), while all pictures of it are part of this facet (in a *collection* as understood within the framework of PHAIDRA). Nevertheless this solution would not be a consistent, easily usable possibility to describe the problem, as one could never be sure where to limit defining objects.

Humanities are usually late to discover and implement technology as a method to facilitate their research. Generally, a cursory search in Wikipedia or Google gives the impression, that it is not very easy to fulfill the requirements of a temporal database (Temporal Database 2009), namely the ability to carry all data and metadata through time, specifically by means of two "sorts of time". The first time, the *transaction time,* states who altered the object or metadata at what time and place and in which manner. This function is fully implemented in PHAIDRA and also supported by Dublin Core and LOM. The second time that is necessary to obtain a functioning temporal database is the so-called *validity time*. While the transaction time could be described as a point on a timeline, the validity time forms a time span or period showing how long the information established by the transaction time *was* or *is* valid.

Taking up the example of the Kariye Camii, the information that the building was a church is *valid* from the time of its erection to its transformation into a mosque which began in 1495. This new information was then *valid,* until the site *was* turned into a museum – an information *valid now* and into an undefined future. *(Table 13.1)* The crucial point is that LOM as well as Dublin Core seem to be limited in respect to these specific needs of a historical database. Dublin Core proposes to use the term "coverage" for these purposes, defining it as "[t]he spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant." (DCMI Metadata Terms 2008). According to the Dublin Core Metadata Initiative (2009) it may contain "a named place or a location specified by its geographic coordinates. A temporal topic may be a named period, date, or date range. A jurisdiction may be a named administrative entity or a geographic place to which the resource applies. Recommended best practice is to use a controlled vocabulary such as the Thesaurus of Geographic Names [TGN]. Where appropriate, named places or time periods can be used in preference to numeric identifiers such as sets of coordinates or date ranges." LOM states exactly the same, as it evolved directly from the Dublin Core Metadata Initiative (IEEE 2002). Only in the usage guide is additional information provided, stating that "for more complex applications, consideration should be given to using an encoding scheme that supports appropriate specification of information, such as DCMI Period, DCMI Box or DCMI Point" (Using Dublin Core 2005), whereas *period* is used to define periods of time, *box* is used for areas and *point* for exact geographical locations. *Coverage* thus theoretically does cover time and place, but there does not seem to be a possibility to unmistakably link time and space with the subject matter since it is to be stated in a separate field entitled *subject.*

It has proven to be essential to resolve this problem in order to create the possibility of visualising historical changes in the objects we collect via mapping. It is, however, advantageous to do so in accordance with international compatibility standards in order to guarantee the possibility of cooperations with other (historical) databases.

13.5.3 Relation between Location, Time and Subject-Matter

Most complicated to document is the history of portable objects like paintings, manuscripts or spolia, which can often change their whereabouts many times. In order to record the path that such a portable object has taken throughout its existence, it is necessary to be able to link the information about the location with the according validity time, and to do so for every single known piece of information. Additionally, it is possible that the objects may have changed their dedication or purpose – their subject matter. All these aspects combined can be found, for example, in the case of a baptismal font currently in the narthex of the Hagia Sophia in Istanbul, that was formerly used as a fountain at a different location. Thus users of such a database, especially when visualised through maps, could "follow" portable objects or moving workshops on their way through time and space. Even for architectural monuments, which currently represent the greater part of objects documented within DiFaB, and that cannot "move" as a complete entity, it is of the utmost importance to document time-related changes. The demands of both groups, portable as well as non-portable objects, should be fulfilled by combining and linking the different layers of information consisting of time, space and subject.

In order to add value to the information already provided by the pictures themselves, it is important that the history of an object be incorporated into the database as well. As a result, the enabled interrelation of many objects and their metadata can provide additional value and layers of meaning for the individual asset. Such an intelligent metadata system can offer new perspectives for trans- and interdisciplinary research, and, with the possibility of comprising even immaterial objects such as ideas, useful information could be found without purposefully searching for it. With the example of Kariye Camii, one could ask to what extend former Byzantine churches around the year 1500, nearly half a century after the fall of Constantinople, were converted into mosques. The visualisability of questions like these in the form of a map could furthermore lead to new insights and interpretations in the field of cultural history.

13.5.4 Serendipitous Findings, or, the "Missing Link" through Visuality

The ability to interconnect metadata on a purely computer-based level can lead to the creation of correspondences in the database and in subsequent mapping, the combined results of which have the potential to exceed what had been anticipated. In the case of Kariye Camii, with properly defined metadata, one could potentially come across the progress of a specific workshop, for example the one that had worked on the parekklesion. Stylistic comparisons with a previously undated church in a different area could reveal a wealth of new insights about the interconnec-

tivity of objects, as seen in the movement of the workshop, and also well-founded information about individual monuments. These findings would have been unveiled unintentionally through the implementation of a new tool.

Such discoveries by chance can be seen as serendipity, a term coined by Horace Walpole and defined by Van Andel (1994) as "the art of making an unsought finding".[8] This principle has even been considered a possible scientific method as early as the 1950s by Barber and Merton (2004). The application of this principle on a database specialised on history can lead to the discovery of "missing links" – important scientific results that are difficult to find as it is impossible to ask the necessary questions. These findings become especially apparent with the addition of suitable maps.

Having pointed out the problem of the metadata, the benefits of visualisation have already been argued. It will not be long before it will be possible to create maps by defining time, area and subjects, whether architecture, specific portable objects, churches that became mosques, or movement of workshops. Another means to increase our understanding of the Byzantine cultural area and its reception until today is by providing links between maps and the objects in our database to further visualise the places where the pictures were taken. As stated above, byzantinists have from the very start used maps as a well-proven means of visualisation of data. The goal is to entrench the project DIFAB in this tradition, while staying focused on the specific interests of art historians.

13.6 Conclusions and Future Prospects

Integrating visual archives into an online research database is an undertaking that requires the thorough planning of every step, from an analogue original, through the scanning and storage process, to properly providing the digital asset with metadata thereby ensuring its longevity and findability for the interested user. The aim of a digitisation project like DIFAB, however, should not only be to store images and information. It is important to reflect on the processes and to support the study, in our case Byzantine culture, and detect possibilities for new approaches to the field. In Byzantine Studies, maps and questions concerning topography have always played a crucial role and much research has been done in this direction. Maps prove to be not only indispensable when working with historical monuments, but they are also a strong visualisation tool, enabling the viewer to perceive a complex set of information simultaneously and in a different light.

Despite advances, much work still needs to be done in view of the importance of linking not only space and object, but also space, time and time frames, and objects

[8] The recent discovery of the harbour of Theodosius in Istanbul already mentioned is a concrete example for serendipity in the "real world".

and their attributes within databases and within mapping environments. This capability is a vital objective to make the information not only more effective, but also more easily approachable for the general scientific public. The development of standards is not yet completed, and the technology is evolving very quickly. There is a certain chance that the problems discussed will be solved in the near future. For the project DiFaB it is important, to be able to interconnect with project partners, to broaden the basis of the pictorial evidence accessible, as well as to establish groups of assets being exchanged under controlled circumstances to develop realistic conceptions of its future development. For accessability, it will be crucial to find precise requirements regarding legal questions; Open Access and respectively Open Content could nevertheless be the topic of another paper in their own right.

13.7 Case Study: Kariye Camii (Chora Monastery)

The case study focuses on a site known today as the Chora Museum (Kariye Camii Müzesi). Its long history, including various functional changes and architectural modifications, dates back to its first building phase in the 6th century. The main body of the church of what was then known as the Chora monastery was constructed around 1077–1081 and is attributed to Maria Ducaena, the mother-in-law of the then Emperor Alexios I. Komnenos. A drastic alteration occurred around the year 1120, when the main church was completely rebuilt. Additional rooms including the parekklesion, a private funerary chapel, were added during the renovations funded by Theodore Metochites from 1316–1321. Most of the existing interior decoration was executed at this time. After the fall of Constantinopel, the transformation of the building into a mosque by Grand Vizier Hadim Ali Pasa ended in 1511; it was a process that included the construction of a minaret and the covering or destruction of the figural decoration within the church as well as a change of name to Kariye Camii. During the seventeenth and eighteenth centuries, the mosque was restored. After its rediscovery by scholars in the 1870s, the building was again restored from 1875–76, during which time the exterior was altered and the mosaics were uncovered. In 1894, the building suffered severely during an earthquake and the minaret collapsed. The building was again restored in 1898 in honour of the visit of Kaiser Wilhelm II. Additional restoration and uncovering was conducted in 1929. 1945 marks another crucial year in the long history of the site when it was secularised and converted into a museum. From 1947 until 1958, a thorough cleaning and restoration was undertaken, revealing new insights into the history and structure of the now Chora Museum.[9]

[9] The two seminal publications on the Kariye Camii and its history are the four volumed work of Underwood (1966, 1975) and the architectural study by Ousterhout (1987).

Fig. 13.3. Map of Istanbul with localisation of the Kariye Camii (Salzenberg 1854)

Fig. 13.4. Istanbul, Kariye Camii. View from west. Before 1894. In the public domain/ hosted by DiFaB /University of Vienna. PID: http://phaidra.univie.ac.at/o:2609

Fig. 13.5a. Istanbul, Kariye Camii. Exonarthex, south bay, view from west into the funerary chapel. 1890s. In the Public domain/hosted by DiFaB /University of Vienna (photographed by Sébah & Joaillier). PID: http://phaidra.univie.ac.at/o:26095

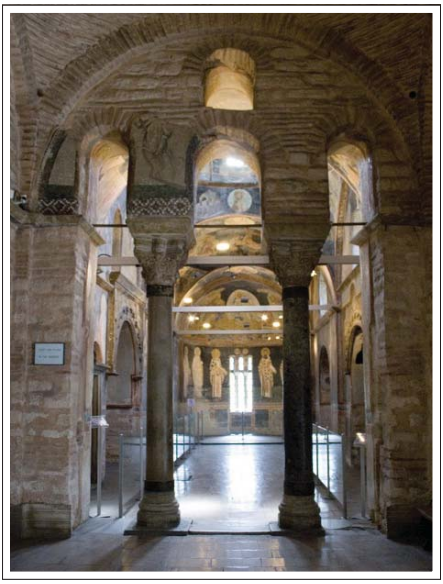

Fig. 13.5b. Istanbul, Kariye Camii, Exonarthex, south bay, view from west into the funerary chapel. 01.06.2007. DiFaB / University of Vienna (photographed by Galina Fingarova). PID: http://phaidra.univie.ac.at/o:26093

Table 13.1. Metadata for Figures 13.4 and *13.5;* the relation of time and information/ element

Element	Information	Time
"classification" ("subject")	Getty Art & Architecture Thesaurus → Objects Facet → Built Environment → Single Built Works → single built works → single built works by specific type → single built works by function → ceremonial structures → religious structures → religious buildings → **churches**	(validity time) 1316/21–1453
"classification" ("subject")	Getty Art & Architecture Thesaurus → Objects Facet → Built Environment → Single Built Works → single built works → single built works by specific type → single built works by function → ceremonial structures → religious structures → religious buildings → **mosques**	(validity time) 1453–1945
"classification" ("subject")	Getty Art & Architecture Thesaurus → Objects Facet → Built Environment → Single Built Works → single built works → single built works by specific type → single built works by function → exhibition buildings → museums → museums by subject → **religious museums**	(validity time) 1945–INF[2]
"classification" ("space")	Getty Thesaurus of Geographic Names → World → Asia → Türkiye → Marmara → İstanbul → İstanbul	(validity time) 1316/21–INF[2]
"role"	(expert:) Daniel Terkl	(transaction time) 2009-04-26

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Chapter 14

Mapping Byzantium – The Project "Macedonia, Northern Part" in the Series Tabula Imperii Byzantini (TIB) of the Austrian Academy of Sciences

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Abstract

The aim of the present paper is to outline the history, development and current status of the project *Tabula Imperii Byzantini (TIB)* of the Austrian Academy of Sciences. The *TIB* carries out systematic research on the historical geography of the Byzantine Empire, which existed from the beginning of the 4th century AD until the 15th century AD (i.e., from Late Antiquity to the Ottoman conquest), in order to create an atlas of the aforesaid empire. The project was founded in 1966. Since 1973 eleven volumes of the main series of the *TIB* have appeared. The main part of each volume of the *TIB* is comprised of a catalogue of the Byzantine names of towns, settlements, fortresses, churches, monasteries, fields, mountains, rivers and lakes in alphabetical order and extracted for each region / province of the Byzantine Empire from four categories of sources. The collected and sorted information is presented in headwords (i.e., lemmata). The results of each volume are presented to the reader on a map on the scale of 1 : 800,000 with the headwords marked onto it. Whereas the structure of the volumes of the *TIB* has remained nearly unchanged since the 1970s, Prof. Dr. Johannes Koder, director of the overall *TIB* project, has introduced new scientific methods and technical innovations in the last thirteen years *[Central Place Theory, Global Positioning System (GPS),* digital photography, *Historic Landscape Characterisation, Geographic Information System (GIS)]*.

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14.1 Introduction

14.1.1 Preliminary Studies

When Prof. Dr. Herbert Hunger (1914–2000) announced the foundation of the project *Tabula Imperii Byzantini* (hereafter *TIB)* of the Austrian Academy of Sciences at the 13th International Congress of Byzantine Studies in Oxford in the year 1966 (Hunger 1967, p. 481), he stated the basis upon which the new project was to be modelled:

> *In Analogie zu der von der Union Académique Internationale herausgegebenen Tabula Imperii Romani bereitet das Institut die Publikation eines Atlas des byzantinischen Reiches vor, der in rund 35 Kartenblättern (1 : 1,000,000) und ebenso vielen zugehörigen Faszikeln alle Städte und grösseren Orte des Ostimperiums enthalten soll. Einige Spezialkarten in grösserem Massstab werden für besondere Gebiete notwendig sein* (Hunger 1967, p. 481).[1]

Initially, the *Tabula Imperii Romani (TIR)* served as a model for the *TIB*. According to the website of the International Union of Academies (2008) the *Tabula Imperii Romani* was founded in 1928. After the Second World War it was placed under the supervision of the International Union of Academies. Its aim consists in publishing an atlas of the Roman Empire on the scale of 1 : 1,000,000 with accompanying volumes containing historical and bibliographical data for each locality shown on the maps. Fifteen sheets were published between 1932 and the Second World War. After 1945 another twelve sheets appeared. Of special interest for the current scientific work of the *TIB* are the volumes on Naissus (Šašel et al. 1976) and on Philippi (Avraméa & Karanastassi 1993).

Although some similarities do exist, it has to be stressed that there are nevertheless substantial differences between the two projects (Koder 1978, p. 257). While the *Tabula Imperii Romani* places a strong emphasis on archaeological data with little information on the history of localities and with references to the most important literature, the *TIB* equally combines the aspects of history, archaeology, bibliography and field research / surveys.

In the wake of the *Tabula Imperii Romani* two archaeological maps of the Kingdom of Yugoslavia with accompanying volumes were completed in the 1930s. These must be mentioned at this point since they form an important basis for the current project 'Makedonien, nördlicher Teil / Macedonia, northern part' (FWF – Austrian Science Fund P 18866-G02) within the *TIB* (see below). Both volumes

[1] In analogy to the *Tabula Imperii Romani,* which is edited by the Union Académique Internationale, the Institute [scilicet of Byzantine Studies] is planning the publication of an atlas of the Byzantine Empire with ca. 35 map sheets (1 : 1,000,000) and fascicles on the cities and major places of the Eastern Roman Empire. Several special maps on a larger scale will be necessary for particular areas. (my translation)

were written in German by the Serbian historian and archaeologist Nikola Vulić (1872–1945) (Saria 1953). The first volume comprises the region of Prilep and Bitola (today Former Yugoslav Republic of Macedonia, hereafter FYROM) and was published in 1937 (Vulić 1937). The second contains the region of Kavadarci (today FYROM) and was completed in 1938 (Vulić 1938). Analogous to the *Tabula Imperii Romani,* both of them give an overview of the archaeological findings in the abovementioned regions.

One fact seems especially interesting in the context of Vulić's publications. In order to produce his archaeological maps and hence to indicate findings, Vulić combined Yugoslav maps drawn between 1923 and 1925 on the scale of 1 : 100,000 with Latin transcriptions of toponyms from Austrian maps of these regions on the scale of 1 : 200,000 (Haardt von Hartenthurn 1897; Levačić 1897), which proved useful, since both accompanying volumes were published in German. Thus, Austrian know-how supported Yugoslav cartography and archaeology before the Second World War.

Last but not least, Prof. Dr. Johannes Koder has pointed out the importance of the project *Tübinger Atlas des Vorderen Orients (TAVO),* which was begun in 1969 and completed in 1992; but he also stated that it could not be compared with the *TIB* as it is less specialised in that it covers a larger area over a longer time period and because it places a strong emphasis on information presented through maps without links to accompanying volumes (Koder 1978, pp. 256–257).

14.2 The Project Tabula Imperii Byzantini (TIB)

14.2.1 The Development of the Tabula Imperii Byzantini

In the period between the announcement of the project by Herbert Hunger in 1966 and the publication of the first volume in 1976, the *TIB* evolved significantly. Progress reports were presented by Herbert Hunger in 1966 (Hunger 1966) and in 1972/73 (Hunger 1973) and by Johannes Koder in 1975/76 (Koder 1976). The first volume of the *TIB (TIB* 1) entitled 'Hellas und Thessalia' was completed by Johannes Koder and Friedrich Hild in 1976 (Koder & Hild 1976) and was referred to at the 15th International Congress of Byzantine Studies in Athens in the same year (Hunger 1979, p. 111; Koder & Hild 1976, p. 10).

Since 1976 the aforesaid volume has served as a model for all later volumes of the *TIB*. Moreover, it helped to define the working method of the overall project, which can be summarised as follows.

14.2.2 The Aim and the Working Method of the Tabula Imperii Byzantini

After the publication of the first volume and on the basis of the experience gathered during its writing, Johannes Koder described the aim of the project in the following manner:

> *Das Ziel der TIB ist nicht, in jedem Detail und für jeden Aspekt neue Forschung zu treiben bzw. neue Ergebnisse anzubieten, sondern in erster Linie ein möglichst vollständiges, homogenes und „objektives" Bild des neuesten Forschungsstandes zu produzieren, wobei der historisch-quellenkundliche, der denkmalkundliche, der archäologische, der kunsthistorische und der topographische Faktor in gleicher Weise zu berücksichtigen sind und auch die kartographische Präsentation qualitativ entsprechen soll* (Koder 1978, p. 261).[2]

Thus, the *TIB* was not intended to present new research for all aspects of the regions covered, but rather to collect the results of the latest research on the historical sources, monuments, archaeology, art history and topopgraphy, and with attention given to high-quality cartographic presentation.

The main part of each volume of the *TIB* comprises a catalogue of the Byzantine names of towns, settlements, fortresses, churches, monasteries, fields, mountains, rivers and lakes in alphabetical order, which is extracted for each region / province of the Byzantine Empire from four categories of sources. These categories are the written sources from the abovementioned period (e.g. historiography, inscriptions etc.), the archaeological evidence (monuments and their remnants), the toponyms and the physical state of landscapes.

The collected and sorted information is presented in headwords (i.e., lemmata). Each headword contains the localisation (if possible) of a place found in the sources and data on its history and monuments. The sources used and the most important secondary literature are cited at the end of a lemma. There, the reader also finds information as to whether field research or on-site surveys have been conducted by *TIB* scholars. It has to be stressed that the excavation of monuments in the areas of research has never been an aspect of the project (Hunger 1991, p. 276). The conducted surveys have always had the aim of localising visible monuments and documenting their current state through photography. Hence, the abovementioned scholars rely heavily on the cooperation with archaeologists in the countries visited and on the publication of archaeological reports of monuments.

[2] The aim of the TIB is not to conduct new research on every detail and on every aspect or to offer new results, but to create primarily a picture of the current state of research as complete, homogeneous and "objective" as possible, in which the factors concerning the history, sources, monuments, archaeology, art history and topography have to be taken into consideration in a balanced manner and in which the cartographic presentation is to meet the standards of quality. (my translation)

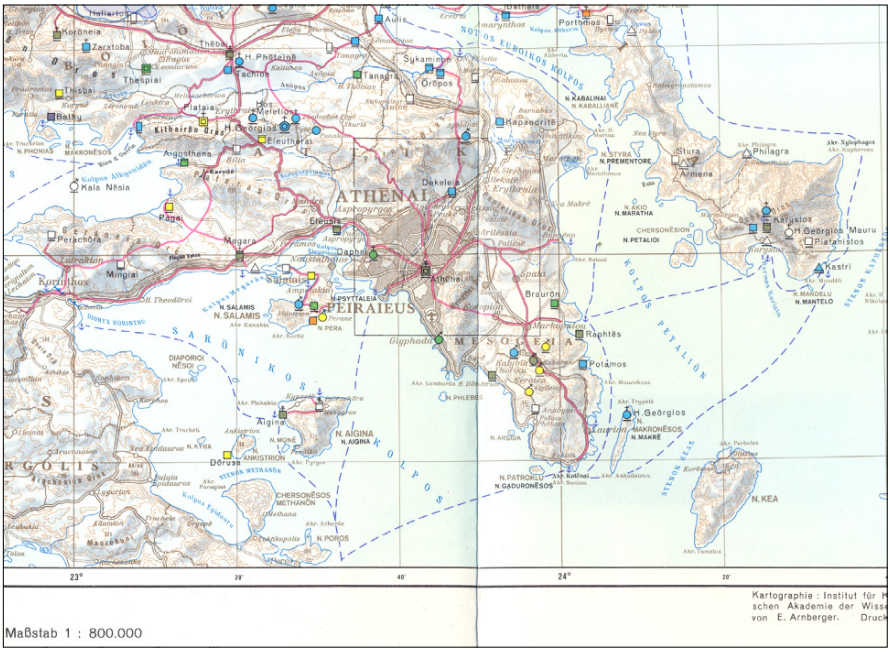
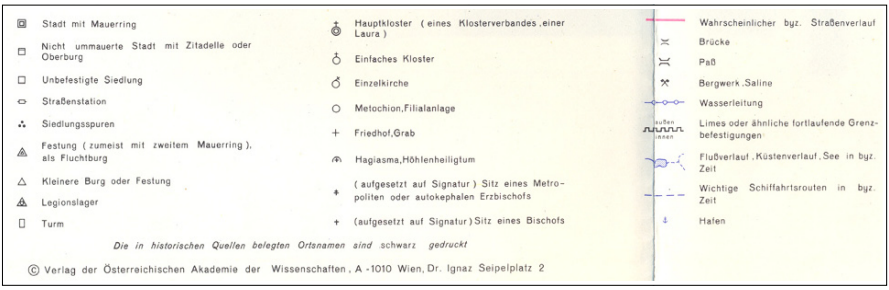


Fig. 14.1. Detail of the map "Tabula Imperii Byzantini 1, Hellas und Thessalia, Thematische Karte". Source: Koder, J, Hild, F 1976, Tabula Imperii Byzantini 1, Hellas und Thessalia. Register von Peter Soustal, 2nd edn 2004, Verlag der Österreichischen Akademie der Wissenschaften, Wien.

Furthermore, each volume of the *TIB* contains introductory chapters on the geography, climate, history, administration, church history, population, lines of communication and the economy of the studied region / province of the Byzantine Empire as well as a register.

The results of each volume are presented to the reader on a map on the scale of 1 : 800,000 with the headwords marked onto it (see *Figure 14.1, TIB* 1). Special symbols and combinations of colours indicate the nature of the monument and its dating (see *Figures 14.2* and *14.3,* both *TIB* 1). The maps also include historical places that are known only through archaeological evidence and whose ancient (Byzantine) names are not secure.

The original plan to produce maps on the scale of 1 : 1,000,000 in the style of the *Tabula Imperii Romani* (see above) was quickly abandoned and the former Institute of Cartography of the Austrian Academy of Sciences designed a map for the whole Mediterranean on the larger scale cited above (Kelnhofer 1976; Koder & Hild 1976, p. 8; Koder 1978, pp. 254–256). This enabled a more thorough topographic approach and facilitated the entry of headwords. If necessary, a larger scale is used for some regions (e.g. 1 : 400,000 in *TIB* 1 and *TIB* 10, cf. *Figures. 14.4* and *14.5).*



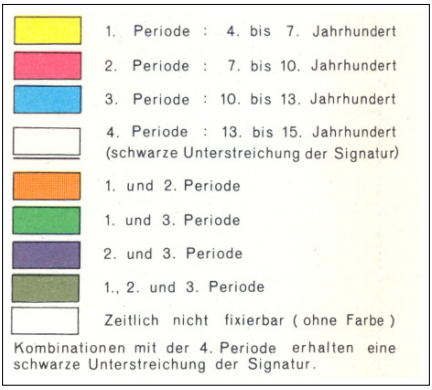


Fig. 14.2 and 14.3. Special symbols and combinations of colours indicating the nature of the monuments and their dating. Source: Koder, J, Hild, F 1976, Tabula Imperii Byzantini 1, Hellas und Thessalia. Register von Peter Soustal, 2nd edn 2004, Verlag der Österreichischen Akademie der Wissenschaften, Wien.

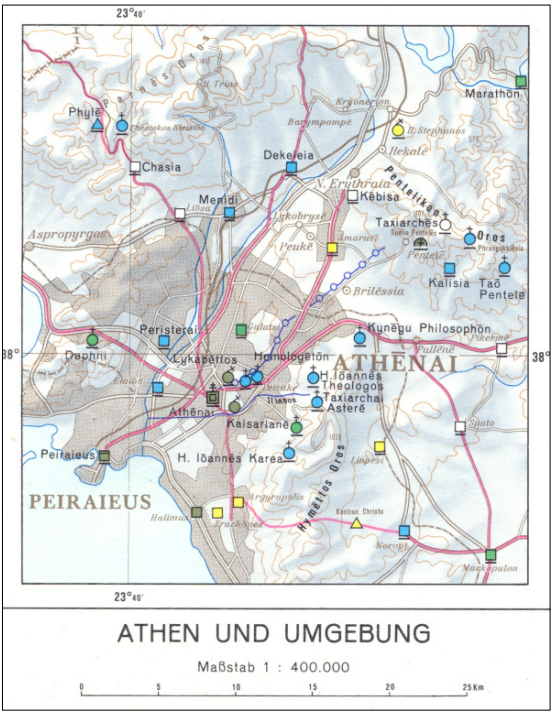


Fig. 14.4. Athens and its surrounding area.
Source: Koder, J, Hild, F 1976, Tabula Imperii Byzantini 1, Hellas und Thessalia. Register von Peter Soustal, 2nd edn 2004, Verlag der Österreichischen Akademie der Wissenschaften, Wien.

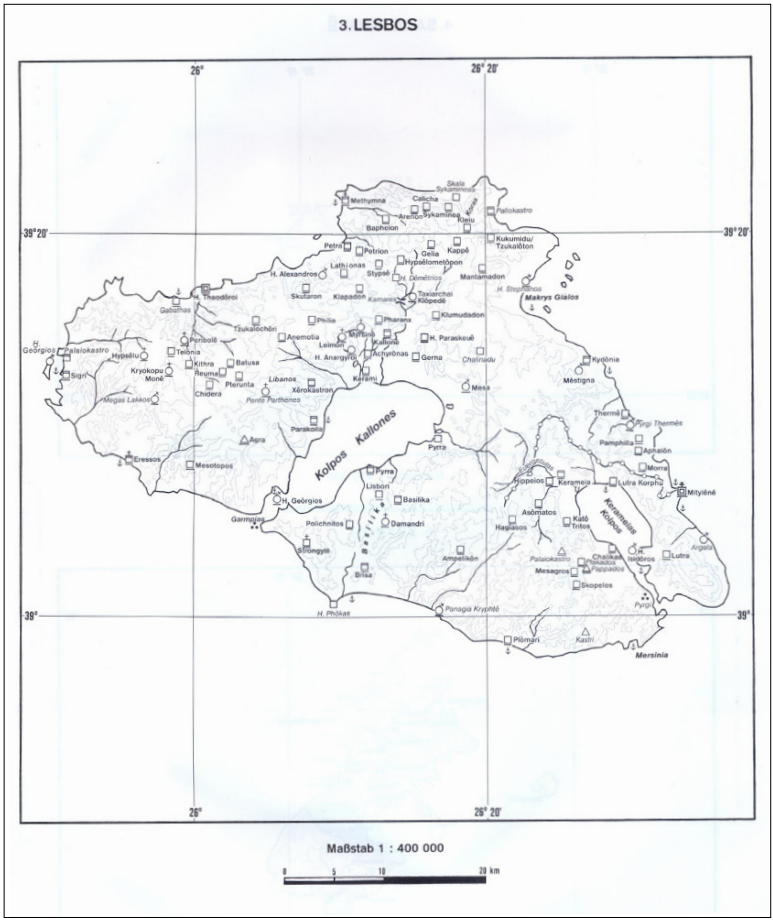


Fig. 14.5. The island of Lesbos. Source: Koder, J (unter Mitarbeit von P. Soustal und A. Koder) 1998a, Tabula Imperii Byzantini 10, Aigaion Pelagos (Die nördliche Ägäis), Verlag der Österreichischen Akademie der Wissenschaften, Wien.

The basic working method and the layout of the *TIB* have remained nearly unchanged since the 1970s, as outlined for example in the Progress Report of the Austrian Academy of Sciences (2004–2005), with the exception of the implementation of selected new scientific methods and technical innovations introduced by Prof. Dr. Johannes Koder in the 1990s (see below).

14.2.3 The Publications of the Tabula Imperii Byzantini

The *TIB* focuses on the regions/provinces of the Byzantine Empire. When the project began, the scope for each volume had to be set. This was done in accordance

with the sources on Byzantine administration and the natural borders of landscapes. The classification was undertaken by Johannes Koder (Hunger 1973, p. 83).

Initial research focused on the Balkan Peninsula (Hellas, Thessaly) and on Asia Minor (Cappadocia). The first volume of the *TIB (TIB* 1), published in 1976, is entitled 'Hellas und Thessalia' (see above), the second *(TIB* 2) on 'Kappadokien' was completed by Friedrich Hild and Marcell Restle in 1981 (Hild & Restle 1981). The third volume *(TIB* 3) on 'Nikopolis und Kephallēnia' was also published in 1981 (Soustal 1981). These last two volumes were subsequently presented to a wider audience at the 16th International Congress of Byzantine Studies held in Vienna in October 1981 (Hild 1981).

The regions upon which research was to be conducted were initially chosen as follows:

> *Den Kernländern, Kleinasien und der Balkanhalbinsel, wurde der Vorzug eingeräumt. ... Den Kontrapost Hellas ~ Anatolien hielten wir dabei für zielführend und arbeitstechnisch sinnvoll. ... Ferner werden – in Beibehaltung des Kontraposts Hellas ~ Anatolien – die Bände Epirus und Lykaonien vorbereitet. Mit den Arbeiten an Aigaion Pelagos wurde begonnen* (Koder & Hild 1976, pp. 8–10).[3]

Volume 4 of the *TIB (TIB* 4) entitled 'Galatien und Lykaonien' appeared in 1984 (Belke 1984) and included for the first time black-and-white photographs of monuments. The same year saw the publication of a book on the historical geography of the eastern Mediterranean by Johannes Koder (Koder 1984), which marked the beginning of a new perception of the geographical characteristics of the Byzantine Empire. Due to its impact on the academic community in general and on the *TIB* in particular it was reprinted with an augmented bibliography in 2001 (Koder 2001) and translated into Modern Greek in 2005 (Koder 2005).

In this book Johannes Koder defined three central areas of the Byzantine Empire (the so-called 'Kerngebiete'), which were: 1. the eastern Mediterranean, 2. Asia Minor and 3. the Balkan peninsula (Koder 1984, p. 16). Vital for the existence of the Byzantine state and therefore of great importance were: 1. the Aegean Sea, the Sea of Marmora, the Bosphorus and the access to the Black Sea, 2. the western part of Asia Minor, the northern and southern shores of Asia Minor and 3. Thrace, the shores of the Aegean Sea and the Peloponnesos (Koder 1996, p. 76).

On the basis of this approach the scientific work of the *TIB* shifted towards the abovementioned central areas ('Kerngebiete') in the 1990s. Consequently, the fifth volume on 'Kilikien und Isaurien' *(TIB* 5) was printed in 1990 (Hild

[3] Preference was given to the heartlands, Asia Minor and the Balkan peninsula. … We thought the contrapposto Hellas ~ Anatolia to be effective and expedient. … Moreover, the volumes on *Epirus* and *Lycaonia* are in preparation according the contrapposto Hellas ~ Anatolia. The work on *Aigaion Pelagos* has begun. (my translation)

& Hellenkemper 1990). Volume 7 entitled 'Phrygien und Pisidien' *(TIB* 7) was published in the same year (Belke & Mersich 1990). One year later, Peter Soustal completed the sixth volume of the *TIB (TIB* 6) on 'Thrakien (Thrakē, Rodopē und Haimimontos)' (Soustal 1991). All three volumes were presented to a wider audience at the 18th International Congress of Byzantine Studies in Moscow in August 1991 (Hunger 1991, p. 278).

In 1995 Prof. Dr. Johannes Koder became chairman of the overall project of the *TIB* and conducted it until the end of 2005. In January 2006 the *TIB* became part of the newly established Institute of Byzantine Studies of the Austrian Academy of Sciences [cf. http://www.oeaw.ac.at/byzanz/ (viewed 24 November 2008)]. Johannes Koder continues to remain the project director of the *TIB* and the editor of the volumes bearing the same name.

Since 1995 the ninth volume *(TIB* 9) on 'Paphlagonien und Honorias' (Belke 1996), the tenth *(TIB* 10) on 'Aigaion Pelagos (Die nördliche Ägäis)' (Koder 1998a) and the eighth volume *(TIB* 8) on 'Lykien und Pamphylien' (Hild & Hellenkemper 2004) were realized. The twelfth volume *(TIB* 12) on 'Ostthrakien (Eurōpē)' by Andreas Külzer recently appeared (Külzer 2008).

Since the 1970s, the main *TIB* series has been enhanced by the publication of volumes in the series *Veröffentlichungen der Kommission für die Tabula Imperii Byzantini*. This series enabled the publication of detailed studies on the historical geography of Byzantium and of congress proceedings which otherwise could not be included in the main series due to lack of space. With the establishment of the new Institute of Byzantine Studies of the Austrian Academy of Sciences (see above) this series has been renamed *Veröffentlichungen zur Byzanzforschung*. A complete list of publications can be accessed via http://www.oeaw.ac.at/byzanz/vtib.htm (viewed 24 November 2008).

14.2.4 New Scientific Methods and Technical Innovations

Whereas the structure of the volumes of the *TIB* has remained nearly unchanged since the 1970s, Johannes Koder has introduced new scientific methods and technical innovations over the last thirteen years.

He called for the systematic utilisation of results deriving from studies on the Palaeoclimate (Koder 1994; Koder 1996, pp. 84–85), and applied the *Central Place Theory* on different landscapes of the Byzantine Empire (Koder 1998b; Koder 1998c).

Nowadays the *Global Positioning System (GPS)* is used regularly during surveys in the areas of research. In addition to making slides during the course of field research, digital photography is used on a regular basis. The applicability and usefulness of *Historic Landscape Characterisation* [cf. http://www.english-heri-

Fig. 14.6. Leaflet of the Institute of Byzantine Studies of the Austrian Academy of Sciences illustrating the progress of the *TIB*. Source: Institute of Byzantine Studies of the Austrian Academy of Sciences, designed by Elisabeth Ch. Beer, revised by Christian Gastgeber

tage.org.uk/server/show/nav.1292 (viewed 24 November 2008)] and *Geographic Information System (GIS)* will be tested for a new stand-alone project financed by the FWF – Austrian Science Fund on the 'Economy and regional trade routes in northern Macedonia (12th–16th century)' under the supervision of Prof. Dr. Johannes Koder (see below) and consequently for the overall *TIB* project.

14.2.5 Current Research

Seven volumes of the *TIB* are in preparation at the moment. Peter Soustal is preparing 'Makedonien, südlicher Teil' *(TIB* 11), Klaus Belke 'Bithynien und Hellespontos' *(TIB* 13), Friedrich Hild 'Karien' *(TIB* 14), Klaus-Peter Todt and Bernd Andreas Vest 'Syria' *(TIB* 15), Mihailo Popović 'Makedonien, nördlicher Teil / Macedonia, northern part' *(TIB* 16) and Andreas Külzer 'Lydien' *(TIB* 17) and 'Asia' *(TIB* 18) (see *Figure 14.6).*

The project 'Makedonien, nördlicher Teil / Macedonia, northern part' *(TIB* 16) (FWF – Austrian Science Fund P 18866-G02)

The project 'Makedonien, nördlicher Teil / Macedonia, northern part' (i.e., the Byzantine province of *Macedonia Secunda* and parts of the provinces *Macedonia Prima, Dardania, Epirus Nova, Praevalitana* and *Dacia Mediterranea)* is financed by the FWF – Austrian Science Fund. It began on 1 March 2006 under the supervision of Prof. Dr. Johannes Koder and was concluded on 28 February 2009 [see http://www.fwf.ac.at/de/abstracts/abstract.asp?L=D&PROJ=P18866 and http://www.oeaw.ac.at/byzanz/tib014.htm (both viewed 24 November 2008)].

The project is closely connected with the incipient volume on 'Makedonien, südlicher Teil / Macedonia, southern part' (Peter Soustal; *TIB* 11), which, for practical reasons, covers the historical area of Macedonia only from the south to the present-day Greek border. Since the historical area of Macedonia is today encompassed by Greece, FYROM and Bulgaria, it proved necessary to research the northern part of this area in continuation of the incipient volume on southern Macedonia. The project's methodology follows the concept of the existing volumes of the *TIB* series. The historical textual sources (Latin, Greek, Slavonic, Arabic and Ottoman), the monuments and archaeological reports, historical names of settlements, plains and waters, and finally the physical state of the area form the basis of research. Both extant and nonextant monuments are documented and described by consulting academic literature, travel literature and by travelling to the region itself. As usual, the chronological frame of the project ranges from Late Antiquity to the Early Ottoman period, thus covering the Byzantine period as a whole. The results will be presented in a text volume *(TIB* 16) with illustrations, photographs and a thematic map (on the scale of 1 : 800,000). In this way the objective will be accomplished to produce as authentic and complete a picture as possible of the aforementioned historical area.

Thus far (February 2009) the following results have been achieved in the course of the abovementioned project:

1. A manuscript of approximately 500 pages containing headwords (lemmata) with a strong emphasis on archaeological data needed for surveys (see below).
2. In 2007 and 2008 three journeys were undertaken by Mihailo Popović and Peter Soustal in the area under research in order to conduct surveys. The first journey took place in Bulgaria (provinces Kjustendil and Blagoevgrad) from 12 to 26 June 2007; the second was conducted in the eastern part of FYROM from 3 to 17 September 2007; and the third went to the south-western part of FYROM in the period between 3 and 18 September 2008. Some 1,700 digital photographs and about 850 slides were made in the course of the these journeys. All were registered and described according to the guidelines of the *TIB* (Bildarchivierung – Richtlinien, Fassung 15.03.04).
3. Mihailo Popović wrote four articles on the Bulgarian town of Melnik (Popović 2007; Popović 2008a; Popović 2008b; Popović 2008c) and one on the valley of the river Strumica in FYROM (Popović 2009).

4. Moreover, Mihailo Popović gave papers on 'Melnik – Geschichte und Denkmäler einer Stadt an den Ausläufern des Pirin-Gebirges' (Bulgarisches Kulturinstitut 'Haus Wittgenstein', Vienna, 13 March 2008), 'Continuity and change of Byzantine and Old Slavonic toponyms in the valley of the river Strumica (FYROM)' (GeoNames 2008, Vienna, 19 May 2008), 'Regionale Handelswege, Siedlungsstruktur und Wirtschaft im nördlichen Makedonien (13.–16. Jahrhundert)' (Institut für Osteuropäische Geschichte der Universität Wien, Vienna, 29 May 2008) and two papers on the overall project of the *TIB,* i.e., 'Methodik, Arbeitsweise und aktueller Stand der *Tabula Imperii Byzantini (TIB)'* (Institut für Osteuropäische Geschichte der Universität Wien, Vienna, 15 March 2007) and 'Geographie einmal anders … – Das Projekt *Tabula Imperii Byzantini (TIB)* der Österreichischen Akademie der Wissenschaften' (Lange Nacht der Forschung 2008, Vienna, 8 November 2008).
5. Mihailo Popović presented three posters, the first entitled 'Melnik – a medieval town on the slopes of the Pirin-mountains' (The Archaeologies of Byzantium, Edinburgh, 6 April 2008), the second and the third on the overall project of the *TIB,* i.e., 'Mapping Byzantium – The project *Tabula Imperii Byzantini (TIB)* of the Austrian Academy of Sciences' (AGIT 2008 – Symposium und Fachmesse für Angewandte Geoinformatik, Salzburg, 2 July 2008) and 'Byzanz – Orte und Denkmäler eines Weltreiches' (Lange Nacht der Forschung 2008, Vienna, 8 November 2008).

14.2.6 Future Prospects

In October 2008 the FWF – Austrian Science Fund approved a new stand-alone project entitled 'Economy and regional trade routes in northern Macedonia (12th–16th century)' (project P 21137-G19). It began on 1 March 2009 and will end on 30 September 2011, with research undertaken by Mihailo Popović under the supervision of Prof. Dr. Johannes Koder.

The aim of the new stand-alone project consists of detailed research on regional lines of communication and trade routes – apart from the well documented arteries *Via militaris* and *Via Egnatia* respectively – as well as on the economic area of northern Macedonia, which will be conducted on the basis of written sources from the end of the 12th century through the end of the 16th century AD. An approximate chronological starting point is set by the treaty made in the year 1186 between Stefan Nemanja and Ragusa (Dubrovnik) on free trade in Nemanja's dominion. With the foundation of the Serbian medieval state and its expansion, Old Slavonic and Byzantine charters appear more frequently, which can be explained by territorial changes in the Byzantine-Serbian borderland (especially in Byzantine Macedonia) and the resulting redistribution of property. Further relevant sources are the (mostly

published) documents from the archives of Ragusa (Dubrovnik), chronicles and rulers' biographies, historiography, the Lives of Saints, travel accounts, itineraries, inscriptions, seals and coins. Finally, the Ottoman defters from the 15th and 16th centuries set the chronological end of the project.

The anticipated new results will, on the one hand, provide an important contribution to understanding the communication and interaction of local economic centres in the area of research. On the other hand, they aim to offer a differentiated assessment of the significance of northern Macedonia regarding mining and the transfer of goods and resources between the river Danube, the Pirin Mountains, the Aegean and the Adriatic Sea. Furthermore, the long-term value of this detailed approach lies in the creation of a basis providing information on the economic history of the late Byzantine and early Ottoman period for the overall project of the *TIB* as well as for comparisons of northern Macedonia with other regions of the Byzantine Empire (e.g. Asia Minor).

14.3 Conclusion

Research on the historical geography of the Byzantine Empire has been conducted successfully at the Austrian Academy of Sciences within the project *Tabula Imperii Byzantini (TIB)* by several generations of scholars since 1966. On the basis of working methods defined by Prof. Dr. Herbert Hunger and Prof. Dr. Johannes Koder, Vienna has evolved into an internationally recognised centre for this specific branch of Byzantine Studies.

The importance of the *TIB* is attested by a large number of relevant publications. Eleven volumes of the main series of the *TIB* and eight volumes of the *Veröffentlichungen der Kommission für die Tabula Imperii Byzantini* have appeared since 1973. Currently seven volumes of the *TIB* are in preparation.

In addition, the FWF – Austrian Science Fund plays a major role in breaking new scientific ground by providing funds for projects that enable the implementation of new methods and technical innovations. Together with the fundamental interest of international colleagues from the fields of Byzantine studies, medieval studies, archaeology, art history, geography etc. in the publications as well as in the progress of the overall *TIB,* these factors ensure the vitality and fruitfulness of a project that is unique in every sense.

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Chapter 15

The Mastery of Narratively Creating Mental Maps: Literary Cartography in Karl May's Œuvre

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Abstract

The biographic background and the art of landscape description of Karl May, one of the most prominent European travel writers and novelists is presented. Based on meticulous studies of up-to-date atlases and geographic scientific publications he developed most realistic depictions of the settings of his novels which are, in most cases, first-person narratives. Having influenced generations of not only German-speaking young readers – myself included – May's art of combining an accurate geographic background with totally imaginary and even fanciful plots is presented and scrutinized. Various examples are given.

15.1 Introduction

Today, more than ever, cartography is developing from a means of orientation into a medium for the structuring of space and time (cf. i.a. www.kulturkurier.de/Veranstaltung_156117.html). It is evident that this aspect plays an eminent role in the understanding of complex narrative situations. Hence, it seems justified to illuminate the relation between the generation of cognitive maps and the high art of novel-narration using the example of one of the leading and most influential European novelists, Karl May (25 February 1842 – 30 March 1912).

Rarely, in the German-speaking region, has an author so emphatically and impressively influenced the creation of the world view of whole generations of readers. The total number of copies of May's books amounts to more than 200 million. His work has been translated into at least 33 languages, so he has to be considered one

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of the leading writers of adventure novels and travel tales. He has been coining the geographic knowledge of generations of (not only) German-speaking young (and even older) readers, in particular at times when neither cinema newsreels or educational TV channels nor Internet were available as sources of geographic information and/or formation. Even recently, in his speech on the occasion of being granted the 2008 Georg Büchner Prize, the most important literary award in the German-speaking region, Josef Winkler mentioned two volumes of Karl May's books which, in the early1960s, represented for him as a little boy growing up in a remote Carinthian alpine village a keyhole to the "wide world" (Winkler 2008).

May's trilogies and multi-volume novels which are mainly set in the U.S.A., i. e. in the "Wild West", and in the Maghreb, i. e. in North Africa, the Middle East and the Lower Balkans, are best known to the public and they established the May's fame. Nevertheless, he used many other parts of the world as backdrop for his travel novels and adventure stories. (see *Section 15.2.2)*.

A lot has been written about Karl May, and about his art of the narrative creation of mental maps although this process has never been called that, probably because it is mainly literary theorists who deal with this phenomenon. Hence, it might be more than justified to make this whole topic better known amongst the cartographic community. This is the purpose of this paper.

15.2 Generation of Narrated and Fictitional Spaces

In a style similar to that of Watson & Saunders (2004) the attempt will be in the following paper to investigate May's way of constructing narrative landscapes which correspond well to concrete landscapes of the physical world.

15.2.1 Karl May's Life: Prerequisites for his Art of Landscape Description

Much has been written about both the life and the œuvre of Karl May. This article is not the place to repeat what has been most comprehensively summarised in the 840-pages monograph *Große Karl-May-Biographie. Leben und Werk (Great Karl May Biography. Vita and Œuvre)* by Hermann Wohlgschaft (1994). In brief, an enormous interest in foreign countries and the eager intention to convey this interest and his knowledge to his readers triggered May's excellent geographic descriptions. To write his novels and *Reiseerzählungen (travel tales)* at times where he had not yet had a chance to travel to the countries represented in his novels, is one of *the* intriguing peculiarities of Karl May. (In his late days, however, he made extensive journeys to the places of his novels.)

The geographic-cartographic background knowledge of May stems from a series of reliable scientific sources, particularly the German geographic journal *Petermanns Geographische Mittheilungen* (where Sven Hedin also published various reports about his journeys to Asia), during May's lifetime undoubtedly one of the world's leading scientific publications. But also the books of explorers like Charles Didier (1862) covering North America or Francis Frith (1862; cf. also *Figure 15.1)* dealing with the Middle East were a source for his geographic knowledge (cf. Lieblang 1999a) which he then ingeniously rendered in his novels. In any case, compared to today's pictorial information sources, also in the form of film material, the availability of visual material was rather restricted for Karl May.

In the refurbished study in May's *Villa Shatterhand* in Radebeul near Dresden, Germany, his use of large-size atlases is demonstrated. Here, the famous *Andree's Weltatlas* published by the Bibliographic Institute in Mannheim, Germany, and *Stieler's Handatlas* published by the world-renowned Justus Perthes Publishers in Gotha, Germany, *(Figures 15.2* and *15.3)* both with their various up-dated editions,are to be found. May also used the *Vollständiger Hand-Atlas der neueren Erdbeschreibung über alle Theile der Erde* by Sohr and Berghaus (1860). These atlases are also in most cases the sources for May's geographic names. In addition the *Neueste Länder- und Völkerkunde. Ein geographisches Lesebuch für alle Stände,* published in 23 volumes between 1807 and 1827 served as a reliable source of information.

Fig. 15.1. Cairo 1956: El Karafa Cemetery with Citadel and Alabaster Mosque in the background. From Francis Frith (1862). Early photography like this allowed May to produce the spaces of his accounts.

May's "narrative augmentation" of the merely two-dimensional cartographic representations of the landscapes in the typical hachured relief drawing style of that time, at small scale and, hence, with low degrees of detail into the third dimension – just based on very few, mostly black-and-white, illustrations in the aforementioned journals and books – is remarkable (cf. *Section 15.2.2).* Certainly, however, up-dated map editions might have made Karl May think that, if he had had this more recent geo-information at hand, he would in many instances have described the respective landscape differently (cf. *Figures 15.2* and *15.3).*

In novel *Durch das Land der Skipetaren (Through the Land of the Scipetars)* May even lets his hero Kara Ben Nemsi discuss the quality of the maps of the Ottoman Empire, giving a short account on map-reading and criticising the inconsistencies between the maps and the physical world (cf. also Schönbach 1991, p. 203 f.).

15.2.2 From Scientific Depiction to Popular Narration

One of the most remarkable features of Karl May's adventure writing is the high demand on geographic-ethnographic exactness and mythical figurativeness (cf. Lieblang 1999b). Martin Lowsky (1991) writes about the „more geometrico" in Karl May's œuvre, and Werner Kittstein (1992) states that May uses the „three-dimensional space as scene of action", also mentioning that he is – despite of all the adventurousness – able "to keep the reader's vista unimpeded for the pure geom-

Fig. 15.2. Colorado Plateau and Colorado River south of Las Vegas (at central northern margin). From Andree's Handatlas (1881). Original scale 1:5.000.000.

etry" (in the cartographic sense). Being assigned to the nationalistic lager (lager in English means 'beer'), Karl May has, however, to be seen as a descendant of the *Wilhelmism* of the late 19th century (Roxin 1993), a real cosmopolitan with outstanding geographic expertise.

The novelist must have had a special predilection for geographic matters. This is also proved by one of his less known works, the anthology *Geographische Predigten (Geographic Sermons,* 1875/76), published in a periodical he founded and named *Schacht und Hütte (Shaft and Smelter),* subtitled *Sheets for Entertainment and Instruction of Miners, Smelter- and Machine-Workers.* In eight sections it covers the whole range of geography from its physical basics *(Himmel und Erde/Heaven and Earth, Land und Wasser/Land and Water)* to settlement- and social geography *(Haus und Hof/House and Home).* On 377 pages May did not so much intend to give a depiction of the whole science but rather wanted to prompt the reader to make her/his own geographic reflections about what she/he sees in the world. In any case, these writings – the most comprehensive early work of May, the knowledge for which he might most probably have acquired during his four-year stay in jail (1870–1874) – represent a clue to May's later high art of astute landscape description.

Following Kandolf (1925) and in particular Schönbach (1991) one example out of his book *In den Schluchten des Balkan (Through the Canyons of the Balkans,*

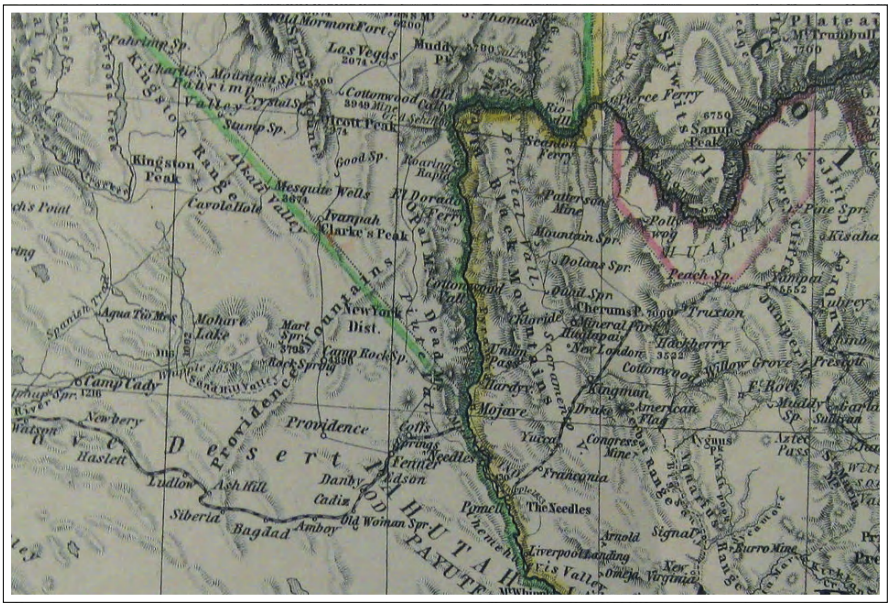

Fig. 15.3. Approximately same region as in *Figure 15.2.* From Stieler's Handatlas (1889). Original scale 1:3.700.000. Note the significantly different terrain depiction and labelling compared to *Figure 15.2.*

volume 4 of his works) shall be given to demonstrate May's way of transforming his accurate map-readings into a narration:

Between Maden and Topoklu his hero *Kara Ben Nemsi* reaches a little village with an inn. Although this inn plays, over several pages, a significant role in May's tales, the reader does not learn the village's name. May himself did not know this village either. Evidently he was, however, aware that inventing a name might have damaged his credibility. On the other hand, he could have assumed that there existed enough villages which were not indicated in the maps available for him.

At a place called Ismilan *Kara Ben Nemsi* answers the question how far is it to Menlik: *"About 25 Turkish Aghatsh or 15 German Miles; air-line I mean."* Cartometric measurements in maps corroborate this statement.

And elsewhere: *"Rumelia seemed to be bigger than Guriler."* A look into the (historic) maps confirms this fact. Or: *"We rode through some little villages. The biggest and most important one of this whole plain, Banja, was left of our route."* The map does not show any other settlement but Banja. Hence, the author could, without using any other source of information, assume that this was the most important one.

Karl May certainly wanted to teach, or rather to educate (in the widest sense), his readers. He had an "urge" to convey geographical knowledge to his audience. Hence, after his first educational writings he also tried to realise this in his novels, either by narrative landscape descriptions or by letting the heroes of his novels act as a sort of "schoolmaster" *(Oberlehrer)* explaining the landscape (cf. Abraham 2002 cum lit.).

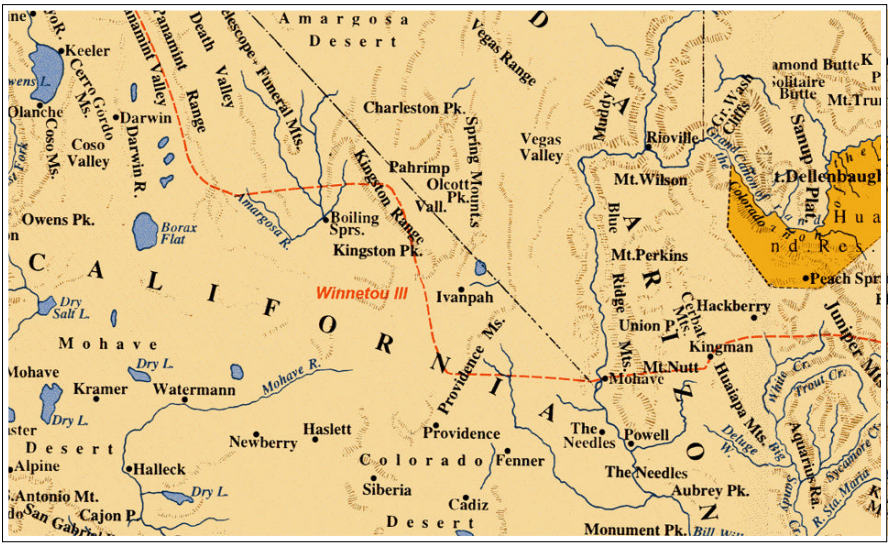

Fig. 15.4. Mapping the storyline of the Winnetou Trilogy into a present-day map. Merge of the map sheets no 251 and 252 of Gerlach (1998). The depicted region roughly corresponds to the ones shown in *Figures 15.2* and *15.3,* approximated to the scale of these figures.

15.3 Reception of Karl May's Narrated and Fictitional Spaces

According to Piatti 2008 (and subsequently also Piatti et al. 2008a and 2008b) Karl May's settings belong to the basic category of so-called "imported scenes", i.e. he uses "real-life" stages for his novels, topographically and typonomically correctly depicted geo-spaces.

Like many classical writers (cf. "Literaturtourismus", Piatti 2008), since World War II the number of travellers following in the footsteps of Karl May's heroes has continuously increased. One of them is Hans-Henning Gerlach, a trained cartographer. He was the first to publish an atlas which depicts all the physical-world and fictititional places in May's narratives. It covers practically the whole world except Australia and Antarctica (Gerlach 1998). Even eastern South Africa, High Asia, Eastern Siberia, the Andaman Islands, and the world of the Indonesian and the Polynesian islands represent the stage for May's novels *(Figures 15.5* and *15.6)*. Particularly the more detailed maps (in relation to the size of the areas covered) in the *Karl-May-Atlas* impressively show how intensively the writer made himself familiar with the geographic settings (cf. *Figure 15.4)*.

The strong and lasting impression of May is his remarkable ability to create cognitive maps in his readers' minds. The successful recognition of sites enables an even more intensive experience of both the read text and the landscape (Piatti 2008). The I myself was repeatedly astonished to experience actual feelings of déjà vu in different parts of North and South America, the Balkans, the whole Middle East, North Africa and the upper Nile Catchment, Siberia and China. More than once I was able to surprise travelling companions with predictions of what type of landscape or what landmarks (cf. "topographic markers", Piatti et al. 2008a and 2008b) were to be expected along our travel routes: mental maps generated in early youth! Such a coining can only be materialised if the description of both the physical landscape and the man-made landmarks is so impressive, precise and detailed, and yet concise, that it gets engraved into a young reader's memory. Karl May as a real "Literatur-pädagoge" ("literary educationalist", Stolte 1976 cum lit.) achieved mastery in this. Gerlach (1998) published in a comprehensive and unitified form what many readers before him had already done or wanted to do: the physical drawings of the readers' mental maps imposed onto current geographical maps.

Logically, the landscape descriptions composed during the last quarter of the 19th century have nowadays more validity in natural, rural regions – or even in national parks, e.g. in Yellow Stone (Karl May's *Winnetou – Der Sohn des Bärenjägers),* and remote regions, e.g. in the Bluffs of Llano Estacado *(Winnetou, Old Surehand)* – than in urban areas where one century of development hampers the coupling of the generated mental map and the physical world. Nevertheless, the general topological setting remains equal and historical landmarks like religious sites or Monuments

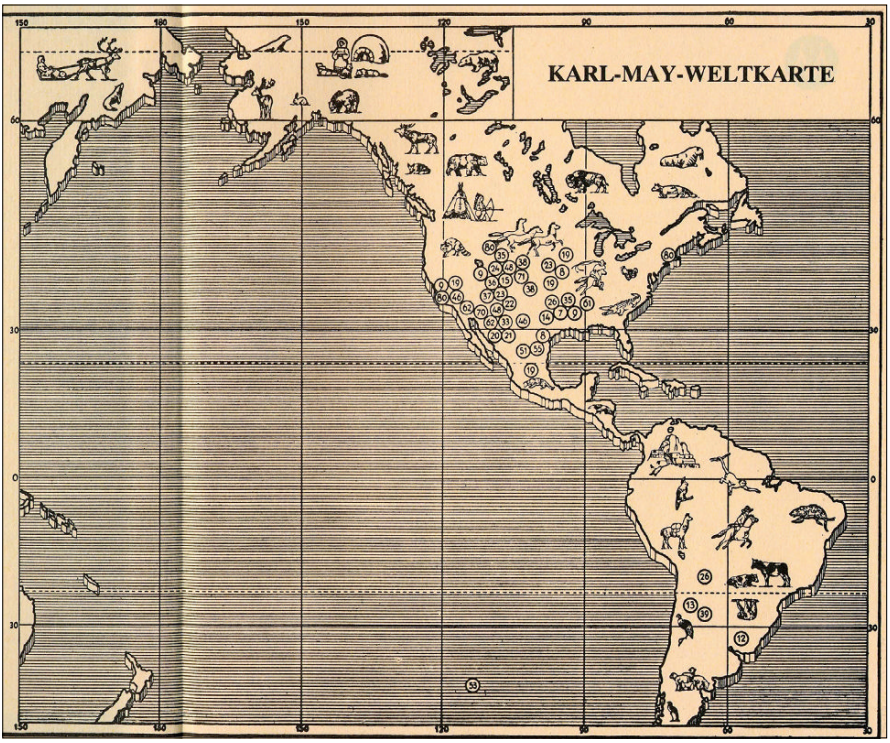

Fig. 15.5. Map of western hemisphere showing the geographic settings of Karl May's novels (from Gerlach 1998).

still remain. In Istanbul *(Stambul),* Cairo (cf. *Figure 15.1),* Kharthoum – Omdurman *(Khartum – Umderman;* cf. *Figure 15.7),* the San Francisco Bay Area and the region of the Salton Sea (both California) I was able to rely on cognitive maps acquired during my early teenager years.

15.4 Concluding Remarks

Presently we are living in a time where the image-based cartography of the "Google Earth" type greatly assists laypersons and experts in the so-called industrialised countries in the creation of a sound and photo-realistic imagination about the action spaces of novels. Pseudo-three-dimensional views of drapings of ultra-high resolution satellite imagery over digital terrain models permit landscape depictions of qualities never imagined before. Previously, one had to rely on more or less impressive written descriptions by authors who placed their narratives in real-world scenes.

Since the new discipline of *literary geography* (Sharp 1904, Piatti 2008) and, hence, the field of mapping the literary geography – which implies the direction

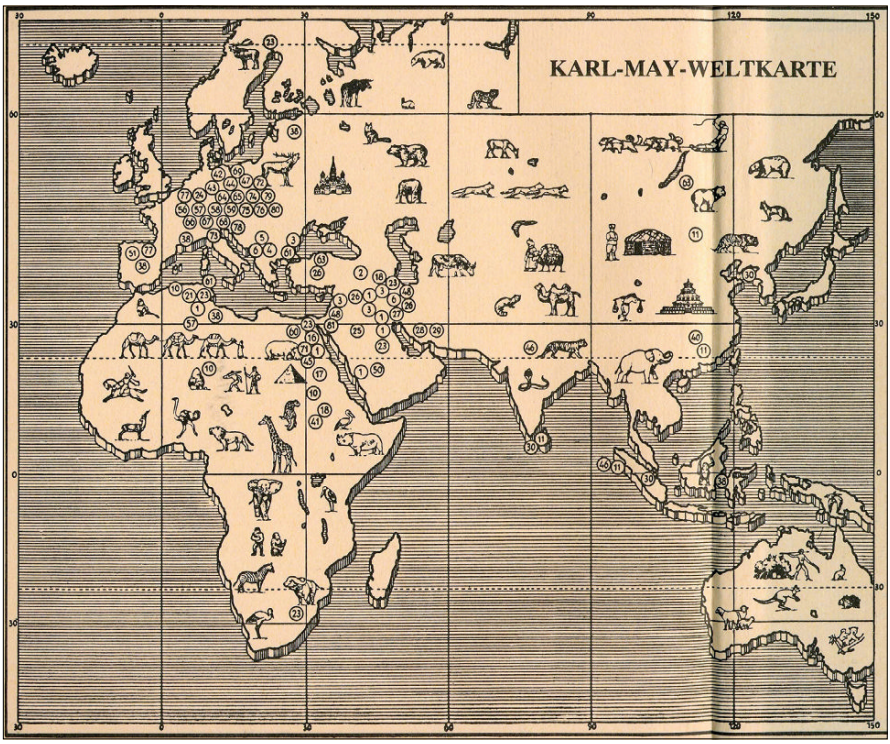

Fig. 15.6. Map of eastern hemisphere showing the geographic settings of Karl May's novels (from Gerlach 1998)

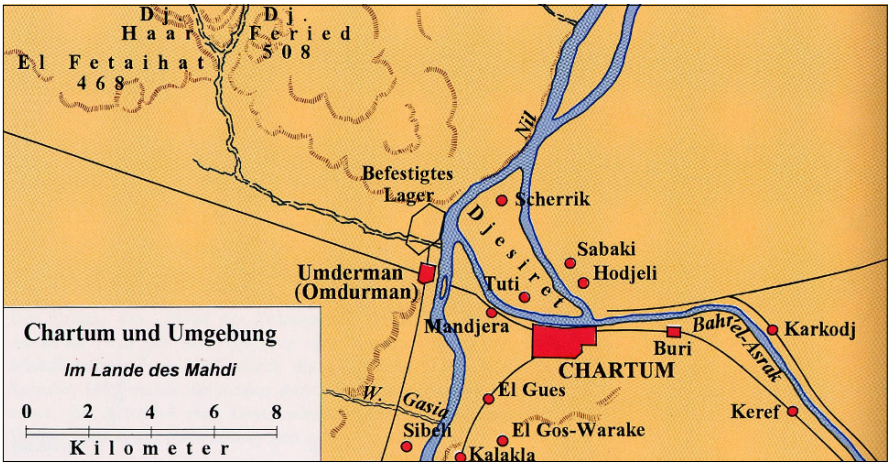

Fig. 15.7. Khartoum and Omdurman as described in Karl May's *Im Lande des Mahdi.* From Gerlach 1998.

of *literary cartography* – has been proposed, Karl May is certainly one of the top candidates within European literature to be investigated. When we consider the idea of establishing a geo-database for fictional sites and concrete geo-spaces occurring in the literature and even of a *Literary Atlas of Europe* (Piatti & Hurni 2007, Piatti et al. 2008a and 2008b), Gerlach's *Karl-May-Atlas* has to be seen as an early forerunner and a striking example of what still has to be produced for the works of other writers.

In summary the remarkable geographical, and in particular geomorphological, as well as typonymical accuracy of Karl May's landscape descriptions is predicated on his eager interest in environ-mental and especially geo-sciences, his credibility and his intention of being a literary educationalist, thus serving as a sort of public schoolmaster. By doing this, he also acted as an advocate for map-reading and cartography in general. One particular merit of May is that through his masterly landscape portrayal he explicitly elevated the frequently "flat" mental maps of his readership into the third dimension.

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Chapter 16

Ghosts of the Past: Mapping the Colonial in Eleanor Dark's Fiction

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Abstract

This paper examines Eleanor Dark's fiction from the 1930s and 1940s, for what it tells us about literature, history and place. By attending to where action takes place in her novels we find a particular engagement with Sydney and its origins, as they are represented in the landscape, in urban form, in language and in maps. Dark's constructs a literary map of Sydney in which the past sits beside the present, refusing to be silent, and this juxtaposition of past and present provides one of the most powerful tools for social and cultural critique in her work.

16.1 Introduction

The cartographic image of the 'Island Continent' has great evocative power. It is displayed even more prominently in Australia than in most other countries as an official or semi-official icon of nationhood. In notional and perhaps also concrete terms, the map enters into an Australian's sense of nationality and even personal identity more deeply than statistical, political or ideological definitions of what constitutes Australia and the Australian.

Perhaps for this reason Australian literature has been more diligent in literally, metaphorically and self-consciously mapping the continent than almost any other old or emerging national literature (Leer 1991, p. 1).

Martin Leer illustrates this observation with two passages from the Australian novels of Christina Stead; one towards the end of *Seven Poor Men of Sydney* (1934) and the second from the proem of *For Love Alone* (1944) each, according to Leer,

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using 'anthologies of stock geographical images and epithets of Australia, which tend to cluster around two coordinates. The older of these is the idea of Antipodean inversion … the other coordinate of images grew from the progress of inland exploration.' The persistence of these images into the present suggests for Leer that 'we have touched a fundamental ore of identity-building' (Leer 1991, p.3)

While it is true that Stead uses these conventional tropes, the passage from *Seven Poor Men* contains much more besides: this account of settlement is not simply a trope of inversion, it is a story of invasion as well:

> *Fires were lighted, murder done, ships cast away, cargoes plundered, robbers clothed in silk, rafts seaswept, women lost, sacrosancts profaned, mutinies smothered, hostages taken, chartings made, short-lines plumbed, reefs struck, wreckers enriched, the Chinese rolled from port to port, the Kanakas perished in the cane, mountain bluffs were climbed, the blackfellows destroyed, the plains bore flocks, the deserts of spinifex sprouted gold, the new world began. And after all this notable pioneer tale of starvation, sorrow, escapades, mutiny, death, labour in common, broad wheatlands, fat sheep, broad cattle-barons, raw male youth and his wedding to the land, in the over-populated metropolis the sad-eyed youth sits glumly in a hare-brained band, and speculates on the suicide of youth, the despair of the heirs of yellow heavy-headed acres. What a history is that; what an enigma is that?"* (Stead 1999, p. 308).

It is interesting that in a number of inter-war novels written by politically engaged authors, the majority of them women, there is a sometimes un-stated but yet palpable unease with the historical facts of Australia's foundation. These authors attempt to grapple with the fact and consequences of these first acts of aggression which accompanied the discovery and settlement of Europeans on the continent. For Eleanor Dark (1902–1981) they sit just underneath the veneer of modernity and civilisation, waiting to be revealed.

Dark's first novels of the early 1930s were resolutely modernist, psychological stories that experimented with stream-of-consciousness and other modernist narrative techniques. Even so, they contain a hint of what became one of her major concerns. *Return to Coolami* (1936) is a 'road' novel in which wealthy Tom Drew, his wife Millicent, their daughter and son-in-law; set off from Sydney in Tom's expensive new tourer on what turns out to be a literal and metaphoric journey home. As they travel away from Sydney their relationship to each other, and to the land, changes. Home takes on the character of both a physical place and a reconciliation with history. Tom is the key figure here and his interrogation of the road map the metaphor by which Dark documents his change of spirit. At the outset his hostility to the Aboriginal past is expressed as derision for Sydney's indigenous place names: 'Parramatta. It had a silly sound, a jabbering sound, the kind of sound that a child might make experimenting with vocal noises! And over there to his left still

another – Kirribilli!. Well, they sounded exactly what they were – the language of savages! (Dark 1936, p.16).

Gradually, as the trip unfolds and they drive further and further into the hinterland, Tom undergoes a change and his tour map transforms:

> *And Good God, what an unholily seductive thing a map could be! Black magic, no more, no less. For after you'd seen it the road you drove was no longer just a road, but a valiant little black line, weaving and threading and picking its way across plains and through vast tracts of bush and over wild blue mountains. ...*
>
> *Names which you must have seen last night in small black print were like voices now, calling out of some primeval past; Yarragrin, Cobborah. They were like something you had forgotten a thousand years ago and to which you were returning now, not only in miles along a road but in spirit through a dissolving barrier of time. . .*
>
> *Time! Again he was aware, uneasily, of the difference even, sometimes the antagonism, between what one knows and what one feels. And he found himself suddenly abashed because he realised that until now he had always felt that this land of his had been born out of the womb of Mother England in the year 1770 with Captain James Cook for midwife* (Dark 1936, pp. 295–296).

Tom's revelation that the names existed prior to European settlement and spoke of a history much more ancient than that of Mother England is one of the key moments of illumination in this novel. It is as though reading the map he suddenly perceived another, older map beneath. What this implies on every level of historical awareness haunts Dark's fiction from this point. While early works like *The Road to Coolami* are primarily psychological novels driven not by external historical forces but by internal drives and desires, the later work becomes more politically engaged. In the place of the indeterminate setting of *The Road to Coolami,* for example, Dark returns to Sydney as a major locale for action.

Mapping the city of Dark's imaginative fiction, we find a relatively confined place that she appears to toil over. Contemporary Sydney is for her no vast metropolis – it comprises a few streets, imprecisely located houses and shops, and the harbour as for example in *Waterway* 'her novel of the contemporary city' (Brooks 2001, p. 12). Taking place over the course of just one day, the action of *Waterway* is set in two primary locales – Watson's Bay, a small village to the east of the city and Sydney itself. The novel opens and closes in the Bay while the central chapter is set in the city. As a setting for action this city forms a long thin rectangle stretching from the ferry terminal at Circular Quay to the northern edge of Hyde Park. Characters alight and travel up Castlereagh Street or Macquarie Street to St Mary's Cathedral; one goes to the hairdresser in Macquarie Street, others meet on King Street nearby while writer Leslie Channon works in the Mitchell Library and meets her lover for lunch in the adjacent Botanic Gardens. These locales, stretching

down Macquarie Street, comprise the most beautiful part of the city and are most redolent of its colonial past. Macquarie Street also provides the urban boundary to the Domain and it is here that another group of characters meet. During the interwar years of political unrest the Domain was the symbolic heart of popular politics in Sydney, where every Sunday people voiced their opinions from their soapboxes and political activists of all kinds gathered. The homeless lived there as well, in caves or tents or other crude forms of shelter. These two locales provide the stage for two very different gatherings in *Waterway*: a society wedding at St Mary's Cathedral on Macquarie Place and a workers' rally in the Domain; inevitably the participants in each of these, the wealthy and the working class, clash. The urban map Dark draws is designed not to represent the city in a realistic fashion so much as act as a funnel, pushing its characters up through the city to the place where they will enact an ugly confrontation of ideology and class.

There is a sense in Dark's novel that the past, the colonial roots of Sydney, lies just underneath the surface of the city, and a little imagination can bring the two, past and present, face to face. Significantly, each of *Waterway*'s five sections is prefaced by quotations from dairies and historical documents from the First Fleet and later – as though to provide an overall framework in which to understand the nature of the conflict described within. The novel opens with the doctor Oliver Denning driving along the ridge of Watson Bay looking down over the harbour:

> *It was quiet now, Oliver thought, as it must have been on the dawn of that day a hundred and fifty years ago which had marked the end of its primeval solitude. Now, with the aid of dim light, narrowed eyes, and a little imagination, you could annihilate the city, the growth whose parent cells had fastened upon that land that day. You could become a different kind of man, tall and deep-chested, black-skinned and bearded, standing upon some rocky peak with the dawn wind on your naked body, your shield and spear and throwing-stick in your hands* (Dark 1938, p.11).

As Barbara Brooks has observed 'Eleanor [Dark] moves around the city vertically as well as horizontally, going down through layers of time, peeling back the urban landscape to reveal the original bush, listing the Aboriginal names for the foreshores' (Brooks 2001, p. 14). This peeling back of the layers of the city, of revealing the old maps just beneath the new is precisely what Leslie Channon, a writer and aspiring novelist, sets out to do in the Mitchell Library. Channon, like Dark herself, seeks in the library's manuscripts and books a key to imagining Sydney Cove as it was one hundred and fifty years before. Reading Dark, Brooks was reminded of Walter Benjamin's observation that the 'superficial inducement, the exotic, the picturesque has an effect only on the foreigner. To portray a city, a native must have other, deeper motives – motives of one who travels into the past instead of into the distance. A native's book about his city will always be related to memoirs; the writer has not spent his childhood there in vain' (Brooks: 2001, p. 14). Struggling

to begin her historical novel, Channon grasps for the elusive, right words to tell her Australian story, words that are not those of the English, those she calls 'invaders' who 'felt a soil beneath their feet whose very texture was alien' (Dark 1938, p. 216). Channon's short historical stories with their 'period' flavour were popular and sold well; she researched them until

> *her mental picture of the city in its infancy had grown so familiar to her that she had often felt when she had stepped out again from this quiet room into the daylight, and looked up and down Macquarie Street, surprised to find it no longer that city, no longer the straggling settlement of a handful of colonists, its street no longer traversed by carriages and bullock wagons, its womenfolk no longer picking their way delicately upon tiny feet beneath gigantic crinolines* (Dark 1938, p. 218).

The sense that the city's past is palpable, but just out of grasp, is strong in Dark's work, and eventually in the late 1930s she began to work in a new literary genre – the historical novel, although Brenton Doecke would argue it is a composite of a number of genres 'combining several narrative paradigms and modes of discourse' (Doecke 1994, p. 49). *The Timeless Land* was published in the early years of the war, 1941, but it was the novel that Dark's *alter ego* Leslie Channon in *Waterway* begins to write in the Mitchell Library that day. Those elusive words were now voiced:

> [Bennelong] *was conscious of the world, and conscious of himself as a part of it, fitting into it, like a bee in the frothing yellow opulence of the wattle. He was conscious of an order which had never failed him, as noises such as the chorus of cicadas, less a sound than a vibration on his ear-drums, of scents which he had drawn into his nostrils with his first breath, and of the familiar, scratchy touch against his bare skin of sand and twig, pebble and armoured leaf* (Dark 1958, p. 19).

In this novel the names that had appeared besides the quotations at the beginning of each section of *Waterway,* such as Governor Phillip and David Collins, now spring to life; the frame of that novel has become the internal matter of this later one. *The Timeless Land* is a fictionalised account of the European settlement of Australia, so meticulously researched that the author's sources and a glossary of Aboriginal words are included at the front of the book. Indeed in the Australian context it is unique in the way it renders transparent its use of contemporary documents including letters and journals (Doecke 2001, p. 49). Dark tells her tale of the first five years of settlement at Sydney Cove from three competing, but inextricably intertwined points of view; that of the English crown represented by Governor Arthur Phillip and his marines, the convicts represented by Andrew Prentice, his wife and son, and the local Aboriginal people represented primarily by Bennelong whose biography Dark was later to write. Here she has finally peeled away the veneer of recent progress and modernity in order to imagine and scrutinize those first foundational acts of

discovery, annexation and occupation. The setting at Sydney Cove is the undercarriage of modern Sydney in its raw state. Dark's research in the library amongst the official historical records of New South Wales, the narratives of witnesses such as marine Watkin Tench and later histories of Aboriginal culture, life and language, is everywhere evident and frequently quoted. That she consulted maps and attempted to animate them can be seen in passages such as this one which, in its landscape details, shows knowledge of Thomas Medlands map of Sydney Cove 1789:

> [from the Observatory] *They hurried along the hillside, passing lieutenant Ball's garden, passing the hospital and a dreary cluster of convict huts, passing the Marines camp and crossing the parade ground* (Dark 1958, p. 156).[1]

The title of the novel *The Timeless Land* immediately sets up a proposition about the past and the present that lies at the heart of the conflict the work describes. Aboriginal culture had been, since white settlement, characterised as 'timeless', belonging to a past that seemed to have no temporal shape in European terms. With colonisation came the exigencies of time and space connected with imperial ideas of progress which were laid over this 'timeless' land that was thought to exist somehow outside history. In addition the concept of Terra Nullius legitimised the illegal expropriation of Aboriginal land by the British; land grants to private individuals from 1792 onwards initiated an ongoing national obsession with land ownership, while speculation in land and housing has been a favourite national lottery since early settlement. It is in the figure of Stephen Mannion that Dark wrestles with this particular issue. Irish gentleman landowner, descended from a family of colonial adventurers, impulsive, bigoted, imprudent, at times violent and alcoholic without sympathy for any but those of his own class, he is possibly the least engaging character in the novel. Mannion decides to stay in the colony after Phillip grants him a large parcel of land. His impulse is entirely pecuniary:

> *I must make it clear to your Excellency, once and for all, that I have no intention of remaining permanently in this country. My position forbids it. The future of my sons would not permit it. The land which I take up I shall regard as an investment, and I shall remain here only so long as is necessary to set it in proper train. No doubt I shall visit the colony every few years to inspect it. My immediate intentions however, are these: I shall have a small house erected, and huts for such convict labour as I may have occasion to employ. I shall write to Ireland to have certain men from my own estates sent out as overseer, together with horses, livestock, and necessary tools and implements* (Dark 1958, p. 380).

In *A Little Company* (1945) we seem to hear an echo of that early, greedy lust for land when Gilbert Massey, a well-off bookseller in war-time Sydney, discovers with dismay the source of his family's wealth and social pretensions:

[1] I wish to thank Noni Boyd for alerting me to Medland's Map in the National Library of Australia

> *It appears that our great-grandfather, Henry, got the land as a grant in 1820 ... for farming! ... he died a disgruntled man ... He talks [in a letter] of "a society abandoned to every kind of wickedness," but his greatest grievance seems to have been that the land – as one would expect – was hopeless for farming. He left it to his son, William, and William built the houses on it.*
>
> *Gilbert stared out the window beside him, recalling his tour of inspection. He had stood in the narrow street trying to imagine it in those middle years of the last century, before, spreading out over the shores and promontories of the harbour, the city had at last engulfed it. Well, however barren it had been for crops, it had sprouted a luxuriant growth of houses. Built faithfully after the prevailing English model, they stood in grim and hideous terraces, wall to wall* (Dark 1958, pp. 92–95).

A more blunt appraisal of the ties that bound the Australian present to its British past are voiced by one of Christina Stead's characters in *Seven Poor Men of Sydney,* Communist librarian Tom Winter:

> *Let me tell yew here and now that Terra Felix Australis, this waste and sleepin' land, this lazy dago land. . .is on the edge of a social volcano. Because why? we're primary producers, and we feel every oscillation in the market as a cloud in the wind. Because why? because the shadder of the N. S. W. Corps still blights the wheat-fields, because we've all got to work here to keep four thousand elect and fifty thousand mean little rentiers in the boardin' houses of London. Because "their Whitehall" is breakin' the sheep's back."* (Stead 1999, p. 170).

Dark's sympathetic portrayal of Aboriginal life prior to European occupation opens up questions about the final benefits of progress. She herself noted:

> *I do not want to be taken for a "back to nature" advocate, nor for one who, in these disallusioned times, regards our own civilisation as inevitably doomed; but I do believe that we, nine tenths of whose "progress" has been mere elaboration and improvement of the technique, as opposed to the art of living, might have learned much from a people who, whatever they may have lacked in technique, had developed that art to a very high degree* (quoted in Modjeska 1981, p. 240).

For Eleanor Dark, a politically engaged author writing from the political left, human action is conditioned to an extent by the exigencies place and history and the ghosts of the old city are not forgotten in the progress of the new. The streets of Sydney fanning out from Circular Quay which was carved out of Sydney Cove in the mid-nineteenth century are redolent of the past. Governor Lachlan Macquarie's name is everywhere, as is the evocation of the old city, its plan activated in the present, and its unresolved legacies of illegal settlement infecting its modernity. As one of Dark's characters points out: 'Macquarie Street, Macquarie Place, Macquarie House, Macquarie Range, Lake Macquarie, Port Macquarie, Fort Macquarie, Macquarie

Falls. To say nothing of Lachlan River … this chap strewed his name about, didn't he? Macquarie?" (Dark 1938, p. 229).

As a Sydney writer of the inter-war period Dark was also witness to a growing historical interest in the physical fabric of old Sydney Town that was being recorded by artists and architects around publisher Sydney Ure Smith in particular. William Hardy Wilson had published his ambitious folio of drawings *Old Colonial Architecture in New South Wales and Tasmania* in 1924 and from the early twentieth century artists like Lionel Lindsay had been recording Macquarie's city as it began to disappear through neglect, slum clearance and redevelopment. Dark's contemporaries M Barnard Eldershaw set their two early historical novels *A House is Built* (1929) and *Green Memory* (1933) in the old city and turned to history for their *Phillip of Australia* (1938) and *The Life and Times of Captain George Piper* (1939) while Marjorie Barnard as a solo author published another historical work *Macquarie's World* in 1941 (Edquist 2009, pp. 269–271). A little later, in 1949, M H Ellis was to publish his biography of convict architect Francis Greenway whose work for Macquarie (the biography of whom Ellis had published in 1947) became the foundational narrative for the birth of Australian architecture. This archaeological exhumation of the past was focussed largely on the city of Sydney itself and its old harbour suburbs, the sites of much of Dark's fiction. Undertaken at the same time as the city was being refashioned under the pressures of modernist capitalism, these historical researches form a counterpoint to Dark's novels.

16.2 Conclusion

Eleanor Dark's construction of a multilayered map of Sydney in her novels, a palimpsest where the past and present co-exist in an uneasy relationship, achieves, as Doecke puts it, 'a radical perspective that confronts the existing order of things, challenging what "is"' (Doecke 1994, p. 55). Her merging of the recorded past and its agents such as Arthur Phillip and Watkin Tench with imagined narrative provokes in the reader questions to do not only with the past but also with the authenticity of the historical account and how we engage with it. Dark is interested to show how the actions of former generations obtrude into the present and she details the various ways in which her characters are heirs to the past, brutal and confronting as it is and in so doing provides 'a powerful critique of Australian society' (Doecke 2001, p. 50). She shows us how to read a city in history, how to interrogate a map and most importantly how to imagine ourselves in the past and, in engaging with its issues, achieve a more considered insight into the present.

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